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DEPARTMENT OF ENVIRONMENTAL QUALITY
STATE AQ PROGRAM

PRE-PERMIT CONSTRUCTION APPROVAL APPLICATION FACILITY-WIDE UPGRADES

IDAHO FOREST GROUP – LEWISTON
LEWISTON, IDAHO

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July 22, 2013

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1.0 INTRODUCTION

Idaho Forest Group (IFG) owns and operates a lumber facility in Lewiston, Idaho, which was purchased from Clearwater Wood Products (CWP) in 2011. Processes at the mill include a sawmill, planer mill, dry kilns and various types of wood handling equipment. The Lewiston sawmill purchases steam from the Clearwater Paper mill located on adjacent property. IFG does not operate any boilers on the Lewiston sawmill property.

The mill equipment previously included the Clearwater Lewiston Cedar Products department, also known as Profile and Specialties. Some of the lumber from the mill was diverted to the Profile and Specialties processes where it was milled into various trim or profiled specialty product types. The Profile and Specialties department also purchased and processed lumber from outside sources. IFG closed the Profile and Specialties department effective in 2012.

1.1 Site Description

The entrance to the Lewiston sawmill is located on Mill Road in Lewiston, Idaho. The mill site is located in S½ Section 28, the N½ Section 33 and NW1/4 Section 34, Township 36 North, Range 5 West, Boise Meridian, Nez Perce County, Idaho. **Figure 1** provides United States Geological Survey (USGS) 7.5-minute quadrangle map showing the plant site and surrounding area.

Figure 2 is a detailed site plan of the Lewiston sawmill facility with the future kiln location indicated. The figure also shows the internal boundary separating Clearwater and IFG property. The air quality classification for the IFG sawmill area is "Unclassifiable or Better than National Standards" (40 CFR 81.327) for the National Ambient Air Quality Standards (NAAQS) for all criteria pollutants. The land-use classification for the area surrounding the IFG source is unchanged by this project. The land use classification information is on file at DEQ.

1.2 Permit History

IFG transferred the air quality permits for the Lewiston sawmill from CWP on November 15, 2011. The Lewiston mill is regulated under Tier I operating permit T1-2008.0183. PTC permits PTC P-2010.0131 and PTC P-2011.0135 were incorporated into Tier I permit T1-2008.0183.

Tier I permit T1-2008.0183 has an expiration date of January 23, 2013, and remains in effect until the renewal process is completed. IFG submitted a Tier I permit renewal application on June 29, 2012 and DEQ deemed the application complete on August 27, 2012. On July 2, 2012 IFG submitted a Permit to Construct (PTC) application to modify the Tier I permit to reflect changes in the facility since the permit was transferred from the former owners. The PTC permit application was deemed complete on September 10, 2012.

PTC P-2011.0135 was reissued on October 25, 2012 and replaces PTC P-2010.0103. DEQ has incorporated the conditions of revised PTC P-2011.0135 into the current draft Tier I permit.

1.3 Current Permitting Action

IFG is submitting this PTC application to allow installation of additional dry kilns and upgrades to equipment in the sawmill and planer mill. Signed permit application forms are included in **Appendix A.** The mill improvements will increase the mill capacity beyond levels that were evaluated in the prior compliance demonstration.

The current permitting action is a re-submittal of a PTC application that IFG submitted in June 2013. While reviewing the June 2013 PTC application, DEQ determined that IFG would need to adopt short-term production limits in addition to annual production limits in order to ensure that the facility emissions did not exceed levels that were previously evaluated. IFG determined that short-term production levels would be impossible to implement due to the operating nature of the mill and kilns. Therefore, IFG has revised this PTC and dispersion modeling analysis to evaluate the short-term ambient impacts of all equipment operating at full capacity.

In addition to revising the short term emission estimates and dispersion modeling demonstration, IFG is also raising the annual production levels of the facility. Due to the existing VOC emission limit in the permit, IFG cannot propose annual production levels equal to the full operating capacity of the mill equipment and kilns. The annual ambient compliance demonstration in this PTC application is based on mill production of 470,000 thousand board feet per year (MBF/yr).

IFG submitted a modeling protocol on May 9, 2013 and DEQ provided an approval letter, with comments, on May 29, 2013. The modeling presented in this report incorporates DEQ's comments in the protocol approval letter. Copies of the protocol and letter are included in **Appendix B**.

The ambient impacts of the mill were previously evaluated using dispersion modeling in 2005 when CWP submitted a PTC application for a Kiln Replacement Project. The 2005 permitting action raised the allowable kiln production of the facility to the current level of 351,009 thousand board feet per year (MBF/yr). The 2005 CWP project is described in detail in the Pre-permit Construction Approval Application for the Kiln Replacement Project, which was submitted by Potlatch Corporation, Wood Products Division, Clearwater Wood Products (CWP) on March 18, 2005. IFG obtained the 2005 permit analysis through the DEQ public records process prior to purchasing the Lewiston sawmill. The CWP application document is available in the DEQ archives.

The 2005 compliance demonstration used maximum short term emissions based on the physical loading capacity of the 4 dry kilns. By adding two dry kilns, IFG would be increasing the dry kiln capacity by 50%. Therefore the current analysis is based on an

increase in short-term dry kiln emissions of 50% over the previous analysis. The annual emission increase is 34% because the maximum annual kiln production is restricted by the 249 tpy VOC emission limit on the facility. Maximum short-term emissions from the sawmill and planer equipment have been evaluated based on the equipment capacity and maximum probable operating hours. **Appendix C** contains a spreadsheet demonstrating the emissions calculations used to support this PTC application.

2.0 PRE-PERMIT CONSTRUCTION ELIGIBILITY

IFG is requesting approval for 15-day pre-permit construction for the kiln and mill upgrades. Idaho permitting regulations contained in IDAPA 58.01.01.213 allow owners to commence construction or modification of certain stationary sources before obtaining the required permit to construct. IDAPA 58.01.01.213.01.a requires that IFG apply for a permit to construct (PTC) in accordance with IDAPA 558.01.01.202.01.a, 202.02, and 202.03. This pre-permit construction approval application is also a complete PTC application. The application forms are included in **Appendix A** and the documentation needed to support the 15-day permit process are included in **Appendix D.**

IDAPA 58.01.01.213.01.b requires consultation with Department representatives prior to submitting a PTC application. IFG and their consultant have consulted with DEQ modeling staff and permitting staff. IDAPA 58.01.01.213.01.c requires that IFG submit a pre-permit construction approval application which must include the following:

- A letter requesting the ability to construct before obtaining the required PTC. A copy of the letter is included in **Appendix D**.

- A copy of the notice referenced in IDAPA 58.01.01.213.02. The Public Information Meeting Announcement was published in the Lewiston Morning Tribune, legal notices section on July 21, 2013. This announcement provided for the required 10-day notification period. The Public Information Meeting will be held on August 1st. at the Red Lion in Lewiston at 2:00. A copy of the notice is included in **Appendix D**.

- Proof of eligibility for pre-permit construction. Pre-permit construction eligibility is demonstrated in this section of the application document.

- Process description. The process description is included in Section 3 and the process flow diagram is provided in **Figure 3**.

- Equipment list. Equipment to be installed will be determined during the plant upgrade design. Sawmill and planer equipment will be located inside the respective buildings. Dry kiln designs are all generally standard, and kiln capacity is determined by operations as well as kiln design. Specific choice of dry kiln equipment will not affect the facility emissions.

- Proposed emission limits. Emissions inventory summaries are contained in Section 4 and in the calculation spreadsheet in **Appendix C**.

- Modeled ambient concentrations for all regulated air pollutants and toxic air pollutants. The completed modeling analysis is included in Section 6 of this application. The modeling protocol and DEQ approval letter are included in **Appendix B**.

IDAPA 58.01.01.213.01 states that pre-permit construction approval is available for non-major modifications proposed in accordance with Subsection 213.01.d. The proposed changes qualify as a non-major modification. The IFG-Lewiston facility is not a major source and the proposed kiln addition and mill improvement project is not a major modification. s.

Subsection 213.01.d states that owners seeking limitations on a source's potential to emit (PTE) such that permitted emissions will be either below major source levels or below a significant increase must describe in detail in the pre-permit construction application the proposed restrictions and certify in accordance with Section 123 that they will comply with the restrictions, including any applicable monitoring and reporting requirements. This permit application does not change any emission limitations. IFG currently has a permitted kiln VOC emission limit that will not be changed by the application.

The IFG-Lewiston mill as a major source of HAPs under the Tier I regulations and is subject to the requirements of the Plywood and Composite Wood Products (PWCP) NESHAPS. The HAPs that are regulated by the PCWP NESHAPS include methanol, formaldehyde, acrolein, acetaldehyde, phenol and propionaldehyde. This list encompasses all the HAP emissions from the dry kilns. Because the kiln TAP emissions are regulated under the NESHAPS, revision of the TAP analysis is not required.

Dispersion modeling is included to evaluate PM_{10} and $PM_{2.5}$ annual and 24-hour compliance. Modeling inputs and outputs are described in Section 6 of this application. Electronic modeling files have been provided to DEQ via email.

IDAPA 58.01.01.213.02 requires IFG to advertise and conduct a public information meeting about the proposed project. This meeting is solely the responsibility of IFG and will not be facilitated by DEQ. IFG has advertised the meeting on July 21 and will hold the meeting on August 1, 2013. This application will be submitted to DEQ between July 22 and August 1, 2013.

3.0 PROCESS DESCRIPTION

The primary processes at the IFG-Lewiston facility are the sawmill, planer mill, dry kilns and materials handling equipment. IFG purchases steam to heat the dry kilns from Clearwater Paper, and does not have any boilers at the site. Logs are debarked, then cut to

dimension in the sawmill. Bark from the debarker is shredded in a hog and transferred to the Clearwater Paper for use as boiler fuel.

Green lumber from the sawmill is dried in the dry kilns then planed in the planer mill. Finished lumber is packaged and shipped by truck or rail. Sawmill chips, planer chips and sawdust are conveyed offsite to the paper mill. Fine sawdust and planer shavings are transferred pneumatically to the truck bins. A plant flow diagram is included in **Figure 3**.

Fugitive PM_{10} emissions are generated during raw log processing. Emission sources include the debarker, bark hog, and hogged bark transfer. The bark hog has previously been included in the Clearwater Paper permit, but this PTC application requests that it be moved to the IFG permit.

Sawmill operations produce wood scraps and sawdust. A chipper cuts the wood scraps into marketable chips and screens out the fine material. Most of the sawdust and all of the marketable chips are transported by conveyor to Clearwater Paper. Fine material that falls through the chipper screen is transferred pneumatically to the sawdust cyclones. Fugitive sawmill emissions are minimized by the building enclosure and pneumatic conveying system.

The sawmill operations are located in the sawmill building. IFG is planning to upgrade the sawmill equipment, and tool the mill to process smaller diameter logs in the future. A new building will be built adjacent to the existing building to house the new sawmill equipment. Chips and sawdust from the new building will be handled in the same manner as the residuals from the existing equipment. The existing negative air system will be extended to the new building, so no additional sources of particulate emissions will be created.

The Lewiston facility currently has four double track kilns that are heated via indirect steam heating coils. IFG plans to install up to two additional kilns of similar design to increase production and improve lumber quality. The specific make and model of the kilns selected will not impact the dry kiln emissions.

Initial moisture content of the lumber is in the range of 40-60%. The final moisture content varies depending on species and product, and generally ranges from 10-15%. Moisture that is driven out of the lumber is released from the dry kilns through multiple roof vents. The vents are opened and closed as needed to control the temperature and moisture within the kiln. Kiln emissions include particulate matter, VOC, and HAP/TAP.

IFG purchases steam from Clearwater Paper and the steam is transferred to the kilns via a pipe from Clearwater's boiler. Clearwater has indicated to IFG that they have sufficient steam available for purchase.

The planers and associated equipment are located in the planer mill building. Air quality within the planer building is controlled with negative air, so there are no estimated fugitive

emissions from the building. Planer shavings are transported pneumatically from the planer building to the shavings baghouses, and then re-conveyed to the dry fuel bins. Planer chips are collected with a cyclone dropped onto the chip conveyor. Fugitive PM_{10} and $PM_{2.5}$ emissions occur when the fine sawdust and shavings are loaded into trucks from the bins.

IFG is considering equipment upgrades within the planer building. The changes will not impact the emissions from the planing mill because the planer equipment is enclosed.

4.0 EMISSIONS INVENTORY

Plant-wide emissions from the IFG-Lewiston facility have been estimated based on the proposed mill changes as shown on the facility-wide emissions spreadsheet in **Appendix C**. The potential to emit for the IFG point sources is summarized in Table 1. IFG submitted a facility-wide emissions inventory for the October 2012 permit application, and DEQ made some changes to the source emission calculations. The PM_{10} and $PM_{2.5}$ emission factors for the dry kilns were selected by DEQ. While preparing this permit application, it became clear that the 2012 emissions inventory overestimated cyclone emissions. The mill contains a number of cyclones that process only small fractions of the total wood residuals. Most of the sawdust and all of the green and dry chips are transported by conveyor to Clearwater Paper. However, the 2012 emission inventory calculated emissions as though all the chips and sawdust ran through every cyclone. That error has been corrected in the PTE emission inventory for this application.

Table 1: Facility Potential to Emit

Source Description	PM_{10}	$PM_{2.5}$	VOC
	T/yr	T/yr	T/yr
Kiln Vents	11.75[1]	5.88	249
IFG-CY1[2]	0.02	0.01	----
IFG-CY2[2]	0.86	0.43	----
IFG-CY3[2]	0.03	0.01	----
IFG-CY4A[2], IFG-CY4B[2]	0.20	0.06	----
IFG-CY5	0.85	0.25	----
IFG-BH1[2]	4.05	2.03	----
IFG-BH2[2]	4.28	2.14	----
IFG-BH3[2]	4.62	2.03	----
IFG-BH4[2]	1.60	0.80	----
Total	**28.3**	**13.9**	**249[3]**

1) Based on Oregon DEQ Emission Factors (AQ-EF02, 8/1/11). Hemlock @ 0.05 PM /MBF. Same emission **calculation used for Existing PTE and Proposed PTE for consistency.**
2) Emissions calculated by IFG in the current application. Revised from the previous PTC application due to inconsistencies between the facility flow diagram and the calculation methodology. BH4 has been estimated using the ODEQ planer shavings cyclone baghouse emission factor.
3) IFG requested to be limited to 249 tons per year of VOC emissions.

The 2012 emissions inventory transferred IFG-BH4 to the IFG permit from the pulp mill permit. The original emissions were transferred from the other permit without review. Upon review, IFG found that the BH-4 emissions depended on the amount of material transferred pneumatically to the truck bin cyclones. Therefore, the IFG-BH4 emissions are estimated based on the Oregon DEQ emission factor for a shavings cyclone controlled by a baghouse.

During the permit application discussions for the Tier I renewal and the October 2012 PTC application, IFG provided a detailed analysis of available VOC and HAP emissions research for dry kiln emissions. IFG and DEQ agreed on a set of emission factors based on kiln temperature and species dried. On December 24, 2012, EPA Region 10 issued a memo with an analysis of available dry kiln research in an attempt to establish a standard set of dry kiln emission factors. IFG has incorporated the EPA dry kiln VOC and HAP emission factors into this permit application, with the exception of the cedar emission factors. IFG feels that the EPA memo greatly overstates the VOC and HAP emissions from drying cedar, and has opted to keep the cedar emission factors from the IFG analysis. Detailed emission estimates are included in the PTE emissions spreadsheet printout in **Appendix C**.

5.0 REGULATORY ANALYSIS

The Minor Source Permit to Construct Application Completeness checklist requires that each applicable regulation be cited. This analysis has been done and is included in a four-page table in **Appendix E.** This section of the application contains additional information related to the regulations that could be impacted by this permit application.

5.1 Permit Requirements

Under Idaho air quality regulations (IDAPA 58.01.01.201) an application for a permit modification is required because additional kilns will be constructed. IFG has complied with all the application procedures contained in IDAPA 58.01.01.202. The application materials also show that the facility will comply with all the conditions of IDAPA 58.01.01.203. Eligibility for pre-permit construction, as allowed in Idaho IDAPA 58.01.01.213 is discussed in Section 2.

5.2 PSD Status and Class I Area Impacts

The proposed changes to the Lewiston sawmill will not increase the mill capacity beyond the level that was evaluated for the current permit. The mill does not have the potential to emit any regulated pollutant in amounts greater than 250 tons per year (tpy). Therefore, the Prevention of Significant Deterioration (PSD) regulations do not apply to this application.

The permit modification does not have the potential to impact any Class I airshed. The modification will not result in an emissions increase above previously permitted levels.

5.3 Visible Air Contaminants and Process Weight Rule

IFG will continue to comply with the visible emission standard of IDAPA 58.01.01.625. No visible emission shall exceed 20% opacity for any aggregate 3-minute period during any 60-minute period from any point source. Point source emissions and fugitive emissions material handling sources will comply with the emission limits contained in Idaho's Process Weight Rule.

5.4 Toxic Air Pollutants

Due to changes in HAP emissions factors, IFG has permitted the Lewiston mill as a major source of HAPs. The mill is now subject to the requirements of the Plywood and Composite Wood Products (PWCP) NESHAPS. The HAPs that are regulated by the PCWP NESHAPS include methanol, formaldehyde, acrolein, acetaldehyde, phenol and propionaldehyde. This list encompasses all the HAP emissions from the dry kilns. Because the TAP emissions are regulated under the NESHAPS, revision of the TAP analysis is not required.

6.0 MODELING ANALYSIS

The pre-construction permit application checklist requires that the applicant submit a modeling protocol with the application. IFG submitted a protocol on May 9, 2013 and DEQ provided an approval letter, with comments, on May 29, 2013. The modeling presented in this report incorporates DEQ's comments in the protocol approval letter. Copies of the protocol and letter are included in **Appendix B**.

Modeling is included to demonstrate compliance with the significant impact levels (SILs), also presented in the Idaho Modeling Guideline as significant contribution levels (SCLs). Compliance with the SILs ensures compliance with the National Ambient Air Quality Standards (NAAQS).

6.1 Modeling Purpose and Model Description/Justification

The purpose of the dispersion modeling for the IFG sawmill is to demonstrate that the proposed mill upgrades will not cause or contribute to a violation of any NAAQS. The proposed actions are upgrade of the planer mill equipment within the planer building, addition of a small log line within a building and addition of more kiln capacity. All of the changes are designed to improve production levels while meeting IFG's quality standards.

The Idaho modeling guidance states that justification is not needed in cases where the AERMOD modeling system is used to evaluate near-field impacts. IFG preformed the modeling using the AERMOD modeling system within the Bee-Line software BEEST program. Versions of the models used are listed in Table 2.

Table 2: Air Dispersion Modeling Programs

Model/Program Name	Version	Revision Date
AERMOD	Version 12345	December 10, 2012
AERMET	Version 12345	December 10, 2012
AERMAP	Version 11103	April 13, 2011
AERMINUTE	Version 11325	November 21, 2011
AERSURFACE	Version 13016	January 16, 2013
BEEST	Version 10.06	May 18, 2013

Source and building locations have been loaded in the BEEST program, and verified by putting a Google Earth satellite program behind the modeling plot plan. **Figure 4** shows the entire modeling grid for the project and **Figure 5** shows the modeling grid overlain on a satellite photograph. **Figure 6** shows the receptors close to the air quality boundary, as well as the sources and building. The peak receptors fell along the east side of the internal boundary between the IFG property and Clearwater. Additional hot spot receptors were added along this fenceline to ensure that peak impacts were captured.

6.2 SIL Modeling Approach

IFG submitted a modeling protocol describing the procedures proposed for use in the modeling analysis. DEQ provided a detailed written response evaluating the protocol, including the following comment:

> *Comment 5: The emissions listed in Table B of the protocol indicates source IFG-CY5 will be removed. If this represents a reduction from what was previously analyzed and permitted, then credit for the reduction can be made in the SIL analysis by modeling the previously allowed emissions as a negative value. Revisions in the other sources from what was previously analyzed but be accounted for in the modeling analyses (both the SIL analysis and the NAAQS analyses).*

The protocol stated that IFG planned to remove cyclone IFG-CY5 as part of the permitting action. IFG has since decided to keep that source in the permit. The previous site modeling included a source called Trash Hog which is the old name for the Fuel Hog. At some point between 2005 and 2007, a fire destroyed the old dry fuel bin and associated equipment. The existing truck bins with cyclones were brought in to replace the dry fuel bin. Emissions from the truck bin cyclones are routed to IFG-BH4. Emission increases from IFG-BH4 and IFG-CY5 are based on increased material being processed as production increases.

As noted in the Introduction, IFG ceased operation of the Profile and Specialties processes after purchasing the mill in 2011. The sources that were included in the original plant-wide modeling have been included in the SIL modeling using negative emission rates to indicate

that they have been removed. Changes in emissions from other IFG sources have also been included in the SIL modeling.

The planer equipment improvements will be housed entirely within the planer building, which is under a negative air system that is vented through the three planer baghouses (IFG-BH1, IFG-BH2. IFG-BH3). Potential emissions from the planer emission sources and the emission source parameters will be unchanged as a result of the proposed project because the baghouse emissions have always been estimated based on design flow rate. The planer baghouses are not included in the SIL modeling but are included in the NAAQS modeling.

The proposed additional saw line will allow processing of smaller logs and will be housed in a new building which will be under negative air. The negative air system from all the sawmill facilities will exhaust through the existing sawmill cyclones. This application includes estimated emissions increases from the sawmill cyclones as a result of increasing production. The hourly emission rate will not change, but the mill will likely operate for more hours per day. Because the sawmill cyclone emissions are estimated based on material throughput, the modeled short term and long term emission rates will increase. The stack parameters will be unchanged as a result of the proposed project. The sawmill cyclones are included in both the SIL modeling and the NAAQS modeling.

IFG is proposing to add two more kilns, essentially identical to the four existing kilns.. The additional kilns have been included in the SIL modeling, and all six kilns have been included in the NAAQS modeling. The Lewiston mill was modeled in 2005 and every effort has been made to provide continuity with the previous analysis. Differences between the previous model and the current model are explained in this application. The kiln PM_{10} emission factor used by IFG are slightly higher than the values used in 2005 site modeling due to changes in emission factors as provided by DEQ. $PM_{2.5}$ emissions were not modeled in 2005 so they have been added to the modeling analysis.

The number of kilns is increased from 4 to 6. The 2005 modeling used five sources to represent the emissions from each kiln. For the existing conditions, the potential kiln emissions were divided over 5 vents on 4 kilns, or a total of 20 sources. For the future conditions, the potential kiln emissions were divided over 5 vents on 6 kilns for a total of 30 sources.

The currently permitted emission rate for the dry kilns is 2.0 lb/hr PM_{10} and 1.0 lb/hr $PM_{2.5}$. The modeled emission rates for 20 sources (4 kilns) is 010 lb/hr PM_{10} and 0.05 lb/hr $PM_{2.5}$ per modeled source. The same emission rates have been applied to the 10 sources representing the new kilns for use in the SIL model.

6.3 Modeling Parameters

The dry kiln stack parameters from the 2005 modeling were reviewed and found to be appropriate for the current modeling. These parameters are a good representation of the kiln exhaust parameters, and the use of a point source allows for downwash. The kiln buildings are 28 feet high at the ridge, and the kilns are located on the slanting roof, just below the ridge. The kiln control booth building is located on the east end of the kiln building and has a higher roof line. Both kiln buildings and the control room have been included in the building downwash analysis for the new and existing kilns. The model uses 5 sources to represent the 20 vents on each kiln. Total exhaust area for the 5 sources is 22 ft^2 per kiln which roughly equals 1 ft^2 per vent. The kiln velocity times the opening area shows that the modeled volume flow rate from each kiln is about 1500 acfm. Kiln exhaust varies during the drying cycle, and the modeled flow volume is a conservatively low value. Kiln temperature is modeled at 200°F as this is the typical kiln temperature for exiting air.

PM_{10} and $PM_{2.5}$ emitting sources located at the adjacent paper mill were included in the modeling based on source emissions and parameters included in the 2005 modeling demonstration. The previous modeling did not include PM_{25} modeling, so $PM_{2.5}$ emissions have been estimated for each source. $PM_{2.5}$ emissions were assumed to be 29% of the PM_{10} emissions for green-wood handling sources, 50% of the PM_{10} for dry wood handling sources, and 80% of the PM_{10} emissions for combustion sources. A listing of the modeled sources at the adjacent facilities is included in **Appendix F**.

The modeled stack parameters for the existing and removed cyclones and baghouses at the IFG facility have been verified with IFG information. IFG source parameters are listed in Table 3. Modeled short term and annual emission rates for the SIL modeling are listed n Table 4. IFG potential emission rate used in the NAAQS modeling are listed in Table 5.

Table 3: IFG Source Parameters for SIL and NAAQS Modeling

Source	Model Source Name	Exhaust Type	Height (ft)	Dia. (ft)	Vel. (fps)	Temp. (F)
Existing Kilns	KILN1V1-KILN4V5	Point, Default	27	5.27	1.14	180
Proposed Kilns	IFGK5V1-IFGK6V5	Point, Default	27	5.27	1.14	180
Specialties Gang Rip C.	CWCY1, Removed	Point, Default	40	4.00	17.39	68(1)
Specialties Gang Rip C.	CWCY2, Removed	Point, Default	40	2.99	23.95	68(1)
Specialties GRECON	CWCY3, Removed	Point, Default	40	2.99	24.28	68(1)
Specialties NULOC	CWCY4, Removed	Point, Default	40	2.99	17.06	68(1)
Specialties Cyclone	CWCY6, Removed	Point, Default	40	2.49	30.51	68(1)
Profile Baghouse	CWBH4, Removed	Point, Default	8.9	4.00	59.71	68(1)
Profile Baghouse	CWBH5, Removed	Point, Default	8.9	4.00	57.09	68(1)
Profile Baghouse	CWBH6, Removed	Point, Default	8.9	4.00	46.26	68(1)
Profile Baghouse	CWBH7, Removed	Point, Default	8.9	4.00	43.64	68(1)
Sawmill Cyclone	IFGCY1	Horizontal, Beta	40	3	17	68(1)
Sawmill Cyclone	IFGCY2	Horizontal, Beta	40	3	13	68(1)
Sawmill Cyclone	IFGCY3	Horizontal, Beta	40	2.5	13	68(1)
Sawmill Cyclone	IFGCY4(3)	Horizontal, Beta	40	3	23	68(1)
Fuel Cyclone	IFGCY5	Point, Default	56	6.6	24	68(1)
Surfacing Baghouse	IFGBH1	Point, Default	43	4.3	41	68(1)
Surfacing Baghouse	IFGBH2	Point, Default	18	4.3	44	68(1)
Surfacing Baghouse	IFGBH3	Point, Default	43	4.3	47	68(1)
Bin Cyclone Baghouse	IFGBH4(4)	Point, Default	40	10	15	68(1)

(1) Modeling parameters consistent with 2005 modeling, stack heights consistent with site conditions. Temperature set to 68°F to reflect constant indoor temperature of buildings. Used AERMOD horizontal function.

(2) Cyclones are in chip bunker, release height set to bunker height. IFG-CY4A and IFG-CY4B exhaust to a common stack.

(3) Baghouse 4 exhausts through a perimeter ring with louvers directing flow upward. The large diameter represents to diameter of the baghouse, resulting in a low velocity. Downwash from the nearby bins affects the IFG-BH4 impacts.

Table 4: IFG Emissions for SIL Modeling

Model Source Name	PM10 (tpy)	PM10 (lb/hr)	PM2.5 (tpy)	PM2.5 (lb/hr)
KILN1V1-KILN4V5	0	0	0	0
IFGK5V1-IFGK5V5 IFGK6V1-IFGK6V5	2.975	1.000	1.487	0.500
CWCY1, Removed	-0.138	-0.069	-0.069	-0.034
CWCY2, Removed	-0.029	-0.15	-0.015	-0.007
CWCY3, Removed	-0.063	-0.032	-0.032	-0.016
CWCY4, Removed	-0.346	-0.174	-0.173	-0.086
CWCY6, Removed	-0.212	-0.107	-0.106	-0.053
CWBH4, Removed	-5.068	-1.157	-2.534	-0.579
CWBH5, Removed	-4.843	-1.106	-2.422	-0.553
CWBH6, Removed	-3.942	-0.900	-1.971	-0.450
CWBH7, Removed	-3.717	-0.849	-1.858	-0.424
IFGCY1(1)	0.005	0.004	0.003	0.000
IFGCY2(1)	0.217	0.163	0.109	0.000
IFGCY3(1)	0.009	0.006	0.002	0.000
IFGCY4(1)	0.050	0.037	0.014	0.000
IFGCY5	0.238	0.011	0.069	0.000
IFGBH1(2)	0.000	0.000	0.000	0.000
IFGBH2(2)	0.000	0.000	0.000	0.000
IFGBH3(2)	0.000	0.000	0.000	0.000
IFGBH4(2)	0.46	0.001	0.230	0.001

(1) Sawmill cyclone annual emissions are increased due to production increase. Short-term PM10 emissions are increased due to differences between the numbers of hours of operation used to calculate short-term emissions for the previous model. PM2.5 was not included in the previous model.
(2) Planer baghouse emissions are unchanged because they were modeled at maximum annual and short term.

Table 5: IFG Emissions for NAAQS Modeling

Model Source Name	PM10 (tpy)	PM10 (lb/hr)(1)	PM2.5 (tpy)	PM2.5 (lb/hr) (1)
IFGK1V1-IFGK6V5	11.75	3.01	5.875	1.50
IFGCY1	0.021	0.008	0.011	0.004
IFGCY2	0.857	0.320	0.429	0.160
IFGCY3	0.033	0.012	0.009	0.004
IFGCY4	0.196	0.073	0.057	0.021
IFGCY5	0.850	0.317	0.247	0.092
IFGBH1	4.055	0.926	2.027	0.463
IFGBH2	4.280	0.977	2.140	0.489
IFGBH3	4.618	1.054	2.309	0.527
IFGBH4	1.600	0.440	0.800	0.220

(1) Sawmill cyclone short term emissions are based on projected hours of operation, resulting in a conservatively high short-term emission rate. Kiln short term emissions are based on equipment capacity, annual emissions are based on plant-wide limit.

6.4 Source and Building Location Data

Source and building locations were obtained from facility records and converted from NAD27 projection to the NAD83 projection using the CORPSCON program. Using the BEEST program, the converted source and building locations were found to line up well with the Google Earth satellite photograph as shown in **Figure 6**.

All buildings on the overall plant site were included in the BPIP modeling. The BPIP program was implemented using the BEEST program. Building downwash was calculated for the kiln vents using the existing kilns and future kilns. The existing kiln building and control room were traced from Google Earth and imported into the BEEST model. Similar buildings were created for the new kilns and control room.

6.5 Ambient Air Boundary and Receptor Network

The ambient air quality boundary for the IFG modeling is defined as the IFG property line shown on **Figure 2**. The modeling was done in the BEEST program, which allows the AERMOD inputs to be overlain on Google Earth imagery. The IFG boundary was converted to UTM coordinates by tracing it on Google Earth then importing it into the BEEST program. The previous modeling included the boundary of the entire complex, and this boundary was used to help verify that the site placement was correct.

The IFG sawmill property is fenced at the public access points. The internal boundary with the other facilities is not fenced or marked. No unauthorized persons are expected to be present on the IFG property or at the other facilities near the IFG boundary. Fencing of the internal boundary between the facilities could create logistical and safety issues for the workers. The access controls on the IFG property meet the level of facility control described in the Idaho Air Quality Modeling Guideline.

Fenceline receptors were added along the IFG boundary at a spacing of 25 meters. Grid receptors were added within the larger facility boundary outside the IFG boundary at 100 meter spacing. The original property boundary receptors were eliminated to reduce the number of receptors. Receptors locations from the 2005 model were converted from the UTM coordinates based on NAD27 to coordinates based on NAD83. Preliminary modeling made it clear that the kiln impacts would not extend far from the IFG boundary receptors. Therefore, the receptor grid was reduced to expedite the SIL modeling. In addition, 10 meter hotspot receptor grids were added along the fenceline to ensure that the peak concentration was modeled. **Figure 4** shows the modeled kilns, buildings and receptors used in the SIL modeling.

The receptor elevations and hill heights were determined using the AERMAP program version listed in Table 3. Elevation data was obtained from the USGS website in seamless National Elevation Dataset (NED) files. To prepare the receptors for the revised modeling, NED files were downloaded spanning the modeling domain and processed using AERMAP. NED files are very large, and can be provided to DEQ on a CD if requested.

6.6 Meteorological Data and Background Concentrations

The processed met data was provided by DEQ in model-ready format. The data was collected in Lewiston in 1992-1995, and 1997. DEQ pre-processed the data and provided it to IFG for use in the modeling. This is an ideal situation because DEQ does not need to review the met data modeling submittal. DEQ provided 5 separate years of modeling data as well as a file with all five years combined.

When conducting cumulative NAAQS modeling, the sources not explicitly included in the model (e.g., mobile sources; small, stationary sources; some fugitive sources; and large, distant sources) are accounted for by adding a background concentration representative of the air quality in the area. Background concentrations are based on ambient air monitoring data collected in the area or from similar areas determined to be reasonably representative (Idaho Modeling Guideline).

Because the impact of the modeled changes at the facility exceeded the Idaho SIL levels, a suitable background value is needed for the NAAQS modeling. IFG proposed a background value in the modeling protocol, and DEQ responded with their preferred background values in the approval letter. The most appropriate data are 2003 data from the

Sunset Park location between city center and the potlatch facility (1200 29th Street. 46.404722 -116.968889). Only 2003 $PM_{2.5}$ data are available, with a 24-hour 98th percentile value of 18.6 μg/m³ and an annual value of 6.56 μg/m³. PM_{10} data were available for May 1, 2006 through April 30, 2007, and the 2nd high 24- hour design value was 85 μg/m³.

6.7 SIL Modeling Results

The SIL modeling results are presented in Table 6. SIL impacts are based on the highest annual or 24-hour impact during the five year met period. Detailed SIL modeling results are included in **Appendix F**.

Table 6: IFG Class II Significant Impact Modeling

Pollutant	Avg. Period	Modeled Conc. [a] (μg/m³)	Class II SIL (μg/m³)	Significant (Y/N)	Modeled Year of Peak
$PM_{2.5}$	24-hr	4.98	1.2[b]	Y	1994
	Annual	0.24	0.3[b]	N	1995
PM_{10}	24-hr	10.1	5	N	1994
	Annual	0.44	1	N	1995

[a] All concentrations are 1st-high for comparison to SIL's.
[b] $PM_{2.5}$ SCL from the Idaho Modeling Guidance.

The SIL modeling results show annual impacts from the changes at the IFG facility do not exceed the applicable significance levels. No additional annual impact modeling is required. Modeled impacts for the 24-hour PM_{10} and $PM_{2.5}$ impacts exceeded the applicable significance levels. NAAQS compliance modeling is required for both PM_{10} and $PM_{2.5}$. The modeling input/output files (including BPIP and meteorological data, and intermediate files generated by AERMET, AERMAP, and AERMOD) have been provided to DEQ in electronic format.

6.8 NAAQS Modeling Results

The SIL modeling results were used to identify receptors at which IFG had an impact greater than the applicable SIL (or Idaho SCL). The identified receptors were used in the NAAQS modeling to determine ambient compliance. Hotspot receptors were added along the internal fenceline to ensure that the highest impacts were modeled. Some of the SIL receptors fell within the other industrial facilities boundaries. If the impacts at these receptors had been found to be controlling, additional modeling would have been performed to isolate the impacts of IFG at those receptors.

In the modeling protocol review letter, it states that DEQ now allows use of the 5- year average of the 8th highest modeled value, consistent with draft EPA guidance (*Draft Guidance for $PM_{2.5}$ Permit Modeling*. Memorandum from Stephen D. Page, Director, Office of Air Quality Planning and Standards, EPA, March 4, 2013). The PM_{10} 24-hour standard is not to be exceed more than once per calendar year. When modeling five years of met data, compliance is demonstrated by showing that the highest 6th high impact at any receptor over the 5-year period does not exceed the standard. IFG has used spreadsheets to evaluate the modeling results and reduce the data and the spreadsheets have been provided to DEQ electronically.

Table 7: NAAQS Compliance Demonstration

Pollutant	Source Group	Avg. Period	Modeled Conc. (μg/m³)	Background Conc. (μg/m³)	Ambient Conc. (μg/m³)	NAAQS (μg/m³)	% of NAAQS
PM_{10}(1)	IFG Kilns	24-hr	15.4(2)				
	Clearwater Sources	24-hr	22.5(2)				
	All Sources	24-hr	40.8	85.0	127	150	85
$PM_{2.5}$(3)	IFG Kilns	24-hr	12.4(4)				
	Clearwater Sources	24-hr	6.66(4)				
	All Sources	24-hr	14.8	18.6	33.4	35	95

(1) Concentration is high-6th-high modeled value for 5-year met period.
(2) Source group contribution determined with .post files for H6H output.
(3) Concentration is the highest 5 year average high-8th-high value for all receptors.
(4) Source group concentration is the high-8th-high value for 1994 at the peak receptor.

The modeling results in Table 7 demonstrate that the proposed changes at the IFG facility will not cause or contribute to a violation of an ambient air quality standard. The modeled impacts combined with the background value show that the predicted impact from all the industrial sources in the area is 98% of the $PM_{2.5}$ 24-hour standard on the internal property boundary. The peak modeled 5 year average high-8th-high impact on a receptor located on the external boundary of the IFG property is 6.8 μg/m³. When combined with the background value, the total concentration would be 25.4 μg/m³ or 73% of the ambient standard.

FIGURES

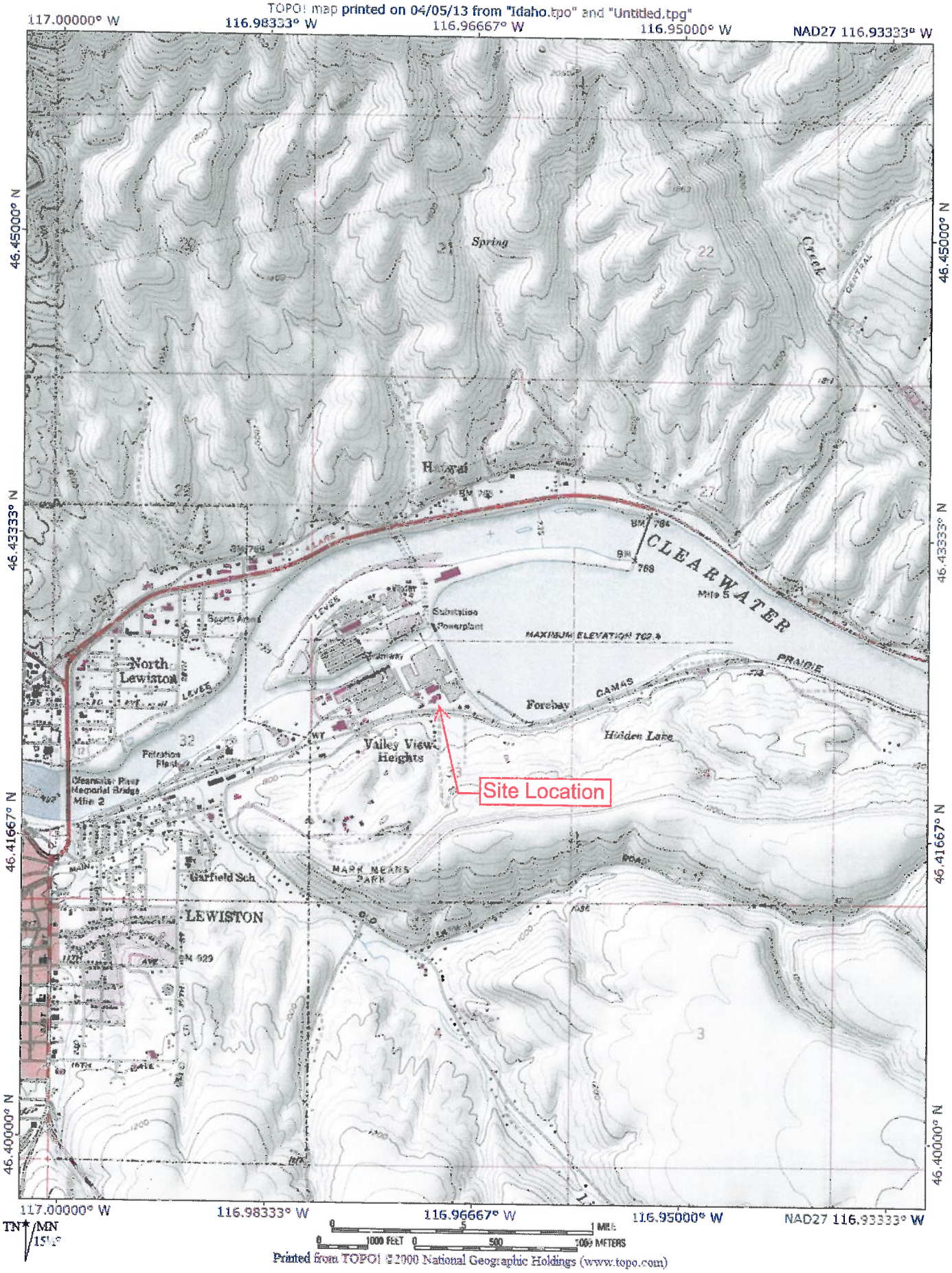
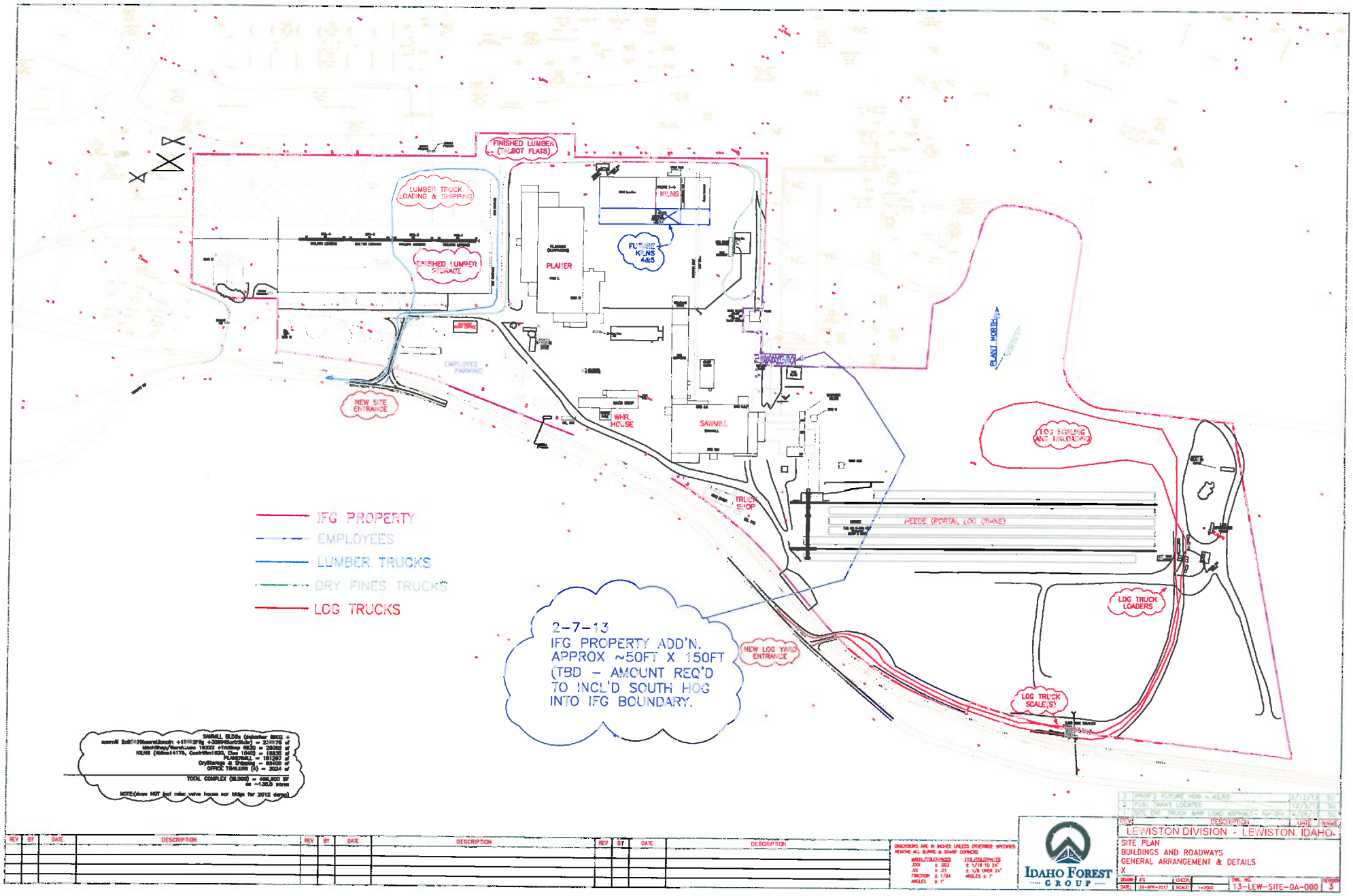
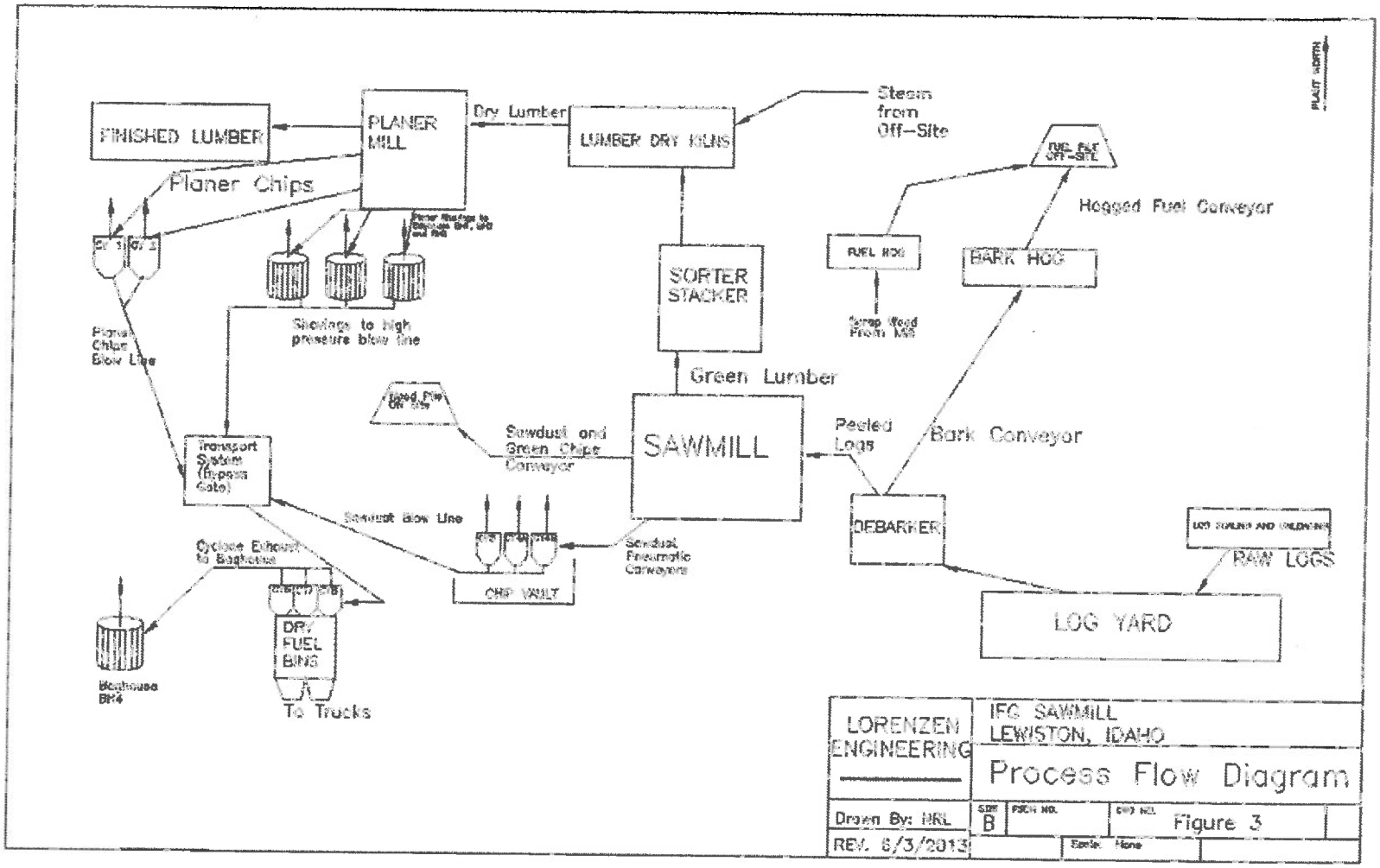
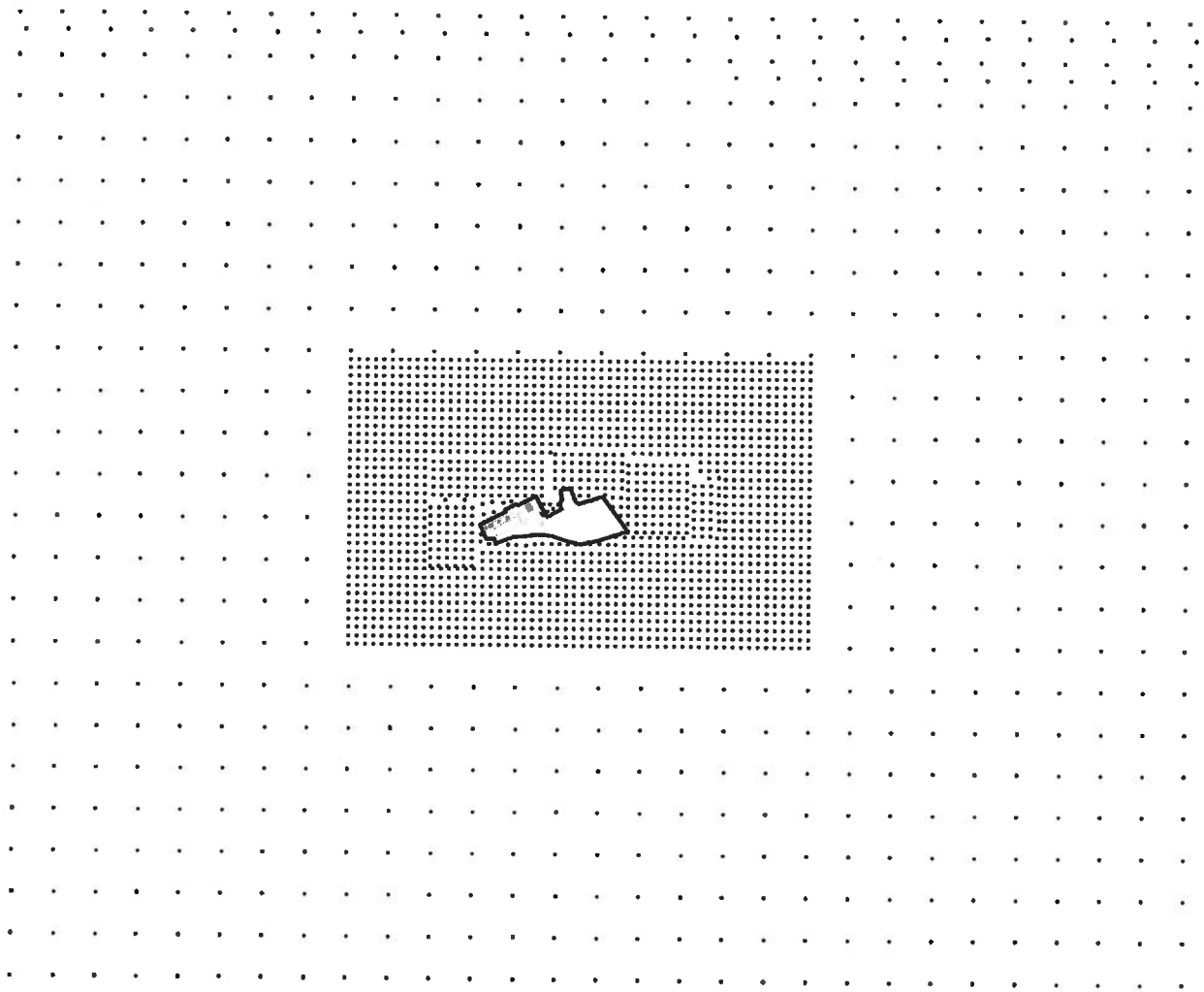


Figure 1: Site Location Map


FINISHED LUMBER (TALBOT FLATS)
LUMBER TRUCK LOADING & SHIPPING
FINISHED LUMBER STORAGE
PLANER
KILNS
FUTURE KILNS 4&5
EMPLOYEE PARKING
NEW SITE ENTRANCE
WHR. HOUSE
SAWMILL
TRUCK SHOP
PLANT NORTH
LOG SORTING AND UNLOADING
FEECE (PORTAL LOG CRANE)
LOG TRUCK LOADERS
LOG TRUCK SCALE(S)
NEW LOG YARD ENTRANCE
IFG PROPERTY
EMPLOYEES
LUMBER TRUCKS
DRY FINES TRUCKS
LOG TRUCKS
2-7-13
IFG PROPERTY ADD'N.
APPROX ~50FT X 150FT
(TBD – AMOUNT REQ'D
TO INCL'D SOUTH HOG
INTO IFG BOUNDARY.
SAWMILL BLDGs
TOTAL COMPLEX
NOTE:does NOT incl rail; valve house nor bldg for 2012 dwgs)
REV
BY
DATE
DESCRIPTION
DIMENSIONS ARE IN INCHES UNLESS OTHERWISE SPECIFIED
REMOVE ALL BURRS & SHARP CORNERS
MACH. TOLERANCES
.XXX ± .003
.XX ± .01
FRACTION ± 1/64
ANGLES ± 1°
FAB. TOLERANCES
± 1/16 TO 24"
± 1/8 OVER 24"
ANGLES ± 1°
IDAHO FOREST GROUP
LEWISTON DIVISION - LEWISTON, IDAHO
SITE PLAN
BUILDINGS AND ROADWAYS
GENERAL ARRANGEMENT & DETAILS
X
DRAWN JFG
CHECKED
DWG. NO. 13-LEW-SITE-GA-000
REVISION 3
DATE 24-APR-2013
SCALE 1=200'


FINISHED LUMBER
PLANER MILL
Dry Lumber
LUMBER DRY KILNS
Steam from Off-Site
Planer Chips
Hogged Fuel Conveyor
FUEL BOX
BARK HOG
SORTER STACKER
Green Lumber
Sawdust and Green Chips Conveyor
SAWMILL
Peeled Logs
Bark Conveyor
Transport System (Bypass Gate)
Sawdust Blow Line
Cyclone Exhaust to Baghouse
CHIP VAULT
Sawdust Pneumatic Conveyors
DEBARKER
RAW LOGS
LOG YARD
DRY FUEL BINS
To Trucks
PLANT NORTH
LORENZEN ENGINEERING
IFG SAWMILL
LEWISTON, IDAHO
Process Flow Diagram
Drawn By: NKL
SIZE B
Figure 3
REV. 6/3/2013
Scale: None

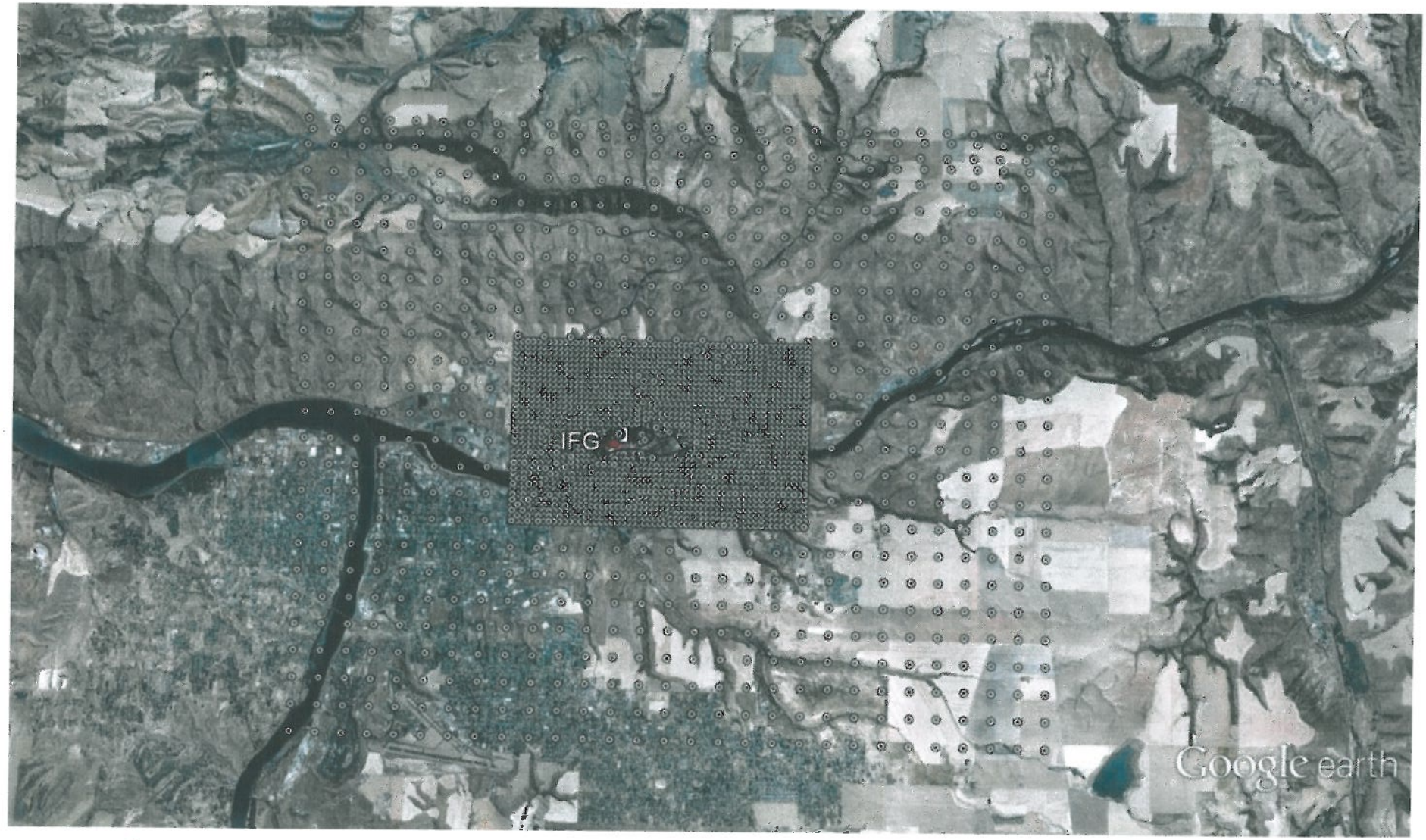
IFG Lewiston Boundary and Full Receptor Grid



Potential vs. Potential with Number of Kilns Changed

Figure 4: AERMOD Modeling Grid

Scale: 1" = 2139.2 Meters



Google earth

Figure 5: AERMOD Modeling Domain

Figure 6: AERMOD Modeling Sources, Buildings and Receptors

Scale: 1" = 232.9 Meters

Appendix A

Permit to Construct Application Forms

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
2/18/10

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

All information is required. If information is missing, the application will not be processed.

IDENTIFICATION

1. Company Name	2. Facility Name
Idaho Forest Group LLC	IFG - Lewiston

3. Brief Project Description:	Install additional kiln capacity, replace/upgrade sawmill and planer equipment to allow mill to reach currently permitted production levels.

FACILITY INFORMATION

4. Primary Facility Permit Contact Person/Title	Jim Miller		Technical Manger	
5. Telephone Number and Email Address	(208) 848-2322		jdmiller@idfg.com	
6. Alternate Facility Contact Person/Title	Jesse Short		Mill Manager	
7. Telephone Number and Email Address	(208) 762-2999		jshort@idfg.com	
8. Address to Which the Permit Should be Sent	P.O. Box 557			
9. City/County/State/Zip Code	Lewiston	Nez Perce	Idaho	83501
10. Equipment Location Address (if different than the mailing address above)	807 Mill Road			
11. City/County/State/Zip Code	Lewiston	Nex Perce	Idaho	83501
12. Is the Equipment Portable?	☐ Yes ☒ No			
13. SIC Code(s) and NAICS Code	Primary SIC: 2421	Secondary SIC:	NAICS: 321113	
14. Brief Business Description and Principal Product	Sawmill, dry kilns and planer mill that produce finished lumber			
15. Indentify any adjacent or contiguous facility that this company owns and/or operates	None			
16. Specify the reason for the application	☒ Permit to Construct (PTC) 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. ☐ Incorporate the PTC at the time of the Tier I renewal ☐ Co-process the Tier I modification and PTC ☒ Administratively amend the Tier I permit to incorporate the PTC upon your request (IDAPA 58.01.01.209.05.a, b, or c) ☐ Tier I Permit ☐ Tier II Permit ☐ Tier II/Permit to Construct			

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.

17. Responsible Official's Name/Title	Jessie Short	Mill Manager	
18. Responsible Official's Signature	Jesse D Short	Date:	7-22-13

19. ☒ Check here to indicate that you would like to review the draft permit prior to final issuance.

DEQ AIR QUALITY PROGRAM
1410 N. Hilton, Boise, ID 83706
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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	Idaho Forest Group LLC		
2. Facility Name	IFG – Lewiston	3. Facility ID No.	069-00003
4. Brief Project Description - One sentence or less	Modify PTC to allow installation of additional klins and replacement/upgrade of sawmill and planer equipment. The modifications will not increase the capacity of the facility beyond the currently permitted level of 351,009 mmbdft/yr.		

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.:_____ Date Issued:_____
☐ 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-CP1 - EI-CP4– Emissions Inventory– criteria pollutants	(Excel workbook, all 4 worksheets)	☐
☒	☐	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

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: Idaho Forest Group LLC	2. Facility Name: Idaho Forest Group - Lewiston
3. Brief Project Description:	Modify PTC to reflect equipment removed and to transfer existing equipment from the Clearwater Pulp and Paper permit to the IFG-Lewiston sawmill permit.

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): **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): **NESHAP Subpart DDDD – Plywood and Composite Wood Products MACT** The facility does not have any emergency or non-emergency SI or CI RICE units.
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.

Applicability Review for Attachment to Idaho Form FRA

TITLE 40--PROTECTION OF ENVIRONMENT, CHAPTER I--ENVIRONMENTAL PROTECTION AGENCY, PART 63_NATIONAL EMISSION STANDARDS FOR HAZARDOUS AIR POLLUTANTS FOR SOURCE CATEGORIES. Subpart DDDD - National Emission Standards for Hazardous Air Pollutants: Plywood and Composite Wood Products

Sec. 63.2231 Does this subpart apply to me?

This subpart applies to you if you meet the criteria in paragraphs (a) and (b) of this section.
(a) You own or operate a PCWP manufacturing facility. A PCWP manufacturing facility is a facility that manufactures plywood… and/or composite wood... **Plywood and composite wood products manufacturing facilities also include facilities that manufacture dry veneer and lumber kilns located at any facility.** Plywood and composite wood products include, but are not limited to, plywood, veneer, particleboard, oriented strandboard, hardboard, fiberboard, medium density fiberboard, laminated strand lumber, laminated veneer lumber, wood I-joists, **kiln-dried lumber**, and glue-laminated beams.
(b) The PCWP manufacturing facility is located at a major source of HAP emissions.

The IFG Lewiston facility is a major source of HAPs and includes lumber dry kilns. Therefore the PCWP NESHAPS applies.

Sec. 63.2232 What parts of my plant does this subpart cover?

(a) This subpart applies to each new, reconstructed, or existing affected source at a PCWP manufacturing facility. (b) … **The affected source includes lumber kilns at PCWP manufacturing facilities and at any other kind of facility.** (c) An affected source is a new affected source if you commenced construction of the affected source after January 9, 2003, and you meet the applicability criteria at the time you commenced construction. (d) An affected source is reconstructed if you meet the criteria as defined in Sec. 63.2. (e) An affected source is existing if it is not new or
reconstructed.

The lumber kilns at the Lewiston sawmill are an affected existing source.

Sec. 63.2252 What are the requirements for process units that have no control or work practice requirements?

…For process units not subject to the compliance options or work practice requirements specified in Sec. 63.2240 (including, but not limited to, lumber kilns), you are not required to comply with the compliance options, work practice requirements, performance testing, monitoring, SSM plans, and recordkeeping or reporting requirements of this subpart, or any other requirements in subpart A of this part, except for the initial notification requirements in Sec. 63.9(b).

There are no applicable requirements in the PCWP MACT regulations for lumber dry kilns except for initial notification requirements. The previous owner of the Lewiston sawmill submitted the initial notification for the PCWP MACT as required.

Appendix B

Modeling Protocol and Approval

IFG Lewiston
Dispersion Modeling Protocol

IFG is preparing a pre-permit construction approval application. The modeling for the project will be completed as described this modeling protocol.

1) **General project description.**

   IFG will be submitting a PTC application to allow installation of additional dry kilns and upgrades to equipment in the sawmill and planer mill. The mill improvements are not intended to increase the mill capacity beyond the current production levels. The proposed IFG permitting is a continuation of a 2005 permitting action that raised the allowable kiln production of the facility to the current level of 351,009 thousand board feet per year (MBF/yr). The 2005 is described in detail in the Pre-permit Construction Approval Application for the Kiln Replacement Project, which was submitted by Potlatch Corporation, Wood Products Division, Clearwater Wood Products (CWP) on March 18, 2005 (on file at DEQ).

2) **Describe the general modeling approach used. If the analyses include multiple operational scenarios, these should be thoroughly described.**

   There will no emissions increase associated with the project, but the emission parameters for the dry kilns will change. Emissions that were formerly modeled as emitting from 4 kilns will now emit from 6 kilns. This change will be used to model impacts for comparison to the significant impact levels (SILs). If the kiln change impacts exceed the SILs, all the sources at the IFG sawmill and surrounding industrial sources will be modeled to demonstrate compliance with the National Ambient Air Quality Standards (NAAQS).

3) **Thoroughly describe the area where the project will be located, including the attainment status for all criteria pollutants.**

   The entrance to the Lewiston sawmill is located on Mill Road in Lewiston, Idaho. Figure 1 provides United States Geological Survey (USGS) 7.5-minute quadrangle map showing the plant site and surrounding area. The air quality classification for the IFG sawmill area is "Unclassifiable or Better than National Standards" (40 CFR 81.327) for the National Ambient Air Quality Standards (NAAQS) for all criteria pollutants.

4) **Modeling applicability. Discuss how it will be determined what emissions sources and pollutants to include in the modeling analyses.**

   The PM_{10} emissions from the sawmill sources are unchanged from the levels that were previously analyzed, except the sources that have been removed. The emissions parameters have not changed since the previous modeling, with the exception of the dry kilns. Therefore the dry kilns will be used in the SIL modeling to determine if the project will have a significant impact. All of the IFG sources will be included in any

necessary NAAQS modeling, as well as all the sources at the surrounding facilities. $PM_{2.5}$ modeling will be included as well as PM_{10} modeling.

5) **Describe the model proposed for the analyses, including the version number.**

The Idaho modeling guidance states that justification is not needed in cases where the AERMOD modeling system to evaluate near-field impacts. IFG will perform the modeling using the AERMOD modeling system within the Bee-Line software BEEST program. Versions of the models used are listed in Table A.

Table A: Air Dispersion Modeling Programs

Model/Program Name	Version	Revision Date
AERMOD	Version 12345	December 10, 2012
AERMET	Version 12345	December 10, 2012
AERMAP	Version 11103	April 13, 2011
AERMINUTE	Version 11325	November 21, 2011
AERSURFACE	Version 13016	January 16, 2013
BEEST	Version 10.06	February 14, 2013
PMPOST	Version 1.4	January 3, 2013

The IFG modeling will use the same source and building information as the 2005 modeling wherever possible. Differences between the two analyses will be described in this report.

6) **List the meteorological data proposed for the project and describe how those data are representative for the application site.**

The processed met data was provided by DEQ in model-ready format. The data was collected in Lewiston in 1992-1995, and 1997. DEQ pre-processed the data and provided it to IFG for use in the modeling. This is an ideal situation because DEQ does not need to review the met data modeling submittal. DEQ provided 5 separate years of modeling data as well as a file with all five years combined.

7) **List the source of terrain data used in the modeling analyses. If terrain affects are not proposed for the analyses, a justification for this should be provided.**

The receptor elevations and hill heights will be determined using the AERMAP program version listed in Table A. Elevation data was obtained from the USGS website in seamless National Elevation Dataset (NED) files. To prepare the receptors for the revised modeling, NED files were downloaded spanning the modeling domain and will be processed using AERMAP.

8) **Provide a facility plot plan with emissions sources and buildings clearly identified, if available.** Figure 2 is a detailed site plan of the Lewiston sawmill facility with the future kilns location indicated.

9) **Describe the modeling domain and the receptor network used. Suggested receptor spacing provided in the Idaho Air Modeling Guideline are general suggestions. DEQ may require a different grid spacing to adequately resolve maximum modeled concentrations.**

Fenceline receptors were added along the IFG boundary at a spacing of 25 meters, which is the same spacing used in the 2005 model. Grid receptors were added within the larger facility boundary outside the IFG boundary at 100 meter spacing. The original property boundary receptors were eliminated to reduce the number of receptors. Receptors locations from the 2005 model were converted from the UTM/NAD27 coordinates UTM/NAD83 coordinates.

10) **Provide justification for the ambient air boundary. The facility must prevent public access inside the ambient air boundary using methods described in the Idaho Air Modeling Guideline.**

The ambient air quality boundary for the IFG modeling is defined as the IFG property line shown on Figure 2. The modeling was done in the BEEST program, which allows the AERMOD inputs to be overlain on Google Earth imagery. The IFG boundary was converted to UTM coordinates by tracing it on Google Earth then importing it into the BEEST program. The previous modeling included the boundary of the entire complex, and this boundary was used to help verify that the site placement was correct.

The IFG sawmill property is fenced at the public access points. The internal boundary with the other facilities is not fenced or marked. No unauthorized persons are expected to be present on the IFG property or at the other facilities near the IFG boundary. Fencing of the internal boundary between the facilities could create logistical and safety issues for the workers. The access controls on the IFG property meet the level of facility control described in the Idaho Air Quality Modeling Guideline.

11) **If known, emissions rates used in the modeling should be listed. This will give DEQ reviews an idea of the magnitude of the project. Describe how modeling emissions rates will be calculated for various averaging periods (exa. 1-hour, 24-hour, and annual for sources that do not operate continuously).**

Modeling emission rates are listed in Table B. The modeling is based on the same emission rates for 24-hour and annual modeling. There is no 1-hour modeling in this analysis, and any daily variations in operations will be averaged out over the 24-hour modeling period.

Table B: Facility Potential to Emit

Source Description	PM_{10} T/yr	$PM_{2.5}$ T/yr
Kiln Vents	8.8[1]	4.4
IFG-CY1[2]	0.016	0.008
IFG-CY2[2]	0.256	0.128
IFG-CY3[2]	0.012	0.004
IFG-CY4A[2]	0.037	0.011
IFG-CY4B[2]	0.037	0.011
IFG-CY5[2]	Removed from permit	
IFG-BH1[2]	4.05	4.05
IFG-BH2[2]	4.28	4.28
IFG-BH3[2]	4.62	4.62
Dry Fuel Bin IFG-BH4[2]	8.11	8.11
Total	**33.2**	**33.2**

1) Based on Oregon DEQ Emission Factors (AQ-EF02, 8/1/11). Hemlock @ 0.05 PM /MBF. Same emission calculation used for Existing PTE and Proposed PTE for consistency.
2) Emissions calculated by IFG in the current application. Revised from the previous PTC application due to inconsistencies between the facility flow diagram and the calculation methodology. BH4 has been corrected to be consistent with the other baghouses.

The number of kilns is increased from 4 to 6. The 2005 modeling used five sources to represent the emissions from each kiln. For the existing conditions, the potential kiln emissions were divided over 5 vents on 4 kilns, or a total of 20 sources. For the future conditions, the potential kiln emissions were divided over 5 vents on 6 kilns for a total of 30 sources.

12) If known, emissions release parameters associated with emissions release points should be listed. Documentation and justification of these values should also be provided.

Modeled IFG source parameters are listed in Table C. In the 2005 modeling, the baghouses and cyclones were modeled using ISCST3 to avoid a bug that existed in AERMOD at that time. All the sources will modeled in AERMOD for the IFG analysis. The AERMOD non-default horizontal modeling function will be used for the cyclone exhausts.

Table C: IFG Source Parameters for NAAQS Modeling

Modeled Source Name	Stack Exhaust Type(1)	Height (ft)	Modeled Diameter (ft)	Modeled Velocity (fps)	Exhaust Temp. (F)
IFGCY1	Horizontal, Beta	40	3	17	68
IFGCY2	Horizontal, Beta	40	3	13	68
IFGCY3(3)	Horizontal, Beta	40	2.5	173(2)	68
IFGCY4(3)	Horizontal, Beta	40	3	23	68
IFGBH1	Point, Default	43	4.3	41	68
IFGBH2	Point, Default	35	4.3	44	68
IFGBH3	Point, Default	43	4.3	47	68
IFGBH4(4)	Point, Default	40	10	15	68
KILN1V1-KILN1V5 KILN2V1-KILN2V5 KILN3V1-KILN3V5 KILN4V1-KILN4V5 KILN5V1-KILN5V5 KILN6V1-KILN6V5	Point, Default	8.22	5.27	1.14	180

(1) Modeling parameters consistent with 2005 modeling, stack heights consistent with site conditions. Temperature set to 68°F to reflect constant indoor temperature of buildings. Used AERMOD horizontal function.

(2) Velocity from 2005 modeling. Use of horizontal function negates the effect of the high velocity.

(3) Cyclones are in chip bunker, release height set to bunker height. IFG-CY4A and IFG-CY4B exhaust to a common stack.

(4) Baghouse 4 exhausts through a perimeter ring with louvers directing flow upward. The large diameter represents to diameter of the baghouse, resulting in a low velocity. Downwash from the nearby bins affects the IFG-BH4 impacts.

13) Describe what values will be used for background concentrations if a full impact analysis is required. DEQ may be consulted for assistance with determining background concentrations.

Preliminary modeling has shown that the SIL analysis will not show annual impacts. Therefore, only 24-hour background values are addressed. The $PM_{2.5}$ 24-hour design value is the three year average of the 98th percentile monitored concentrations. IFG has found the $PM_{2.5}$ design value for Lewiston in the Idaho DEQ Annual Ambient Air Quality Monitoring Network Plan, dated July 1, 2010 (available on the DEQ website). The design value is based on TEOM $PM_{2.5}$ data collected in Lewiston. The modeled sources were operating at the time the data was collected, so use of this data for the background value is conservative. The $PM_{2.5}$ background design value based on the monitor years 2008 through 2010 was 16 $\mu g/m^3$.

The PM_{10} 24-hour background value of 46 $\mu g/m^3$ is the value provided by DEQ for use in the 2005 modeling of the Lewiston facility.

14) Describe what modeled values will be used to evaluate compliance with standards (highest, 1st high values; highest, 2nd high values; etc.)

SIL impacts will be based on the highest annual or 24-hour impact during the five year met period for both PM_{10} and $PM_{2.5}$. Compliance with the PM_{10} 24-hour NAAQS will be determined using the highest 6th high impact at any receptor over the 5-year modeling period.

The 24-hour $PM_{2.5}$ NAAQS modeling will be performed using five separate years of met data to determine the highest impact at each receptor for each year. For the 24-hour $PM_{2.5}$ NAAQS analysis, the modeled concentrations to be added to design value are the maximum modeled 24-hour averages across 5 years for NWS meteorological data. This calculation will be done for each receptor using the BEE-LINE PMPOST processing program.

STATE OF IDAHO
DEPARTMENT OF
ENVIRONMENTAL QUALITY

1410 NORTH HILTON, BOISE, ID 83706 · (208) 373-0502

C. L. "BUTCH" OTTER, GOVERNOR
CURT FRANSEN, DIRECTOR

May 29, 2013

Diane Lorenzen
Lorenzen Engineering, Inc.

RE: Modeling protocol for the Idaho Forest Group Permit to Construct application for proposed changes to their sawmill and planer mill facility in Lewiston, Idaho.

Diane:

DEQ received your dispersion modeling protocol submitted via email, received on May 10, 2013. The modeling protocol was submitted on behalf of Idaho Forest Group (IFG). The modeling protocol proposes methods and data for use in the ambient impact analyses of a PTC application for proposed modifications to the IFG Lewiston facility.

The modeling protocol has been reviewed and DEQ has the following comments:

- Comment 1: The protocol states that the project involves installation of an additional dry kiln, and emphasizes that the modification will not increase mill capacity beyond current production levels. The change in capacity must be evaluated for all averaging periods associated with specific air quality standards. Emissions modeled for the Significant Impact Level (SIL) analysis must reflect the change in allowable emissions from any specific point. Since an additional kiln will be operated, the application must describe in detail how daily throughput will not increase as a result of the modification, and it must describe how such restrictions can be made enforceable with a permit. If there will be no increase in daily emissions from kilns, then the modification should be assessed by modeling the allowable capacity of the new kiln as positive emissions along with reduction in emissions from the existing kiln, modeled as negative emissions.

- Comment 2: The submitted application must provide clear, thorough, and complete justification and documentation of release parameters of all sources included in the modeling analyses. As results approach applicable standards, DEQ will demand a greater degree of stack parameter justification. Also, each application must be complete in itself. Referencing previously provided documentation is not adequate. Release parameters of existing co-contributing sources must also be verified in the application. Documentation must be provided with the current application submitted.

- Comment 3: The protocol notes that "IFG modeling will use the same source and building information as the 2005 modeling wherever possible." As mentioned in Comment 2, each application must be complete in itself, so information used in previous analyses must be resubmitted and its use justified/verified in the application. The exception to this are processed meteorological data provided by DEQ.

- Comment 4: The protocol describes the receptor grid proposed, including 25-meter spacing along the boundary. The adequacy of the receptor grid is largely dependent upon modeling results and the location of the controlling concentrations. It is the applicant's responsibility to use a sufficiently tight receptor network such that the maximum modeled concentration is reasonably resolved. The receptor grid should be sufficiently tight such that receptors near the maximum-impacted receptor do not show substantially different concentrations than that of the maximum-impacted receptor.

- Comment 5: The emissions listed in Table B of the protocol indicates source IFG-CY5 will be removed. If this represents a reduction from what was previously analyzed and permitted, then credit for the reduction can be made in the SIL analysis by modeling the previously allowed emissions as a negative value. Revisions in the other sources from what was previously analyzed but be accounted for in the modeling analyses (both the SIL analysis and the NAAQS analyses).

- Comment 6: The 173 exit velocity of IFGCY3 seems somewhat high and should be verified in the application. Use of the horizontal function does not completely negate the effect of velocity, since velocity affects total flow volume, which then effect the plume buoyancy flux. The horizontal function does negate the plume momentum flux, which is also a function of flow velocity.

- Comment 7: The 16 $\mu g/m^3$ background value was obtained from a specialty monitor that is not a federal reference method monitor. The data purpose for this monitor is for AQI and/or other special purpose rather than NAAQS compliance, and such monitors tend to underestimate $PM_{2.5}$ depending upon the chemical composition of the particulate monitored. Federal Reference Method monitoring in the area has not occurred since 2003 for $PM_{2.5}$ and 2007 for PM_{10} (2007 – 2008 for Clarkston). The most appropriate data are 2003 data from the Sunset Park location between city center and the potlatch facility (1200 29th Street. 46.404722 -116.968889). Only 2003 $PM_{2.5}$ data are available, with a 24-hour 98th percentile value of 18.6 $\mu g/m^3$ and an annual value of 6.56 $\mu g/m^3$. PM_{10} data were available for May 1, 2006 through April 30, 2007, and the 2nd high 24-hour design value was 85 $\mu g/m^3$.

- Comment 8: The protocol proposes using a modeling 24-hour $PM_{2.5}$ design value of the 5-year mean of the 1st high modeled value of each year. DEQ now allows use of the 5-year average of the 8th highest modeled value, consistent with draft EPA guidance (*Draft Guidance for $PM_{2.5}$ Permit Modeling*. Memorandum from Stephen D. Page, Director, Office of Air Quality Planning and Standards, EPA, March 4, 2013)

DEQ's modeling staff considers the submitted dispersion modeling protocol, with resolution of the additional items noted above, to be approved. It should be noted, however, that the approval of this modeling protocol is not meant to imply approval of a completed dispersion modeling analysis. Please refer to the *State of Idaho Air Quality Modeling Guideline*, which is available on the Internet at http://www.deq.state.id.us/air/permits_forms/permitting/modeling_guideline.pdf, for further guidance.

To ensure a complete and timely review of the final analysis, our modeling staff requests that electronic copies of all modeling input and output files (including BPIP and AERMAP input and output files) are submitted with an analysis report. A copy of this protocol approval notice

should also be included with the submitted application. If DEQ provided model-ready meteorological data files, then these do not need to be resubmitted to DEQ with the application. If you have any further questions or comments, please contact me at (208) 373-0112.

Sincerely,

Kevin Schilling

Kevin Schilling
Stationary Source Air Modeling Coordinator
Idaho Department of Environmental Quality
208 373-0112

Appendix C

Emission Calculation Spreadsheets

IFG - Lewiston
PM10 and PM2.5 Modeled Emission Rate Summary

	Previously Analyzed Emissions				Modeled Emissions			
	PM10 LT (ton/yr)	PM10 ST (lb/hr)	PM2.5 LT (ton/yr)	PM2.5 ST (lb/hr)	PM10 LT (ton/yr)	PM10 ST (lb/hr)	PM2.5 LT (ton/yr)	PM2.5 ST (lb/hr)
Point Sources								
Lumber Drying								
Kilns (KILN1V5 - KILN6-V5)	8.78	2.00	4.39	1.00	11.75	3.01	5.88	1.50
Cyclones								
CWCY1, was CY-1, Removed in 2012	0.138	0.069	0.069	0.034	0.000	0.000	0.000	0.000
CWCY2, was CY-2, Removed in 2012	0.029	0.015	0.015	0.007	0.000	0.000	0.000	0.000
CWCY3, was CY-3, Removed in 2012	0.063	0.032	0.032	0.016	0.000	0.000	0.000	0.000
CWCY4, was CY-4, Removed in 2012	0.346	0.174	0.173	0.086	0.000	0.000	0.000	0.000
CWCY6, was CY-6, Removed in 2012	0.212	0.107	0.106	0.053	0.000	0.000	0.000	0.000
IFGCY1, was CY-18	0.016	0.004	0.008	0.004	0.021	0.008	0.011	0.004
CY-24, removed prior to 2012	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
IFGCY2, was CY-25	0.640	0.157	0.320	0.160	0.857	0.320	0.429	0.160
IFGCY3, was CY-26	0.024	0.006	0.007	0.004	0.033	0.012	0.009	0.004
IFGCY4, was CY-27A and CY-27B	0.146	0.036	0.043	0.021	0.196	0.073	0.057	0.021
IFGCY5, was CY-FH(1)	0.612	0.306	0.177	0.089	0.850	0.317	0.247	0.092
Baghouses								
IFGBH1, BH-1	4.055	0.926	2.027	0.463	4.055	0.926	2.027	0.463
IFGBH2, BH-2	4.280	0.977	2.140	0.489	4.280	0.977	2.140	0.489
IFGBH3, BH-3	4.618	1.054	2.309	0.527	4.618	1.054	2.309	0.527
CWBH4, BH-4, removed	5.068	1.157	2.534	0.579	0.000	0.000	0.000	0.000
CWBH5, BH-5, removed	4.843	1.106	2.422	0.553	0.000	0.000	0.000	0.000
CWBH6, BH-6, removed	3.942	0.900	1.971	0.450	0.000	0.000	0.000	0.000
CWBH7, BH-7, removed	3.717	0.849	1.858	0.424	0.000	0.000	0.000	0.000
IFGBH4, truck bin baghouse	1.140	0.438	0.570	0.219	1.600	0.440	0.800	0.220
Point Source Totals	**42.664**	**10.317**	**21.168**	**5.180**	**28.260**	**7.133**	**13.903**	**3.482**

SIL Modeling

	PM10 LT (ton/yr)	PM10 ST (lb/hr)	PM2.5 LT (ton/yr)	PM2.5 ST (lb/hr)
Kilns (KILN1V5 - KILN6-V5)	2.975	1.002	1.487	0.501
CWCY1, was CY-1, Removed in 2012	-0.138	-0.069	-0.069	-0.034
CWCY2, was CY-2, Removed in 2012	-0.029	-0.015	-0.015	-0.007
CWCY3, was CY-3, Removed in 2012	-0.063	-0.032	-0.032	-0.016
CWCY4, was CY-4, Removed in 2012	-0.346	-0.174	-0.173	-0.086
CWCY6, was CY-6, Removed in 2012	-0.212	-0.107	-0.106	-0.053
IFGCY1, was CY-18	0.005	0.004	0.003	0.000
CY-24, removed prior to 2012	0.000	0.000	0.000	0.000
IFGCY2, was CY-25	0.217	0.163	0.109	0.000
IFGCY3, was CY-26	0.009	0.006	0.002	0.000
IFGCY4, was CY-27A and CY-27B	0.050	0.037	0.014	0.000
IFGCY5, was CY-FH(1)	0.238	0.011	0.069	0.003
IFGBH1, BH-1	0.000	0.000	0.000	0.000
IFGBH2, BH-2	0.000	0.000	0.000	0.000
IFGBH3, BH-3	0.000	0.000	0.000	0.000
CWBH4, BH-4, removed	-5.068	-1.157	-2.534	-0.579
CWBH5, BH-5, removed	-4.843	-1.106	-2.422	-0.553
CWBH6, BH-6, removed	-3.942	-0.900	-1.971	-0.450
CWBH7, BH-7, removed	-3.717	-0.849	-1.858	-0.424
IFGBH4, truck bin baghouse	0.460	0.001	0.230	0.001

IDAHO FOREST GROUP, LEWISTON
Emission Inventory/Calculations
Production Information Supporting PTE Calculations

Lumber Production, Current Permit

Sawmill	351,009	mbdft/year
Dry Kilns	351,009	mbdft/year
Planer	351,009	mbdft/year
Logs Used	1,263,632	tons/year, based on std. ratio

Residuals Production. Based on specific equipment

	tons/year	Ratio from typical mill production	
Sawmill Chips to convey	263,000	0.75	GT chips/mbdft sawmill
Sawdust to convey	116,000	0.33	GT sawdust/mbdft sawmill
Fines to cyclones	5,033	from cyclone data	
Bark to fuel hog	105,000	0.3	GT bark/mbdft sawmill
Planer Chips	21,060	0.06	BDT chips/mbdft planer
Shavings	38,610	0.11	GT shavings/mbdft planer
Wood to Fuel Hog	7,200	estimated from production	

Sawmill and Planer	43,643	tons/year	to truck bins
LCP, When Operating	13,093	tons/year	to truck bins
	57,000	tons/year	to truck bins

Lumber Production, Proposed

Sawmill	470,000	mbdft/year, estimated based on dry kilns
Dry Kilns	470,000	mbdft/year, production level in permit
Planer	470,000	mbdft/year, estimated based on dry kilns
Logs Used	1,692,000	tons/year, based on std. ratio

Residuals Production. Based on specific equipment

	tons/year	Ratio from typical mill production	
Sawmill Chips to convey	353,000	0.75	GT chips/mbdft sawmill
Sawdust to convey	155,000	0.33	GT sawdust/mbdft sawmill
Fines to cyclones	28,857	from cyclone data	
Bark to fuel hog	141,000	0.3	GT bark/mbdft sawmill
Planer Chips	28,200	0.06	BDT chips/mbdft planer
Shavings	51,230	0.11	GT shavings/mbdft planer
Wood to Fuel Hog	10,000	estimated from production	

Total to Bins	80,087	tons/year	to truck bins
LCP, Now Closed	0	tons/year	to truck bins
	80,000	tons/year	to truck bins

LUMBER DRY KILN PARTICULATE EMISSIONS

Current Emissions, PM10 Prevously Analyzed

Current Annual Production PTE 351,009 Mbf/yr

Daily compliance based on equipment potential, not limited by permit.

PM10 Emission Factor:	0.05	lbs/Mbf	PTC 2011.0135 Rev. 10/12
Annual PM10 Emissions:	8.78	tons/year	PTE
Modeled Annual PM10:	0.100	lb/source/hr	4 kilns, 5 sources each
Daily PM10 Emissions:	48.08	lb/day	PTE, 4 kilns
Modeled Daily PM10:	0.100	lb/vent/hr	4 kilns, 5 sources each

PM2.5 (not previously modeled)

Emission Factor:	0.025	lbs/Mbf	50% of PM10 from dry kilns
Annual Emissions:	4.39	tons/year	PTE
Modeled Annual Emissions:	0.050	lb/source/hr	4 kilns, 5 sources each
Daily Emissions:	24.04	lb/day	PTE, 4 kilns
Modeled Daily Emissions:	0.050	lb/source/hr	4 kilns, 5 sources each

Proposed Emissions, Analyzed in FIA Modeling

Proposed Annual Production PTE 470,000 Mbf/yr

Daily compliance based on equipment potential, not limited by permit.

PM10 Emission Factor:	0.05	lbs/Mbf	PTC 2011.0135 Rev. 10/12
Annual PM10 Emissions:	11.75	tons/year	PTE
Modeled Annual PM10:	0.089	lb/source/hr	KILN1V1-KILN6V5
Daily PM10 Emissions:	72.13	lb/day	PTE, 6 kilns
Modeled Daily PM10:	0.100	lb/source/hr	KILN1V1-KILN6V5

PM25 Emission Factor:	0.025	lbs/Mbf	50% of PM10 from dry kilns
Annual PM25 Emissions:	5.88	tons/year	PTE
Modeled Annual PM25:	0.045	lb/source/hr	KILN1V1-KILN6V5
Daily PM25 Emissions:	36.06	lb/day	PTE, 6 kilns
Modeled Daily PM25:	0.050	lb/vent/hr	KILN1V1-KILN6V5

Changes in Emissions, Analyzed in PA Modeling

Model the changes and compare to the SCLs

Existing Kilns

Modeled Annual PM10:	-0.011	lb/source/hr	KILN1V1-KILN4V5
Modeled Daily PM10:	0.000	lb/source/hr	KILN1V1-KILN4V5 (exclude)
Modeled Annual PM25:	-0.005	lb/source/hr	KILN1V1-KILN4V5
Modeled Daily PM25:	0.000	lb/source/hr	KILN1V1-KILN4V5 (exclude)

Proposed Kilns

Modeled Annual PM10:	0.089	lb/source/hr	KILN5V1-KILN6V5
Modeled Daily PM10:	0.100	lb/source/hr	KILN5V1-KILN6V5
Modeled Annual PM25:	0.045	lb/source/hr	KILN5V1-KILN6V5
Modeled Daily PM25:	0.050	lb/source/hr	KILN5V1-KILN6V5

KILN VOLATILE ORGANIC COMPOUND (VOC) EMISSIONS

Using EPA VOC factors for temperatures greater than 200 F
Average Production 2008-2011: 17% cedar, 0% P.pine, 0% ESLP, 65% hem fir, 18% red fir-larch
VOC Emissions will be tracked to verify that emissions are below the permit limit of 249 tpy.

Annual Production Limit:	470,000	Mbf/yr	
Emission Factor:	1.038	lbs/Mbf	VOC Emissions based on
Emissions:	244	tons/year	mix shown below.

Wood Species:	% of Total	VOC (lb/Mbf)	Weighted (lb/Mbf)	Reference
Cedar	17%	0.14	0.024	U of Idaho, 1996
Hem Fir (use white fir)	65%	1.09	0.709	EPA Reg 10, Dec. 2012
Douglas Fir and larch	18%	1.70	0.305	EPA Reg 10, Dec. 2012
Ponderosa Pine	0%	3.81	0.000	EPA Reg 10, Dec. 2012
ESLP, use Lodgepole	0%	1.53	0.000	EPA Reg 10, Dec. 2012
Other (use ESLP)	0%	1.53	0.000	EPA Reg 10, Dec. 2012
Total	100%		**1.038**	

KILN HAZARDOUS AIR POLLUTANT (HAPS)

Total MBF processed	**351,009**		
% Douglas Fir	18%	63,182	*MBF/Yr by species*
% Hem-Fir	65%	228,156	
% Ponderosa Pine	0%	0	
% ESLP	0%	0	
% Cedar	17%	59,672	
% Other (name species)	0%	0	
	100%	351,009	

EMISSION FACTORS:	EPA 12/12, except cedar					
Pollutant	Total HAP	Methanol	Formal-dehyde	Acetal-dehyde	Propion-aldehyde	Acrolein
Douglas Fir	0.1913	0.1170	0.0043	0.0682	0.0007	0.0011
Hem Fir (HF, WW)	0.4956	0.4200	0.0163	0.0550	0.0018	0.0026
Ponderosa Pine	0.2029	0.1440	0.0092	0.0420	0.0032	0.0045
ESLP	0.1166	0.0628	0.0041	0.0420	0.0032	0.0045
Cedar	0.0678	0.0298	0.0016	0.0355	0.0003	0.0005

EMISSIONS

	Emission lb/Yr					
Species	Total HAP	Methanol	Formal-dehyde	Acetal-dehyde	Propion-aldehyde	Acrolein
Douglas Fir	12087	7392	272	4309	44	69
Western Hemlock	113074	95825	3719	12549	411	593
Ponderosa Pine	0	0	0	0	0	0
White Fir (white wood)	0	0	0	0	0	0
Cedar	4046	1778	95	2118	18	30
TOTAL, lb/yr	129,206	104,996	4,086	18,976	473	693
TOTAL, ton/yr	64.60	52.50	2.04	9.49	0.24	0.35

BAGHOUSES

Material Handling Baghouses

These baghouses seperated transported dry wood residuals from the pneumatic air stream.

Source/Pollutants	E. F. (gr/cf)	Flow cfm	PM10 e.f. lb/hr	PM25 e.f. lb/hr
BH-1, Surfacing Baghouse/PM	0.003	36000	0.926	0.463
BH-2, Surfacing Baghouse/PM	0.003	38000	0.977	0.489
BH-3, Surfacing Baghouse/PM	0.003	41000	1.054	0.527
BH-4, Specialties Baghouse/PM	0.003	45000	1.157	0.579
BH-5, Profiles Baghouse/PM	0.003	43000	1.106	0.553
BH-6, Profiles Baghouse/PM	0.003	35000	0.900	0.450
BH-7, Specialties Baghouse/PM	0.003	33000	0.849	0.424
Conversion of minutes to hours	60 min/hr			
Conversion of grains to lbs	7000 gr/lb			

IFGBH4, Truck Bin Baghouse

PM10 e.f. 0.04 lb/ton, ODEQ, AQ-EF02

PM2.5 e.f. 0.02 lb/ron, 50% of PM10 for dry material

IFGBH4 is an emissions control baghouse, which cleans the exhaust streams from the material handling cyclones on the truck bins. The most applicable emission factor for this source comes from the Oregon DEQ Wood Products Emsision factors in AQ-EF2. The emission factor for a material handling cyclone with baghouse emissions, processing fine dry material, is 0.04 lb/bone

The throughput to the three cyclones on the truck bin equals the sum total of material blown to the bins from all processes. This is the loading used to calculate IFGBH4 emissions.

In 2005, IFGBH4 was used as a material handling baghouse, without the benefit of the cyclones upstream to remove the bulk of the transported materials. Under this arrangment, the estimated emissions were based on the air flow and grain loading. The revised emissions are based on material handling to provide comparable emissions estimation.

BAGHOUSE EMISSIONS INCLUDED IN PREVIOUS PERMIT ANALYSIS

HOURS OF OPERATION 8760 HOURS PER YEAR

ANNUAL PLANER PRODUCTION 351,009 MBDFT/YR

Modeled Source Name/Status	Emissions Basis (hrs/yr)	Previously Analyzed Emissions (PM2.5 not modeled)			
		PM10 (ton/yr)	Daily PM10 (lb/hr)	PM2.5 (ton/yr)	PM2.5 (lb/hr)
IFGBH1, BH-1	8,760	4.055	0.926	2.027	0.463
IFGBH2, BH-2	8,760	4.280	0.977	2.140	0.489
IFGBH3, BH-3	8,760	4.618	1.054	2.309	0.527
CWBH4, BH-4, removed	8,760	5.068	1.157	2.534	0.579
CWBH5, BH-5, removed	8,760	4.843	1.106	2.422	0.553
CWBH6, BH-6, removed	8,760	3.942	0.900	1.971	0.450
CWBH7, BH-7, removed	8,760	3.717	0.849	1.858	0.424
IFGBH4, truck bin baghouse Was included in previous analysis as a different source	57,000 tons/yr 5,200 hrs/yr	1.140	0.438	0.570	0.219

BAGHOUSE EMISSIONS INCLUDED IN THIS MODELING

HOURS OF OPERATION 8760 HOURS PER YEAR
ANNUAL PLANER PRODUCTION 470,000 MBDFT/YR

Modeled Source Name/Status	Emissions Basis (hrs/yr)	Previously Analyzed Emissions (PM2.5 not modeled)			
		PM10 (ton/yr)	Daily PM10 (lb/hr)	PM2.5 (ton/yr)	PM2.5 (lb/hr)
IFGBH1, BH-1	8,760	4.055	0.926	2.027	0.463
IFGBH2, BH-2	8,760	4.280	0.977	2.140	0.489
IFGBH3, BH-3	8,760	4.618	1.054	2.309	0.527
CWBH4, BH-4, removed	0	0.000	0.000	0.000	0.000
CWBH5, BH-5, removed	0	0.000	0.000	0.000	0.000
CWBH6, BH-6, removed	0	0.000	0.000	0.000	0.000
CWBH7, BH-7, removed	0	0.000	0.000	0.000	0.000
IFGBH4, truck bin baghouse Increase handled by operating more hours.	80,000 tons/yr 7,280 hrs/yr	1.600	0.440	0.800	0.220

CYCLONE EMISSION FACTORS

Potlatch developed cyclone emission factors for PM. IFG is using those emissions factors where possible, with corresponding factors for PM10 and PM2.5.

Source	PM10 e.f. (lb/ton) (1)	PM2.5 e.f. (lb/ton) (2)	Status
CY-1, Specialties Gang Rip Cyclone	0.778	0.389	REMOVED
CY-2, Specialties Gang Rip Cyc.	0.164	0.082	REMOVED
CY-3, Specialties GRECON	0.164	0.082	REMOVED
CY-4, Specialties NULOC	0.522	0.261	REMOVED
CY-6, Specialties	0.164	0.082	REMOVED
CY-18, Surfacing, #4 Splitter	0.600	0.300	IFG-CY1
CY-24, Surfac., Brooks Chip., Fines	0.778	0.389	REMOVED IN PAST
CY-25, Surfac., Brooks Chip., Chips (3)	0.062	0.031	IFG-CY2
CY-26, Sawmill, All Machine Ctrs	0.165	0.048	IFG-CY3
CY-27A, Sawmill, All Machine Ctrs	0.780	0.226	IFG-CY4A
CY-27B, Sawmill, All Machine Ctrs	0.780	0.226	IFG-CY4B
CY-FH, Complex, Fuel Hog	0.170	0.049	IFG-CY5

Notes:

(1) Original note from Potlatch said: Calculated using cyclone and dust parameters per Rex. M. Robbins, Pollution Engineering, March, 1988 , with number of turns (Ne) calc. According to Wark and Warner, 1981

(2) SCC Code 30700805, dry wood: PM10=PM*0.4, PM2.5=PM*0.2, PM2.5 = PM10*0.5. SCC Code 30700820, green wood: PM10 =PM*0.51, and PM2.5=PM*0.15, PM2.5=PM10*0.29.

CYCLONE EMISSIONS INCLUDED IN PREVIOUS PERMIT ANALYSIS

HOURS OF OPERATION 4000 HOURS PER YEAR, VARIED IN PREVIOUS ANALYSIS
ANNUAL SAWMILL PRODUCTION 351,009 MBDFT/YR

Modeled Source Name/Status	Current Throughput tons	Previously Analyzed Emissions (PM2.5 not modeled)			
		PM10 (ton/yr)	Daily PM10 (lb/hr)	PM2.5 (ton/yr)	PM2.5 (lb/hr)
CWCY1, was CY-1, Removed in 2012	354	0.138	0.069	0.069	0.034
CWCY2, was CY-2, Removed in 2012	354	0.029	0.015	0.015	0.007
CWCY3, was CY-3, Removed in 2012	773	0.063	0.032	0.032	0.016
CWCY4, was CY-4, Removed in 2012	1,324	0.346	0.174	0.173	0.086
CWCY6, was CY-6, Removed in 2012	2,582	0.212	0.107	0.106	0.053
IFGCY1, was CY-18	53	0.016	0.004	0.008	0.004
CY-24, removed prior to 2012	0	0.000	0.000	0.000	0.000
IFGCY2, was CY-25	20,826	0.640	0.157	0.320	0.160
IFGCY3, was CY-26	296	0.024	0.006	0.007	0.004
IFGCY4, was CY-27A and CY-27B	376	0.146	0.036	0.043	0.021
IFGCY5, was CY-FH(1)	7,200	0.612	0.306	0.177	0.089

(1) CW called this the Trash Hog, and it was modeled at a high emission rate, apparently in error. Values shown are what should have been modeled

CYCLONE EMISSIONS INCLUDED IN THIS MODELING

HOURS OF OPERATION 5356 HOURS PER YEAR
ANNUAL SAWMILL PRODUCTION 470,000 MBDFT/YR

Modeled Source Name/Status	Current Throughput tons	Emissions Modeled for This Application			
		PM10 (ton/yr)	Daily PM10 (lb/hr)	PM2.5 (ton/yr)	PM2.5 (lb/hr)
CWCY1, was CY-1, Removed in 2012	0	0.000	0.000	0.000	0.000
CWCY2, was CY-2, Removed in 2012	0	0.000	0.000	0.000	0.000
CWCY3, was CY-3, Removed in 2012	0	0.000	0.000	0.000	0.000
CWCY4, was CY-4, Removed in 2012	0	0.000	0.000	0.000	0.000
CWCY6, was CY-6, Removed in 2012	0	0.000	0.000	0.000	0.000
IFGCY1, was CY-18	71	0.021	0.008	0.011	0.004
CY-24, removed prior to 2012	0	0.000	0.000	0.000	0.000
IFGCY2, was CY-25	27,886	0.857	0.320	0.429	0.160
IFGCY3, was CY-26	396	0.033	0.012	0.009	0.004
IFGCY4, was CY-27A and CY-27B	503	0.196	0.073	0.057	0.021
IFGCY5, was CY-FH(1)	10,000	0.850	0.317	0.247	0.092

IDAHO FOREST GROUP
LEWISTON, IDAHO
Emission Inventory/Calculations
PTE Emission Calculations

Fugitive Sources	PM10 (ton/yr)	PM2.5 (ton/yr)	SO_2 (ton/yr)	NOx (ton/yr)	VOC (ton/yr)	CO (ton/yr)	HAPS (ton/yr)
Log and Bark Handling, Fugitives							
DEBARKER	4.65	1.35	---	---	---	---	---
FUEL HOG	0.30	0.17	---	---	---	---	---
BARK HOG (existing source, change of ownership)	0.88	0.51					
BARK TRANSFER TO OFF-SITE FUEL PILE	3.53	1.02	---	---	---	---	---
SCRAP WOOD HANDLING	1.00	0.12					
Sawmill, Fugitives							
SAWMILL, INDOOR	1.69	0.49	---	---	---	---	---
SAWMILL CHIPPER, INDOOR	0.88	0.26	---	---	---	---	---
SAWDUST AND CHIP CONVEY OFF-SITE	4.41	1.28	---	---	---	---	---
SAWDUST DIVERT TO CHIP VAULT	0.06	0.02					
Truck Bin Loadout, Fugitives							
TRUCK BIN LOADOUT, GREEN	1.04	0.30	---	---	---	---	---
TRUCK BIN LOADOUT, DRY	4.61	2.31	---	---	---	---	---
PNEUMATIC DIVERT - GREEN AND DRY MATERIAL	0.20	0.10					
Fugitive Road Dust							
Fugitive Dust - PAVED ROADS	0.12	0.03	---	---	---	---	---
Fugitive Dust - UNPAVED ROADS	3.19	0.32	---	---	---	---	---
Fugitive Totals	**26.6**	**8.28**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
Point Sources							
Lumber Drying							
LUMBER DRY KILNS	11.75	5.88	---	---	244	---	86.5
Cyclones							
IFG-CY1, Planer #4 Splitter	0.02	0.01	---	---	---	---	---
IFG-CY2, Planer Chipper	0.86	0.43	---	---	---	---	---
IFG-CY3, Sawmill all Machine Centers	0.03	0.01	---	---	---	---	---
IFG-CY4A,B Sawmill all Machine Centers	0.20	0.06	---	---	---	---	---
IFG-CY5, Fuel Hog	0.85	0.25	---	---	---	---	---
Baghouses							
PLANER SHAVINGS BAGHOUSE (IFG-BH1)	4.05	2.03	---	---	---	---	---
PLANER SHAVINGS BAGHOUSE (IFG-BH2)	4.28	2.14	---	---	---	---	---
PLANER SHAVINGS BAGHOUSE (IFG-BH3)	4.62	2.31	---	---	---	---	---
TRUCK BIN CYCLONES BAGHOUSE (IFG-BH4)	1.60	0.80					
Point Source Totals	**28.3**	**13.9**	**0.00**	**0.00**	**244**	**0**	**87**
Plant Wide Total	**54.8**	**22.2**	**0.0**	**0.0**	**244**	**0**	**86.5**

The Lewiston sawmill does not have any combustion sources, so has negligible greenhouse gas.

IDAHO FOREST GROUP, LEWISTON
Emission Inventory/Calculations
Production Information Supporting PTE Calculations

Lumber Production		
Sawmill	470,000	mbdft/year, estimated based on dry kilns
Dry Kilns	470,000	mbdft/year, production level in permit
Planer	470,000	mbdft/year, estimated based on dry kilns
Logs Used	1,692,000	tons/year, based on std. ratio
Absolute maximum hours, used in PTC Application		
Sawmill Hours	8,760	hours/year, based on ratio of reported data
Planer Hours	8,760	hours/year, based on ratio of reported data
Kiln Hours	8,760	hours/year, based on ratio of reported data
Projected maximum hours		
Sawmill Hours	6,000	hours/year, based on ratio of reported data
Planer Hours	6,000	hours/year, based on ratio of reported data
Kiln Hours	7,000	hours/year, based on ratio of reported data

Residuals Production. Based on specific equipment			
	tons/year	**Ratio from typical mill production**	
Sawmill Chips to convey	353,000	0.75	GT chips/mbdft sawmill
Sawdust to convey	155,000	0.33	GT sawdust/mbdft sawmill
Fines to cyclones	28,857	from cyclone data	
Bark to fuel hog	141,000	0.3	GT bark/mbdft sawmill
Planer Chips	28,200	0.06	BDT chips/mbdft planer
Shavings	51,230	0.11	GT shavings/mbdft planer
Wood to Fuel Hog	10,000	based on records	

LUMBER DRY KILNS

Wood mix is general, to demonstrate calculation method.

CRITERIA POLLUTANTS

470,000 Mbf/yr, lumber dried
8760 hours per year

PM/PM10 :			
Emission Factor:	0.05 lbs/Mbf	PTC 2011.0135 Rev. 10/12	
Emissions:	11.75 tons/year		0.391666667
PM2.5 :			
Emission Factor:	0.025 lbs/Mbf	Assume PM2.5 is 50% of PM10	
Emissions:	5.88 tons/year		0.195833333
VOC:			
Emission Factor:	1.04 lbs/Mbf	VOC Emissions based on	
Emissions:	244 tons/year	mix shown below.	

Wood Species:

	% of Total	VOC (lb/Mbf)	Weighted (lb/Mbf)	Reference
Cedar	17%	0.14	0.024	U of Idaho, 1996
Hem Fir (use white fir)	65%	1.09	0.709	EPA Reg 10, Dec. 2012
Douglas Fir and larch	18%	1.70	0.305	EPA Reg 10, Dec. 2012
Ponderosa Pine	0%	3.81	0.000	EPA Reg 10, Dec. 2012
ESLP, use Lodgepole	0%	1.53	0.000	EPA Reg 10, Dec. 2012
Other (use ESLP)	0%	1.53	0.000	EPA Reg 10, Dec. 2012
Total	100%		**1.038**	

Using EPA VOC factors for temperatures greater than 200 F
Average Production 2008-2011: 17% cedar, 0% P.pine, 0% ESLP, 65% hem fir, 18% red fir-larch

Idaho Forest Group - Lewiston

Wood mix average for 2008 - 2011

EMISSIONS YEAR	PTE

ENTER			
Total MBF processed	**470,000**		
% Douglas Fir	18%	84,600	*MBF/Yr by species*
% Hem-Fir	65%	305,500	
% Ponderosa Pine	0%	0	
% ESLP	0%	0	
% Cedar	17%	79,900	
% Other (name species)	0%	0	
	100%	470,000	

EMISSION FACTORS:	EPA 12/12, except cedar					
Pollutant	Total HAP	Methanol	Formal-dehyde	Acetal-dehyde	Propion-aldehyde	Acrolein
Douglas Fir	0.1913	0.1170	0.0043	0.0682	0.0007	0.0011
Hem Fir (HF, WW)	0.4956	0.4200	0.0163	0.0550	0.0018	0.0026
Ponderosa Pine	0.2029	0.1440	0.0092	0.0420	0.0032	0.0045
ESLP	0.1166	0.0628	0.0041	0.0420	0.0032	0.0045
Cedar	0.0678	0.0298	0.0016	0.0355	0.0003	0.0005

EMISSIONS

	Emission lb/Yr					
Species	Total HAP	Methanol	Formal-dehyde	Acetal-dehyde	Propion-aldehyde	Acrolein
Douglas Fir	16184	9898	364	5770	59	93
Western Hemlock	151406	128310	4980	16803	550	794
Ponderosa Pine	0	0	0	0	0	0
White Fir (white wood)	0	0	0	0	0	0
Cedar	5417	2381	128	2836	24	40
TOTAL, lb/yr	173,007	140,589	5,471	25,409	633	927
TOTAL, ton/yr	86.50	70.29	2.74	12.70	0.32	0.46

LOGS AND BARK, FUGITIVE EMISSIONS

DEBARKER

1,692,000 Tons of Logs/Year
8,760 Hours/Year

PM:	Emission Factor:	0.02 lbs/ton	AIRS 3-07-008-01
	Emissions:	8.46 tons/year	Water spray, 50% control
PM10:	Emission Factor:	0.011 lbs/ton	AIRS 3-07-008-01
	Emissions:	4.65 tons/year	Water spray, 50% control
PM2.5:	Emission Factor:	0.00319 lbs/ton	29% of PM10 for green material
	Emissions:	1.35 tons/year	

BARK TRANSFER TO OFF-SITE FUEL PILE

141,000 Tons of Bark/Year
8,760 Hours/Year

PM:	Emission Factor:	0.1 lbs/ton	General Material Handling Factor
	Emissions:	7.05 tons/year	
PM10:	Emission Factor:	0.05 lbs/ton	General Material Handling Factor
	Emissions:	3.53 tons/year	
PM2.5:	Emission Factor:	0.0145 lbs/ton	29% of PM10 for green material
	Emissions:	1.02 tons/year	

BARK HOG (existing source, change of ownership)

141,000 Tons of Bark/Year
8,760 Hours/Year

PM:	Emission Factor:	0.1 lbs/ton	General Material Handling Factor
	Controlled EF:	0.05 lbs/ton	Hog is partially enclosed, 50% control.
	Emissions:	3.53 tons/year	
PM10:	Emission Factor:	0.025 lbs/ton	General Material Handling Factor
	Controlled EF:	0.0125 lbs/ton	Hog is partially enclosed, 50% control.
	Emissions:	0.88 tons/year	Hog is partially enclosed, 50% control.
PM2.5:	Emission Factor:	0.00725 lbs/ton	29% of PM10 for green material
	Emissions:	0.51 tons/year	

FUEL HOG

48,200 Tons of wood/Year
8,760 Hours/Year

PM:	Emission Factor:	0.1 lbs/ton	General Material Handling Factor
	Controlled EF:	0.05 lbs/ton	Hog is partially enclosed, 50% control.
	Emissions:	1.21 tons/year	
PM10:	Emission Factor:	0.025 lbs/ton	General Material Handling Factor
	Controlled EF:	0.0125 lbs/ton	Hog is partially enclosed, 50% control.
	Emissions:	0.30 tons/year	Hog is partially enclosed, 50% control.
PM2.5:	Emission Factor:	0.00725 lbs/ton	29% of PM10 for green material
	Emissions:	0.17 tons/year	

SCRAP WOOD HANDLING

Includes wood from headrig and bins transported to fuel hog

40,000 Tons of wood/Year
8,760 Hours/Year

PM:	Emission Factor:	0.1 lbs/ton	General Material Handling Factor
	Emissions:	2.00 tons/year	
PM10:	Emission Factor:	0.050 lbs/ton	General Material Handling Factor
	Emissions:	1.00 tons/year	
PM2.5:	Emission Factor:	0.005 lbs/ton	29% of PM10 for green material
	Emissions:	0.12 tons/year	

SAWMILL PROCESSES

SAWMILL, INDOOR

1,692,000 Tons of Logs/Year
8,760 hr/yr

PM:	Emission Factor:	0.35 lbs/ton	Idaho Factor
	Controlled EF:	0.0035 lbs/ton	Indoors with pneumatic dust pickup.
	Emissions:	2.96 tons/year	99% removal efficiency.
PM10:	Emission Factor:	0.2 lbs/ton	Idaho Factor
	Corrected Factor:	0.002 lbs/ton	Indoors with pneumatic dust pickup.
	Emissions:	1.69 tons/year	99% removal efficiency.
PM2.5:	Emission Factor:	0.00058 lbs/ton	29% of PM10 for green material
	Emissions:	0.49 tons/year	

SAWMILL CHIPPER, INDOOR

353,000 Tons of Chips/Year
8,760 hr/yr

PM:	Emission Factor:	0.1 lbs/ton	General Material Handling Factor
	Controlled EF:	0.01 lbs/ton	Enclosed process, 90% control.
	Emissions:	1.77 tons/year	
PM10:	Emission Factor:	0.05 lbs/ton	General Material Handling Factor
	Controlled EF:	0.005 lbs/ton	Enclosed process, 90% control.
	Emissions:	0.88 tons/year	
PM2.5:	Emission Factor:	0.00145 lbs/ton	29% of PM10 for green material
	Emissions:	0.26 tons/year	

PLANER PROCESSES

PLANERS, INDOOR

This is an insignificant source because the planer emissions pneumatically controlled through the shavings transport system. Planer shavings are picked up inside the building and blown to three baghouses. The baghouses transfer the shavings to a high-pressure line for pneumatic transport to the truck bins.

PLANER SHAVINGS BAGHOUSE (IFG-BH1)

		36,000 scfm	Rated Flow
		8,760 hours/yr	Potential Hours
PM/PM10:	Emission Factor:	0.003 gr/dscf	Manufacturer Baghouse Emission Rate
	Emissions:	4.05 tons/year	
		0.93 lbs/hr	
PM2.5:	Emission Factor:	0.0015 gr/dscf	50% of PM10 for Dry Material
	Emissions:	2.03 tons/year	
		0.46 lbs/hr	

PLANER SHAVINGS BAGHOUSE (IFG-BH2)

		38,000 scfm	Rated Flow
		8,760 hours/yr	Potential
PM/PM10:	Emission Factor:	0.003 gr/dscf	Manufacturer Baghouse Emission Rate
	Emissions:	4.28 tons/year	
		0.98 lbs/hr	
PM2.5:	Emission Factor:	0.0015 gr/dscf	50% of PM10 for Dry Material
	Emissions:	2.14 tons/year	
		0.49 lbs/hr	

PLANER SHAVINGS BAGHOUSE (IFG-BH3)

		41,000 scfm	Rated Flow
		8,760 hours/yr	Potential
PM/PM10:	Emission Factor:	0.003 gr/dscf	Manufacturer Baghouse Emission Rate
	Emissions:	4.62 tons/year	
		1.05 lbs/hr	
PM2.5:	Emission Factor:	0.0015 gr/dscf	50% of PM10 for Dry Material
	Emissions:	2.31 tons/year	
		0.53 lbs/hr	

CYCLONE EMISSION FACTORS

Potlatch developed cyclone emission factors for PM. IFG is using those emissions factors where possible, with corresponding factors for PM10 and PM2.5.

Source	PM10 e.f. (lb/ton) (1)	PM2.5 e.f. (lb/ton) (2)	Status
CY-1, Specialties Gang Rip Cyclone	0.778	0.389	REMOVED
CY-2, Specialties Gang Rip Cyc.	0.164	0.082	REMOVED
CY-3, Specialties GRECON	0.164	0.082	REMOVED
CY-4, Specialties NULOC	0.522	0.261	REMOVED
CY-6, Specialties	0.164	0.082	REMOVED
CY-18, Surfacing, #4 Splitter	0.600	0.300	IFG-CY1
CY-24, Surfac., Brooks Chip., Fines	0.778	0.389	REMOVED IN PAST
CY-25, Surfac., Brooks Chip., Chips (3)	0.062	0.031	IFG-CY2
CY-26, Sawmill, All Machine Ctrs	0.165	0.048	IFG-CY3
CY-27A, Sawmill, All Machine Ctrs	0.780	0.226	IFG-CY4A
CY-27B, Sawmill, All Machine Ctrs	0.780	0.226	IFG-CY4B
CY-FH, Complex, Fuel Hog	0.170	0.049	IFG-CY5

Notes:

(1) Original note from Potlatch said: Calculated using cyclone and dust parameters per Rex. M. Robbins, Pollution Engineering, March, 1988 , with number of turns (Ne) calc. According to Wark and Warner, 1981

(2) SCC Code 30700805, dry wood: PM10=PM*0.4, PM2.5=PM*0.2, PM2.5 = PM10*0.5. SCC Code 30700820, green wood: PM10 =PM*0.51, and PM2.5=PM*0.15, PM2.5=PM10*0.29.

CYCLONE EMISSIONS INCLUDED IN THIS MODELING

HOURS OF OPERATION 5356 HOURS PER YEAR
ANNUAL SAWMILL PRODUCTION 470,000 MBDFT/YR

Modeled Source Name/Status	Current Throughput tons	Emissions Modeled for This Application			
		PM10 (ton/yr)	Daily PM10 (lb/hr)	PM2.5 (ton/yr)	PM2.5 (lb/hr)
CWCY1, was CY-1, Removed in 2012	0	0.000	0.000	0.000	0.000
CWCY2, was CY-2, Removed in 2012	0	0.000	0.000	0.000	0.000
CWCY3, was CY-3, Removed in 2012	0	0.000	0.000	0.000	0.000
CWCY4, was CY-4, Removed in 2012	0	0.000	0.000	0.000	0.000
CWCY6, was CY-6, Removed in 2012	0	0.000	0.000	0.000	0.000
IFGCY1, was CY-18	71	0.021	0.008	0.011	0.004
CY-24, removed prior to 2012	0	0.000	0.000	0.000	0.000
IFGCY2, was CY-25	27,886	0.857	0.320	0.429	0.160
IFGCY3, was CY-26	396	0.033	0.012	0.009	0.004
IFGCY4, was CY-27A and CY-27B	503	0.196	0.073	0.057	0.021
IFGCY5, was CY-FH	10,000	0.850	0.317	0.247	0.092

TRUCK BIN LOADOUT

Sawdust fines picked up pneumatically and transferred to cyclones IFG-CY3, IFG-CY4A and IFG-CY4B drops to a high pressure line and is transported pneumatically to the cyclones on the truck bins (IFG-CY6, IFG-CY7 and IFG-CY8). If needed, the sawdust can be diverted from cyclones IFG-CY3, IFG-CY4A and IFG-CY4B to the floor of the chip vault.

TRUCK BIN LOADOUT, GREEN

28,857 Tons of Sawdust/Year
8,760 Hours per year, PTE

PM:	Emission Factor:	0.80 lbs/ton	Idaho DEQ Bin Unloading Factor, green material
	Controlled EF:	0.12 lbs/ton	85% control for side enclosures
	Emissions:	1.73 tons/year	
PM10:	Emission Factor:	0.48 lbs/ton	Idaho DEQ Bin Unloading Factor, green material
	Controlled EF:	0.07 lbs/ton	85% control for side enclosures
	Emissions:	1.04 tons/year	Based on site observations
PM2.5:	Emission Factor:	0.02088 lbs/ton	PM2.5 is 29% of PM10 for green material handling
	Emissions:	0.30 tons/year	Based on EPA's PM Calculator Program

SAWDUST DIVERT TO CHIP VAULT

Chip vault is enclosed on the sides.
Allow 50% control efficiency

300 units per year
1.68 tons per unit
504 tons per year diverted

PM:	Emission Factor:	0.80 lbs/ton	Idaho DEQ Bin Unloading Factor, green material
	Controlled EF:	0.12 lbs/ton	85% control for side enclosures
	Emissions:	0.03 tons/year	
PM10:	Emission Factor:	0.48 lbs/ton	Idaho DEQ Bin Unloading Factor
	Controlled EF:	0.24 lbs/ton	85% control for side enclosures
	Emissions:	0.06 tons/year	
PM2.5:	Emission Factor:	0.0696 lbs/ton	PM2.5 is 29% of PM10 for green material handling
	Emissions:	0.02 tons/year	

Planer shavings picked up pneumatically and transferred to baghouses IFG-BH1, IFG-BH2 and IFG-BH3 drop to a high pressure line and are transported pneumatically to the cyclones on the truck bins (IFG-CY6, IFG-CY7 and IFG-CY8). Planer chips from cyclones IFG-CY1 and IFG-CY2 are also blown to the cyclones on the truck bins.

TRUCK BIN LOADOUT, DRY

51,230 Tons of shavings/year
0 Tons of planer chips/year, go to chip belt
51,230 Total dry tons/year
8,760 Hours per year, PTE

PM:	Emission Factor:	2.00 lbs/ton	Idaho DEQ Bin Unloading Factor, dry material
	Controlled EF:	0.30 lbs/ton	85% control for side enclosures
	Emissions:	7.68 tons/year	
PM10:	Emission Factor:	1.20 lbs/ton	Idaho DEQ Bin Unloading Factor, dry material
	Controlled EF:	0.18 lbs/ton	85% control for side enclosures
	Emissions:	4.61 tons/year	
PM2.5:	Emission Factor:	0.09 lbs/ton	PM2.5 is 50% of PM10 for dry material handling
	Emissions:	2.31 tons/year	Based on EPA's PM Calculator Program

TRUCK BIN LOADOUT, CONTINUED

The pneumatic transport systems for green and dry material are equipped with diversion gates, upstream of the cyclones. If the bins cannot receive material, the diversion gates allow material to be blown direcetly into a truck or to the ground. This is part of the system, and emissions have been estimated for this operation.

PNEUMATIC DIVERT - GREEN AND DRY MATERIAL

Divert is equipped with water sprays
Allow 50% control efficiency

28 tons per truck
24 trucks per year
672 tons per year diverted

PM:	Emission Factor:	2.0 lbs/ton	Idaho DEQ Bin Unloading Factor, dry material
	Controlled EF:	1.0 lbs/ton	50% control for water spray
	Emissions:	0.34 tons/year	
PM10:	Emission Factor:	1.2 lbs/ton	Idaho DEQ Bin Unloading Factor, dry material
	Controlled EF:	0.6 lbs/ton	50% control for water spray
	Emissions:	0.20 tons/year	
PM2.5:	Emission Factor:	0.3 lbs/ton	PM2.5 is 50% of PM10 for dry material handling
	Emissions:	0.10 tons/year	(use dry factor for green and dry material)

The air exhaust streams from the cyclones on the truck bins (IFG-CY6, IFG-CY7 and IFG-CY8) are routed through a pollution control baghouse, IFG-BH4. Emissions from baghouse IFG-BH4 are calculated below.

TRUCK BIN CYCLONES BAGHOUSE (IFG-BH4)

Controls cyclone emissions, based on material processed through cyclones.

80,087 tons/yr	Sawmil and Planer	
7,280 hours/yr	Potential	

PM/PM10:	Emission Factor:	0.04 lb/ton, ODEQ, AQ-EF02
	Emissions:	1.60 tons/year
		0.44 lbs/hr
PM2.5:	Emission Factor:	0.02 lb/ron, 50% of PM10 for dry material
	Emissions:	0.80 tons/year
		0.22 lbs/hr

Fugitive Dust - PAVED ROADS

Calculations based on AP-42 Section 13.2.1.3, rev. 1/11

Source	Class	Number Trips Per Year	Distance per Trip (miles)	VMT per Year	Avg. Vehicle Weight W	Weighted Vehicle Weight
Fork Lifts	Paved, Loaded	2,820,000	0.01	28,200	4.2	1.88
	Paved, Empty	2,820,000	0.01	28,200	1	0.45
LumberTrucks	Paved, Loaded	26,111	0.13	3,297	40	2.09
	Paved, Empty	26,111	0.13	3,297	13	0.68
Other	Paved, Loaded	0	0.00	0	0	0.00
	Paved, Empty	0	0.00	0	0	0.00
Misc. Vehicles incl employee	Paved	0	0.00	0	3	0.00
		5,692,222		62,994		5

E=k(sL)^0.91(W)^1.02 *[1-1.2*P/N]

	PM	PM10	PM2.5		
k =	0.011	0.0022	0.00054	P=	120
sL=	1.1	1.1	1.1	N=	365
W =	5	5	5		
E=	0.038	0.008	0.002		
	lb/VMT	lb/VMT	lb/VMT		
% control from washing/sw	50%	50%	50%		

Total PM Emissions:	**0.6**	**tpy**
Total PM10 Emissions:	**0.12**	**tpy**
Total PM2.5 Emissions:	**0.03**	**tpy**

Fugitive Dust - UNPAVED ROADS

Calculations based on AP-42 Section 13.2.2, rev. 12/06

Source	Class	Number Trips Per Year	Distance per Trip (miles)	VMT per Year	Avg. Vehicle Weight W	Weighted Vehicle Weight
Log Trucks	Unpaved, Loaded	60,429	0.28	17,167	42.5	17.9
	Unpaved, Empty	60,429	0.28	17,167	17.0	7.2
Log Yard Loaders	Unpaved, Loaded	84,600	0.02	1,602	78.0	3.1
	Unpaved, Empty	84,600	0.02	1,602	53.0	2.1
Dump Truck Scrap Wood	Unpaved, Loaded	1,000	0.10	100	52.5	0.1
	Unpaved, Empty	1,000	0.10	100	15.0	0.0
Bucket Loaders Scrap Wood	Unpaved, Loaded	2,000	0.01	19	15.0	0.0
	Unpaved, Empty	2,000	0.01	19	10.0	0.0
Shavings/Sawdust Trucks	Unpaved, Loaded	3,926	0.25	991	52.5	1.3
	Unpaved, Empty	3,926	0.25	991	18.0	0.4
Misc. Vehicles incl employee	Unpaved	50,000	0.02	1,000	1.0	0.0
		353,909		40,760		32.1

E = [k(s/12)^a*(w/3)^b]

	PM	PM10	PM2.5	
k =	4.9	1.5	0.15	
Composite s=	1	1	1	Only a little traffic is in the logyard at 4.8% silt.
W =	32	32	32	The rest is on graveled plant areas.
a=	0.7	0.9	0.9	Use s=1%
b=	0.45	0.45	0.45	
Uncontrolled E=	2.501 lb/VMT	0.466 lb/VMT	0.047 lb/VMT	
Uncontrolled Eext=	1.68 lb/VMT	0.31 lb/VMT	0.03 lb/VMT	P= 120
				N= 365
Controlled E=	0.839 lb/VMT	0.156 lb/VMT	0.016 lb/VMT	Watering provides 50% control

Total PM Emissions:	**17.1**	**tpy**
Total PM10 Emissions:	**3.19**	**tpy**
Total PM2.5 Emissions:	**0.32**	**tpy**

Process Equipment	Description	Throughput Units	Pounds of Pollutant per Throughput Unit[1]				
			PM[2]	SO_2	NO_x	CO	VOC
Wood-Fired Boilers	Dutch Oven	1000 lb steam	0.4[3]	0.014	0.31[4]	3.0[4]	0.13
	Spreader-Stoker	1000 lb steam	0.4[3]	0.014	0.31[4]	2.0[4,5]	0.13
	Fuel Cell	1000 lb steam	0.4[3]	0.014	0.31[4]	1.0[4,6]	0.13
Veneer Dryer – Gas Heat	Doug Fir (uncontrolled)	1000 ft^2 (3/8" basis)	0.52	NA[7]	0.12	0.02	0.22
	Doug Fir (Burley or 45% control)	1000 ft^2 (3/8" basis)	0.29	NA	0.12	0.02	0.22
	Hemlock, White Fir (uncontrolled)	1000 ft^2 (3/8" basis)	0.15	NA	0.12	0.02	0.22
	Hemlock, White Fir (Burley or 45% control)	1000 ft^2 (3/8" basis)	0.10	NA	0.12	0.02	0.22
Veneer Dryer – Steam Heat	Doug Fir (uncontrolled)	1000 ft^2 (3/8" basis)	1.01	NA	NA	NA	0.04
	Doug Fir (Burley or 45% control)	1000 ft^2 (3/8" basis)	0.56	NA	NA	NA	0.04
	Hemlock, White Fir (uncontrolled)	1000 ft^2 (3/8" basis)	0.25	NA	NA	NA	0.04
	Hemlock, White Fir (Burley or 45% control)	1000 ft^2 (3/8" basis)	0.15	NA	NA	NA	0.04
Veneer Dryer – Wood Fired	All species (<20% moisture in fuel)	1000 ft^2 (3/8" basis)	0.75[8]	NA	0.4	1.4	0.2
	All species (≥20% moisture in fuel)	1000 ft^2 (3/8" basis)	1.50	NA	0.4	1.4	0.2
Cyclone- Dry and Green chips, Shavings, Hogged Fuel/Bark, Green Sawdust	Medium Efficiency	Bone dry tons	0.5	NA	NA	NA	NA
	High Efficiency	Bone dry tons	0.2	NA	NA	NA	NA
	Baghouse control	Bone dry tons	0.001	NA	NA	NA	NA
Cyclone - Sanderdust	High Efficiency	Bone dry tons	2.0	NA	NA	NA	NA
	Baghouse control	Bone dry tons	0.04	NA	NA	NA	NA
Target Box		Bone dry tons	0.1	NA	NA	NA	NA
Lumber Dry Kilns	Douglas Fir	1000 board feet	0.02[9]	NA	NA	NA	0.5[10]
	Hemlock	1000 board feet	0.05[9]	NA	NA	NA	0.25[9]
	Ponderosa Pine	1000 board feet	ND[11]	NA	NA	NA	1.4[10]
Press Vents - uncontrolled	Particleboard	1000 ft^2 (3/4" basis)	SS[12]	NA	NA	NA	SS
	Hardboard	1000 ft^2 (1/8" basis)	SS	NA	NA	NA	SS

[1] The emissions factors listed in this table should only be used when better information (i.e., source test data) is not available.
[2] The PM_{10} fraction is dependent upon the type of control equipment. See AQ-EF03 for estimated PM_{10} fractions.
[3] The PM factors are equivalent to 0.1 gr/dscf at 65% boiler efficiency. For other allowable emissions concentrations, the emission factor may be ratioed (e.g., 0.2/0.1 gr/dscf x 0.40 = 0.80 lb/10^3 steam).
[4] These factors are based on collective source tests as of 1992.
[5] Spreader-Stokers with small combustion chambers may exhibit higher CO levels.
[6] Recent tests have shown CO levels in the range of 0.1 to 0.5.
[7] There is no applicable emission factor because the pollutant is either not emitted or emitted at negligible levels.
[8] Based on statewide rule limit.
[9] Based on OSU study (Willamette Industries)
[10] Based on University of Idaho study (NCASI) and reported as pounds of carbon per 1000 board feet.
[11] No data available, but expected to be less than Douglas Fir factor.
[12] Use source specific data because most plants have performed source testing.

Appendix D

Pre-permit Construction Notification

IDAHO FOREST GROUP

Idaho Forest Group is hosting a Public Info Meeting in accordance with IDAPA 58.01.01.213.02. to seek a Permit to Construct to add additional lumber drying and sawing equipment at our Lewiston Sawmill operation. The proposed sawing equipment will enable the mill to process smaller diameter logs. The additional kilns will enable the mill to dry lumber more efficiently while maintaining product quality. This Public Information Meeting will be held at the Lewiston Red Lion Hotel located at 621 21 Street August 1, 2013.

April 4, 2013

IDAHO FOREST
— GROUP —

807 Mill Road
P.O. Box 557
Lewiston, ID. 83501

Bill Rogers, P.E.
Idaho Department of Environmental Quality
Air Quality Division
1410 N. Hilton
Boise, ID 83706
Via email: william.rogers@deq.idaho.gov

Re: IFG – Lewiston, Pre-construction Permit Approval Application

Dear Bill:

Idaho Forest Group (IFG) is planning to submit a Pre-permit Construction Approval Application within the next week. The application will request pre-permit approval for mill upgrades and additional kiln capacity at the Lewiston sawmill. The upgrades are not intended to increase the mill capacity beyond the currently permitted production level.

The Lewiston mill was previously owned by (CWP), and was approved in 2005 for a dry kiln replacement and mill expansion project using the Idaho's pre-permit construction approval process. The 2005 permitting action raised the allowable production of the facility to the current level of 351,009 MBF/yr.

IFG has found that the mill cannot reach the permitted kiln production levels with the current kiln capacity, and we would like to install additional kiln capacity. IFG also plans to upgrade planer equipment within the planer building and may add another log line to allow processing of smaller logs. The property boundary between Clearwater and IFG is also being adjusted. This will result in a wood and bark hog to be owned and operated by IFG. The pre-construction approval application will also seek to include these changes in the IFG permit.

Air contaminant emissions from all these activities are based on the board feet production, not on the specific equipment used. The board feet production and associated air contaminant emissions will not exceed currently permitted levels as a result of IFG's upgrades.

IFG believes the proposed mill upgrades and additional kiln capacity will qualify for Idaho's pre-permit construction approval process. Idaho permitting regulations contained in IDAPA 58.01.01.213 allow owners to commence construction or modification of certain stationary sources before obtaining the required permit to construct. IDAPA 58.01.01.213.01.c requires that the pre-permit construction approval application include a letter requesting the ability to construct before obtaining the required PTC. This letter is intended to fulfill that requirement.

IFG would like an opportunity to discuss the pre-permit construction approval process with DEQ staff before proceeding with our mill upgrade planning. Please contact Jim Miller, our Environmental Manager, to set up a conference call about this project. Jim's office phone number is (208)-848-2322 and his cell phone number is (208)-790-4555.

Sincerely,

Jesse Short
Mill Manager

cc Dan Pitman, Idaho DEQ, via email: daniel.pitman@idaho.gov

Appendix E

List of Applicable Regulations

Citation Under IDAPA 58.01.01	Description of Requirements or Standards	Applicability/ Compliance Method	Emission Unit Affected
123	CERTIFICATION OF DOCUMENTS General Applicability	IFG will include required certification with affected submittals.	Facility wide
130	STARTUP, SHUTDOWN, SCHEDULED MAINTENANCE, SAFETY MEASURES, UPSET AND BREAKDOWN	IFG will record events as required.	Facility wide
131	EXCESS EMISSIONS	IFG will report excess emissions events as required.	Facility wide
132	CORRECTION OF CONDITION	IFG will corrected conditions causing excess emissions events as quickly as practicable.	Facility wide
133	STARTUP, SHUTDOWN AND SCHEDULED MAINTENANCE REQUIREMENTS	IFG will record events as required.	Facility wide
134	UPSET, BREAKDOWN AND SAFETY REQUIREMENTS	IFG will record events as required.	Facility wide
135	EXCESS EMISSIONS REPORTS	Recordkeeping and reporting will constitute on-going compliance.	Facility wide
136	EXCESS EMISSIONS RECORDS	Recordkeeping and reporting will constitute on-going compliance.	Facility wide
155	CIRCUMVENTION	General applicability.	Facility wide
156	TOTAL COMPLIANCE	General applicability.	Facility wide
157	TEST METHODS AND PROCEDURES	General applicability.	NA
160	PROVISIONS GOVERNING SPECIFIC ACTIVITIES AND CONDITIONS General Applicability	General Applicability	NA
161	TOXIC SUBSTANCES	Recordkeeping and reporting will constitute on-going compliance.	Facility Wide
162	MODIFYING PHYSICAL CONDITIONS	General Applicability	NA
163	SOURCE DENSITY	General Applicability	NA
164	POLYCHLORINATED BIPHENYLS (PCBs) Burning and sales prohibited.	IFG will continue to comply with this regulation.	Facility Wide
176-181	FACILITY EMISSIONS CAP (FEC) Regulations related permitting based on FEC.	IFG is not applying for coverage under the FEC regulations	NA
200	PROCEDURES AND REQUIREMENTS FOR PERMITS TO CONSTRUCT	IFG is filing a PTC application for the proposed project.	New dry kilns.
201	PERMIT TO CONSTRUCT REQUIRED	PTC is required because of kiln construction.	New dry kilns.

Citation Under IDAPA 58.01.01	Description of Requirements or Standards	Applicability/ Compliance Method	Emission Unit Affected
225	PERMIT TO CONSTRUCT PROCESSING FEE	IFG will pay the PTC processing fee when assessed by DEQ.	Facility Wide
300 *et seq*	PROCEDURES AND REQUIREMENTS FOR TIER I OPERATING PERMITS	A Tier I permit is in place for the mill. The PTC changes will be included in the Tier I permit as per DEQ processes.	Facility Wide
400 *et seq*	PROCEDURES AND REQUIREMENTS FOR TIER II OPERATING PERMITS	The Lewiston mill does not have a Tier II permit.	NA
440 – 441	REQUIREMENTS FOR ALTERNATIVE EMISSION LIMITS (BUBBLES)	IFG is not applying under this regulation.	NA
460	REQUIREMENTS FOR EMISSION REDUCTION CREDIT	The modeling demonstration in this application incorporates reductions from removed sources, as described in the DEQ modeling protocol review.	Facility Wide
461	REQUIREMENTS FOR BANKING EMISSION REDUCTION CREDITS (ERCs)	IFG is not applying to bank ERCs	NA
500	REGISTRATION PROCEDURES AND REQUIREMENTS FOR PORTABLE EQUIPMENT	IFG is not proposing any portable equipment.	NA
510-516	STACK HEIGHTS AND DISPERSION TECHNIQUES	All stack heights comply.	Facility Wide
510	STACK HEIGHTS AND DISPERSION TECHNIQUES	None Required	NA
590	NEW SOURCE PERFORMANCE STANDARDS (NSPS)	Not applicable to any equipment at the mill.	NA
591	NATIONAL EMISSION STANDARDS FOR HAZARDOUS AIR POLLUTANTS (NESHAPS)	NESHAPS Subpart DDDD applies to the mill. IFG is in compliance.	Facility Wide
600	RULES FOR CONTROL OF OPEN BURNING	General applicability.	Facility Wide
601	FIRE PERMITS, HAZARDOUS MATERIALS AND LIABILITY	General applicability.	NA
602	NONPREEMPTION OF OTHER JURISDICTIONS	General applicability.	NA
603	GENERAL RESTRICTIONS	General applicability.	NA
608	WEED CONTROL FIRES	General applicability.	NA
625	VISIBLE EMISSIONS	Recordkeeping and reporting will constitute on-going compliance.	Facility Wide
650	RULES FOR CONTROL OF FUGITIVE DUST	Recordkeeping and reporting will constitute on-going compliance.	Facility Wide
651	GENERAL RULES	General applicability.	NA
675	FUEL BURNING EQUIPMENT - PARTICULATE MATTER	The mill does not have fuel burning equipment.	NA

Citation Under IDAPA 58.01.01	Description of Requirements or Standards	Applicability/ Compliance Method	Emission Unit Affected
700	PARTICULATE MATTER - PROCESS WEIGHT LIMITATIONS	General applicability.	
701	PARTICULATE MATTER – NEW EQUIPMENT PROCESS WEIGHT LIMITATIONS	Recordkeeping and reporting will constitute on-going compliance.	IFG-CY4A,4B,5. All dry kilns. IFG-BH1,2,3,4
702	PARTICULATE MATTER – EXISTING EQUIPMENT PROCESS WEIGHT LIMITATIONS	Recordkeeping and reporting will constitute on-going compliance.	IFG-CY1, 2, 3
775	RULES FOR CONTROL OF ODORS	General applicability.	Facility Wide
776	GENERAL RULES	General applicability.	Facility Wide
785-786	RULES FOR CONTROL OF INCINERATORS	IFG does not operate any incinerators.	NA
808	FUGITIVE DUST CONTROL	Recordkeeping and reporting will constitute on-going compliance.	Facility Wide

Citation Under IDAPA 58.01.01	Description of Requirements or Standards	Applicability/ Compliance Method	Emission Unit Affected
202	APPLICATION PROCEDURES	IFG has submitted an application that meets the application procedures.	New dry kilns.
203	PERMIT REQUIREMENTS FOR NEW AND MODIFIED STATIONARY SOURCES	The Lewiston mill is a stationary source.	Facility Wide
204	PERMIT REQUIREMENTS FOR NEW MAJOR FACILITIES OR MAJOR MODIFICATIONS IN NONATTAINMENT AREAS	This does not apply to the Lewiston mill because it is not a PSD major facility.	NA
205	PERMIT REQUIREMENTS FOR NEW MAJOR FACILITIES OR MAJOR MODIFICATIONS IN ATTAINMENT OR UNCLASSIFIABLE AREAS	This does not apply to the Lewiston mill because it is not a PSD major facility.	NA
206	OPTIONAL OFFSETS FOR PERMITS TO CONSTRUCT Allows use of emission offsets in permitting.	IFG has included ambient impact reductions resulting from removal of the Specialties and Profiling cyclones and baghouses.	Facility Wide
207-208	REQUIREMENTS FOR EMISSION REDUCTION CREDIT	IFG is not applying for emissions reduction credits.	
209	PROCEDURE FOR ISSUING PERMITS	Applies to DEQ	NA
210	DEMONSTRATION OF PRECONSTRUCTION COMPLIANCE WITH TOXIC STANDARDS 20. NSPS and NESHAPS Sources exempted.	Mill TAP emissions are regulated under the Federal NESHAPS Subpart DDDD so IFG is exempted from IDEQ toxics analysis.	NA
211	CONDITIONS FOR PERMITS TO CONSTRUCT	IFG will comply with applicable notification and testing requirements.	Facility Wide
212	OBLIGATION TO COMPLY	IFG will comply with applicable requirements.	Facility Wide
213	PRE-PERMIT CONSTRUCTION	IFG is applying under the pre-permit construction regulation.	Facility Wide
214	DEMONSTRATION OF PRECONSTRUCTION COMPLIANCE FOR NEW AND RECONSTRUCTED MAJOR SOURCES OF HAZARDOUS AIR POLLUTANTS	The mill is subject to the MACT requirements under NESHAPS Subpart DDDD.	Facility Wide
215	MERCURY EMISSION STANDARD FOR NEW OR MODIFIED SOURCES	The Lewiston mill does not include any mercury emission sources.	NA
220-223	EXEMPTION CRITERIA FOR PERMIT TO CONSTRUCT EXEMPTIONS	IFG is not invoking the exemption criteria.	NA
224	PERMIT TO CONSTRUCT APPLICATION FEE	A check is included for the PTC application fee.	Facility Wide

Appendix F

Off-site Source Information

Pulp and Paper (PNP) and Consumer Product Division (CPD) Sources

Source Name	Stack Type	Description	UTME (m)	UTMN (m)	Elev (m)	Stack H (ft)	T (F)	Vel. (fps)	Dia (ft)	PM10 lb/hr	PM25 lb/hr	PM10A tpy	PM25A tpy
PNP189	DEFAULT	No. 4 Recovery	501997	5141868	235	325.0	350	43.24	9.00	40.628	32.503	122.000	97.600
PNP774	HORIZONTAL	Sawdust Transfer Cyclone	501867	5141822	235	127.0	68	5.38	3.50	5.267	1.527	23.083	6.688
PNP775	HORIZONTAL	Sawdust Transfer Cyclone	501871	5141814	235	119.0	68	5.38	3.50	5.267	1.527	23.100	6.690
PNP157	DEFAULT	No. 4 Smelt Dissolving Tank	502013	5141866	235	215.0	160	47.15	3.00	8.276	2.400	24.878	7.214
PNP721	DEFAULT	No. 5 Recovery	502015	5141922	235	350.0	350	101.51	9.00	58.000	46.400	254.040	203.232
PNP204	DEFAULT	No. 5 Smelt Dissolving Tank	502016	5141908	235	208.0	170	23.56	5.20	10.400	3.016	45.552	13.210
PNP709	DEFAULT	No. 1 PM Coater Burners	501804	5141717	235	65.6	116	42.65	5.02	0.111	0.032	0.300	0.087
PNP2009	DEFAULT	No. 2 PM Coater Burners	501712	5141712	235	65.6	100	41.99	4.49	0.111	0.032	0.300	0.090
PNP510	DEFAULT	No. 2 Lime Kiln	502079	5141795	235	100.0	165	19.69	3.20	7.237	2.099	28.700	8.323
PNP511	DEFAULT	No. 3 Lime Kiln	502125	5141802	235	153.5	375	79.07	3.75	5.200	1.508	17.300	5.017
PNP512	DEFAULT	No. 4 Lime Kilns	502106	5141778	235	153.5	375	78.92	3.75	5.200	1.508	17.300	5.017
PNP43	DEFAULT	Slaker Vent	502048	5141735	235	67.0	215	41.50	1.33	1.950	0.570	7.500	2.175
PNP106	DEFAULT	NCG Incinerator	502048	5141789	235	95.1	360	23.71	2.20	0.030	0.009	0.100	0.029
PNP250	DEFAULT	No. 1 Power Boiler	501985	5141827	235	83.0	350	40.80	7.90	2.852	2.281	11.900	9.520
PNP253	DEFAULT	No. 2 Power Boiler	501955	5141837	235	83.0	328	59.53	6.89	27.589	22.831	120.800	100.000
PNP781	DEFAULT	No. 4 Power Boiler	502438	5141558	232	300.0	410	43.08	13.50	90.400	72.000	396.000	315.000
CPD29	DEFAULT	iL Tissue Machine Hood Exhaust	502180	5141837	235	37.5	570	25.23	4.00	0.242	0.070	1.060	0.308
CPD52	DEFAULT	2L dust scrubber stack	502295	5141972	236	30.0	95	40.17	5.70	2.634	0.764	11.538	3.346
CPD39	DEFAULT	2L tissue machine hood exhaust	502274	5141961	236	76.8	420	21.93	5.64	0.986	0.286	2.600	0.750
CPD82	DEFAULT	Temporary boiler	502213	5141890	235	19.8	766	24.52	4.55	0.940	0.752	0.240	0.192
CPD83	DEFAULT	Temporary boiler	502218	5141892	235	17.0	542	20.35	6.18	0.940	0.752	0.230	0.192
CPD12	DEFAULT	3L Tissue Machine Dust Scrubber	502251	5141866	235	88.0	500	22.05	3.80	1.400	0.406	6.132	1.778
PNP464	HORIZONTAL	Dry Additives Handling BH	501817	5141815	235	67.9	68	4.99	0.82	0.045	0.013	0.200	0.058
PNP465	HORIZONTAL	Dry Additives Handling BH	501821	5141816	235	67.9	68	4.99	0.79	0.042	0.012	0.200	0.058
PNP466	HORIZONTAL	Dry Additives Handling BH	501825	5141818	235	67.9	68	4.99	0.79	0.042	0.012	0.200	0.058
PNP513	DEFAULT	Pulp Dryer	501732	5141709	235	65.9	370	61.68	3.48	0.773	0.224	2.900	0.841
PNP514	DEFAULT	Pulp Dryer	501718	5141702	235	65.9	370	61.35	3.51	0.773	0.224	2.900	0.841
PNP1030	HORIZONTAL	No. 5 Recovery Saltcake	501995	5141935	235	97.1	73	84.97	0.49	1.500	0.435	2.000	0.058
PNP1119	HORIZONTAL	No. 4 Recovery Saltcake	502006	5141872	235	0.8	73	24.87	0.79	1.500	0.435	5.100	1.479
PNP47	DEFAULT	Lime Handling Baghouse	502014	5141745	235	19.0	426	100.07	2.10	1.720	0.499	2.300	0.667
PNP324	DEFAULT	Backup Diesel Gen.	501955	5141908	235	7.9	1011	216.54	0.49	0.108	0.031	0.006	0.002
PNP103	DEFAULT	Backup Diesel Gen.	501905	5141618	235	7.9	1011	216.54	0.49	0.110	0.032	0.006	0.002
CPD28A	HORIZONTAL	1L Tissue Machine	502282	5141935	236	46.9	68	39.04	4.66	0.120	0.035	0.500	0.145
CPD2	HORIZONTAL	3L Tissue	502279	5141889	236	73.5	68	40.35	4.99	1.500	0.435	6.400	1.856
CPD56	DEFAULT	Valmet rewinder	502328	5141991	235	35.4	68	18.41	4.99	0.740	0.215	3.200	0.928

From: Diane Lorenzen <dianelorenzen@optimum.net>
Sent: Wednesday, January 08, 2014 1:17 PM
To: Shawnee Chen
Cc: Michael Simon; jdmiller@idfg.com
Subject: RE: IFG Lewiston
Attachments: IFG_kiln_Form_EU.pdf; Form BCE - Sawline Baghouse.pdf

There you are, let me know if anything else is needed. Diane

Diane Lorenzen
Lorenzen Engineering, Inc.
406-549-3995
dianelorenzen@optimum.net

From: Shawnee.Chen@deq.idaho.gov [mailto:Shawnee.Chen@deq.idaho.gov]
Sent: Wednesday, January 8, 2014 12:19 PM
To: dianelorenzen@optimum.net
Cc: Michael.Simon@deq.idaho.gov; jdmiller@idfg.com; Shawnee.Chen@deq.idaho.gov
Subject: RE: IFG Lewiston

Hi Diane,

I did not find the form for the kilns in the 1/7/2014 email. Would you email it to me?

If it is convenient for you, for saw line baghouse form, replace “BH1” with “BH3”.

Thank you and have a great day!
Shawnee

From: Diane Lorenzen [mailto:dianelorenzen@optimum.net]
Sent: Tuesday, January 07, 2014 8:52 AM
To: Shawnee Chen
Cc: Michael Simon; jdmiller@idfg.com
Subject: TRIM: RE: IFG Lewiston

Shawnee,

The requested information is attached. Diane

Diane Lorenzen
Lorenzen Engineering, Inc.
406-549-3995
dianelorenzen@optimum.net

From: Shawnee.Chen@deq.idaho.gov [mailto:Shawnee.Chen@deq.idaho.gov]
Sent: Thursday, January 2, 2014 1:10 PM
To: dianelorenzen@optimum.net
Cc: Michael.Simon@deq.idaho.gov; jdmiller@idfg.com; Shawnee.Chen@deq.idaho.gov
Subject: RE: IFG Lewiston

Jim and Diane,

Mike and I reviewed our notes from our 12/10/2013 teleconference. Here were the action items from

that meeting:

1. Permit Condition (PC) 1.1. (DEQ's action item)

DEQ will change "identical" to "similar design", remove cyclone emissions estimation item, and simplify PC 1.1.

2. Table 1.1 (IFG's action item)

IFG will fill out forms for new equipment (e.g., new kilns, new cyclones, and new baghouses)

3. PC 2.3 (IFG's action item)

IFG will explain and certify that 10.02 mbf/hr is the maximum capacity of each kiln. DEQ will then remove PC 2.3 based on the information provided by IFG.

4. PC 2.4 (DEQ's action item)

DEQ will change weight % to volume %

5. PCs 2.7 through 2.9 (DEQ's action item)

Once PC 2.3 is removed based on IFG's explanation and certification, PCs 2.7 through 2.9 will be removed.

6. PC 2.10 (DEQ's action item)

DEQ will change weight % to volume %.

7. PC 3.6 (DEQ's action item)

DEQ will put content of PC 3.6 into PC 3.8 and remove PC 3.6.

To summarize the above list, IFG has two action items (i.e., No. 2 and No. 3). DEQ will take actions on the rest of the items. Please let us know if we miss anything.

When IFG can submit their two actions items described above, DEQ will make all of the above revisions and then send IFG a final facility draft permit.

Thanks and have a great new year!
Shawnee

From: Diane Lorenzen [mailto:dianelorenzen@optimum.net]
Sent: Thursday, January 02, 2014 8:50 AM
To: Shawnee Chen
Cc: Michael Simon; 'Miller, Jim'
Subject: IFG Lewiston

Shawnee,

Best wishes for the New Year, I hope you enjoyed the holidays! IFG understands that DEQ will issue a second facility draft of the Lewiston permit, and that is the reason we haven't submitted written comments on the first draft. If we should be sending in written comments on the first facility draft,

please let me know.

Thanks, Diane

Diane Lorenzen
Lorenzen Engineering, Inc.
406-549-3995
dianelorenzen@optimum.net

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:
Idaho Forest Group LLC - Lewiston	IFG - Lewiston	069-00003

4. Brief Project Description:	Install additional kilns.

EMISSIONS UNIT (PROCESS) IDENTIFICATION & DESCRIPTION

5.	Emissions Unit (EU) Name:	KILNS
6.	EU ID Number:	KILNS
7.	EU Type:	☐ New Source ☐ Unpermitted Existing Source ☒ Modification to a Permitted Source -- Previous Permit #: Date Issued:
8.	Manufacturer:	4 MANUFACTURED BY WELLONS, 2 TO BE DETERMINED
9.	Model:	NOT APPLICABLE
10..	Maximum Capacity:	44.7 MILLION BOARD FEET PER MONTH TOTAL
11.	Date of Construction:	4 CONSTRUCTED IN 2007, 2 TO BE DETERMINED
12.	Date of Modification (if any):	KILNS HAVE NOT BEEN MODIFIED
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:	UP TO 8760 HOURS/YEAR
23.	Maximum Operation:	8760 HOURS/YEAR

REQUESTED LIMITS

24.	Are you requesting any permit limits?	☒ Yes ☐ No (If Yes, indicate all that apply below)
	☐ Operation Hour Limit(s):	
	☒ Production Limit(s):	470 MILLION BOARD FEET PER 12-MONTH PERIOD
	☐ 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):	ROLLING 12-MONTH LIMIT ENSURES COMPLIANCE WITH VOC EMISSIONS LIMIT.

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

Baghouse Control Equipment **Form BCE**
Revision 6
2/18/10

Complete this form for each baghouse. Please see instructions on page 2 before filling out the form.

IDENTIFICATION

1. Company Name	2. Facility Name:
Idaho Forest Group LLC	IFG - Lewiston

3. Brief Project Description: Add baghouse for wood residuals handling at the sawmill.
Known as the sawline baghouse and BH3.

BAGHOUSE INFORMATION

4. Baghouse Manufacturer: To be determined.	5. Baghouse Model: To be determined.	6. Baghouse Equipment ID: BH3

7 (a). Baghouse particulate matter emission concentration. **Note: Provide information in 7(a)-(c) or answer question #8 below.**	0.003 gr/dscf	*Manufacturers typically provide guarantees in grains per dry standard cubic foot (gr/dscf). Provide a copy of the guarantee, or other documentation, with the application along with a description of the types of bags that must be used to achieve the emission concentration.* ***Emission concentrations less than 0.01 gr/dscf will receive additional scrutiny by DEQ and a source test of the baghouse may be required.*** *If a guarantee is not provided then you must document how you obtained the emission concentration. Without documentation the application is not complete.*
7 (b). Percentage PM_{10} Or Provide PM_{10} Emission Concentration	_____ % 0.003 gr/dscf	*What percentage of the PM concentration listed in question #7(a) is PM_{10}. You must provide documentation as to how the percentage was determined (i.e per the baghouse manufacturer). Without documentation the application is not complete.*
7 (c). Baghouse flow rate	17,655 dscfm	*Provide the baghouse flow rate in dry standard cubic feet per minute. Actual cubic feet per minute may be given in lieu of dscfm* ***if it is documented*** *that moisture content is insignificant. You must provide documentation as to how this flow rate was determined (i.e. per the exhaust fan manufacturer, combustion evaluation, etc.). Without documentation the application is not complete.*
8. Baghouse particulate matter control efficiency. **Note: Not needed if section #7 is completed.**	_____ % PM control _____ % PM_{10} control	*Applicant's providing the control efficiency of the baghouse must provide control efficiency for both PM and PM_{10}. Provide a copy of the control efficiency documentation with the application. Documentation must include a description of the types of bags that must be used to achieve the control efficiency. Without documentation the application is not complete.*
9. Is the baghouse equipped with a bag leak detector?	☐ Yes ☒ No	*If a bag leak detector is installed provide documentation on the leak detector, including; how the leak detector functions and what level of the output signal indicates that a bag is leaking. Without documentation the application is not complete.*

From: Diane Lorenzen <dianelorenzen@optimum.net>
Sent: Tuesday, January 07, 2014 8:52 AM
To: Shawnee Chen
Cc: Michael Simon; jdmiller@idfg.com
Subject: RE: IFG Lewiston
Attachments: Kiln_Capacity_Certification.pdf; cyclone form Shavings Cyclone.pdf; Form BCE _Shavings Baghouse.pdf; Form BCE_Chips Baghouse.pdf; Form BCE - Sawline Baghouse.pdf; IFG Comments on Facility Draft Permit.docx

Shawnee,

The requested information is attached. Diane

Diane Lorenzen
Lorenzen Engineering, Inc.
406-549-3995
dianelorenzen@optimum.net

From: Shawnee.Chen@deq.idaho.gov [mailto:Shawnee.Chen@deq.idaho.gov]
Sent: Thursday, January 2, 2014 1:10 PM
To: dianelorenzen@optimum.net
Cc: Michael.Simon@deq.idaho.gov; jdmiller@idfg.com; Shawnee.Chen@deq.idaho.gov
Subject: RE: IFG Lewiston

Jim and Diane,

Mike and I reviewed our notes from our 12/10/2013 teleconference. Here were the action items from that meeting:

1. Permit Condition (PC) 1.1. (DEQ's action item)

DEQ will change "identical" to "similar design", remove cyclone emissions estimation item, and simplify PC 1.1.

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To summarize the above list, IFG has two action items (i.e., No. 2 and No. 3). DEQ will take actions on the rest of the items. Please let us know if we miss anything.

When IFG can submit their two actions items described above, DEQ will make all of the above revisions and then send IFG a final facility draft permit.

Thanks and have a great new year!
Shawnee

From: Diane Lorenzen [mailto:dianelorenzen@optimum.net]
Sent: Thursday, January 02, 2014 8:50 AM
To: Shawnee Chen
Cc: Michael Simon; 'Miller, Jim'
Subject: IFG Lewiston

Shawnee,

Best wishes for the New Year, I hope you enjoyed the holidays! IFG understands that DEQ will issue a second facility draft of the Lewiston permit, and that is the reason we haven't submitted written comments on the first draft. If we should be sending in written comments on the first facility draft, please let me know.

Thanks, Diane

Diane Lorenzen
Lorenzen Engineering, Inc.
406-549-3995
dianelorenzen@optimum.net

IDAHO FOREST
— GROUP —

807 Mill Road
P.O. Box 557
Lewiston, ID. 83501.

December 20, 2013

Shawnee Chen, P.E.
Idaho Department of Environmental Quality
Air Quality Division
1410 N. Hilton
Boise, ID 83706
Tel: (208) 373 – 0502

Re: Facility ID No. 069-00003, IFG – Lewiston

Dear Shawnee:

IFG would like to thank you for meeting with our group via telephone on December 10 to answer questions about the Lewiston Facility Draft permit. During the December 10 meeting, we understood that DEQ would like a letter from IFG certifying that the capacity of the existing and proposed dry kilns is physically limited to the values presented in the permit. The certification of kiln capacity is contained in this letter.

The existing lumber dry kilns were designed to have a total capacity as represented in the 2005 and 2013 permit applications. The future kilns identified in the 2013 permit application will have the capacity and emission characteristics as represented in the permit application and modeling. If IFG finds that the kilns available at the time of purchase are different than modeled, IFG will resubmit modeling with the as-built kiln emission characteristics.

I certify that, based on information and belief formed after reasonable inquiry, the lumber dry kiln capacity information contained in the permit application materials and any attached document(s) are true, accurate, and complete in accordance with IDAPA 58.01.01-123.

Jim D. Smith — 1-3-2014

Responsible Official Signature — Date

Plant Manager – Lewiston division

Responsible Official Title

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

Baghouse Control Equipment **Form BCE**
Revision 6
2/18/10

Complete this form for each baghouse. Please see instructions on page 2 before filling out the form.

IDENTIFICATION

1. Company Name	2. Facility Name:
Idaho Forest Group LLC	IFG - Lewiston

3. Brief Project Description: Change wood residuals handling process to reduce particulate emissions.
Referred to Planer Shaving Baghouse or BH1.

BAGHOUSE INFORMATION

4. Baghouse Manufacturer: To be determined.	5. Baghouse Model: To be determined.	6. Baghouse Equipment ID: BH1

7 (a). Baghouse particulate matter emission concentration. **Note: Provide information in 7(a)-(c) or answer question #8 below.**	0.003 gr/dscf	*Manufacturers typically provide guarantees in grains per dry standard cubic foot (gr/dscf). Provide a copy of the guarantee, or other documentation, with the application along with a description of the types of bags that must be used to achieve the emission concentration.* ***Emission concentrations less than 0.01 gr/dscf will receive additional scrutiny by DEQ and a source test of the baghouse may be required.*** *If a guarantee is not provided then you must document how you obtained the emission concentration. Without documentation the application is not complete.*
7 (b). Percentage PM_{10} Or Provide PM_{10} Emission Concentration	_____ % 0.003 gr/dscf	*What percentage of the PM concentration listed in question #7(a) is PM_{10}. You must provide documentation as to how the percentage was determined (i.e per the baghouse manufacturer). Without documentation the application is not complete.*
7 (c). Baghouse flow rate	est. 36,000 dscfm	*Provide the baghouse flow rate in dry standard cubic feet per minute. Actual cubic feet per minute may be given in lieu of dscfm* ***if it is documented*** *that moisture content is insignificant. You must provide documentation as to how this flow rate was determined (i.e. per the exhaust fan manufacturer, combustion evaluation, etc.). Without documentation the application is not complete.*
8. Baghouse particulate matter control efficiency. **Note: Not needed if section #7 is completed.**	_____ % PM control _____ % PM_{10} control	*Applicant's providing the control efficiency of the baghouse must provide control efficiency for both PM and PM_{10}. Provide a copy of the control efficiency documentation with the application. Documentation must include a description of the types of bags that must be used to achieve the control efficiency. Without documentation the application is not complete.*
9. Is the baghouse equipped with a bag leak detector?	☐ Yes ☒ No	*If a bag leak detector is installed provide documentation on the leak detector, including; how the leak detector functions and what level of the output signal indicates that a bag is leaking. Without documentation the application is not complete.*

DEQ AIR QUALITY PROGRAM
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Air Permit Hotline – 1-877-5PERMIT

Baghouse Control Equipment **Form BCE**
Revision 6
2/18/10

Complete this form for each baghouse. Please see instructions on page 2 before filling out the form.

IDENTIFICATION

1. Company Name	2. Facility Name:
Idaho Forest Group LLC	IFG - Lewiston

3. Brief Project Description: Add baghouse for wood residuals handling at the sawmill.
Known as the sawline baghouse and BH1.

BAGHOUSE INFORMATION

4. Baghouse Manufacturer: To be determined.	5. Baghouse Model: To be determined.	6. Baghouse Equipment ID: BH1

7 (a). Baghouse particulate matter emission concentration. **Note: Provide information in 7(a)-(c) or answer question #8 below.**	0.003 gr/dscf	*Manufacturers typically provide guarantees in grains per dry standard cubic foot (gr/dscf). Provide a copy of the guarantee, or other documentation, with the application along with a description of the types of bags that must be used to achieve the emission concentration.* ***Emission concentrations less than 0.01 gr/dscf will receive additional scrutiny by DEQ and a source test of the baghouse may be required.*** *If a guarantee is not provided then you must document how you obtained the emission concentration. Without documentation the application is not complete.*
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7 (c). Baghouse flow rate	17,655 dscfm	*Provide the baghouse flow rate in dry standard cubic feet per minute. Actual cubic feet per minute may be given in lieu of dscfm* ***if it is documented*** *that moisture content is insignificant. You must provide documentation as to how this flow rate was determined (i.e. per the exhaust fan manufacturer, combustion evaluation, etc.). Without documentation the application is not complete.*
8. Baghouse particulate matter control efficiency. **Note: Not needed if section #7 is completed.**	_____ % PM control _____ % PM_{10} control	*Applicant's providing the control efficiency of the baghouse must provide control efficiency for both PM and PM_{10}. Provide a copy of the control efficiency documentation with the application. Documentation must include a description of the types of bags that must be used to achieve the control efficiency. Without documentation the application is not complete.*
9. Is the baghouse equipped with a bag leak detector?	☐ Yes ☒ No	*If a bag leak detector is installed provide documentation on the leak detector, including; how the leak detector functions and what level of the output signal indicates that a bag is leaking. Without documentation the application is not complete.*

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

Cyclone Separator - **Form CYS**
Revision 2
08/28/08

Please see instructions on page 3 before filling out the form.

IDENTIFICATION

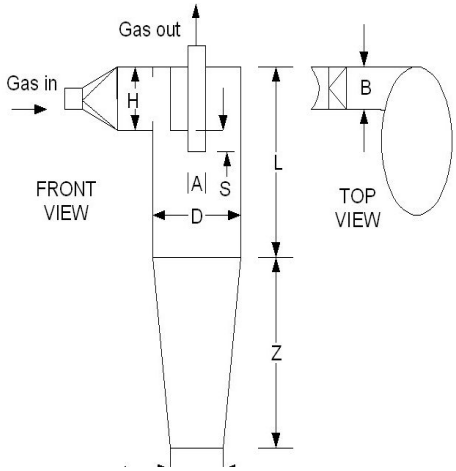
1. Company Name:	Idaho Forest Group LLC - Lewiston	2. Facility Name:	IFG - Lewiston	3. Facility ID No.:	069-0003
4. Brief Project Description:	Cyclone for seperation of planer shavings from pneumatic transport stream.				

CYCLONE SEPARATOR INFORMATION

Equipment Description

5. Manufacturer:	To be determined.	6. Model Number:	To be determined.

7. Dimensions



Give dimensions of cyclone. (See sample diagram above.)

1. B:	in.	5. Z:	in.
2. H:	in.	6. D:	in.
3. S:	in.	7. A:	in.
4. L:	in.	8. J:	in.

8. Particulate Size Distribution Data

Micron range	Particle size distribution weight %	Manufacturer's guaranteed removal efficiency for each micron range
0.5-1.0		TBD
1.0-5.0		TBD
5-10		TBD
10-20		TBD
Over 20		TBD

9. Type of Cyclone: ☐ Wet ☒ Dry

10. Type of Cyclone Unit: ☒ Single ☐ Quadruple ☐ Dual ☐ Multiclone

11. Blower
Blower horsepower: TBD hp
Design flow rate: est. 36,000 scfm
Draft: ☐ Forced ☐ Induced

12. Design Criteria: Cyclone configuration: ☐ Positive pressure ☐ Negative pressure

13. Pre-Treatment Device: ☐ Cyclone ☐ Knock-out chamber ☐ Precooler ☐ None ☐ Preheater

14. Post-Treatment Device: ☒ Baghouse/Cartridge ☐ HEPA ☐ Other:

Process Stream Characteristics	
15. Brief Description of Process	.Process stream is planer shavings pneumatically captured from within the planer building.
16. Flow Data	Gas stream temperature: Same as inside temp of building. degrees F Moisture content: Very low. grams of water/cubic feet (ft^3) of dry air <u>Pressure drop range</u> High: TBD in. H_2O Low: TBD in. H_2O Dew point temperature of process stream: Indoor Air degrees F Inlet flow rate: ext. 36,000 ACFM
17. Dust Collection Device	☐ Pneumatic conveyor ☒ Rotary airlock values ☐ Screw conveyors ☐ Closed container ☐ Double dump ☐ Drag conveyor ☐ Manual discharge device: ☐ Slide gate OR ☐ Hinged doors or drawers
18. Operating Schedule	Normal: 16 hours/day 6 days/week 52 weeks/year Maximum: 24 hours/day 7 days/week 52 weeks/year

DEQ AIR QUALITY PROGRAM
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Baghouse Control Equipment **Form BCE**
Revision 6
2/18/10

Complete this form for each baghouse. Please see instructions on page 2 before filling out the form.

IDENTIFICATION

1. Company Name	2. Facility Name:
Idaho Forest Group LLC	IFG - Lewiston

3. Brief Project Description: Change wood residuals handling process to reduce particulate emissions.
Referred to the Chips Baghouse or BH2.

BAGHOUSE INFORMATION

4. Baghouse Manufacturer: To be determined.	5. Baghouse Model: To be determined.	6. Baghouse Equipment ID: BH2

7 (a). Baghouse particulate matter emission concentration. **Note: Provide information in 7(a)-(c) or answer question #8 below.**	0.003 gr/dscf	*Manufacturers typically provide guarantees in grains per dry standard cubic foot (gr/dscf). Provide a copy of the guarantee, or other documentation, with the application along with a description of the types of bags that must be used to achieve the emission concentration.* ***Emission concentrations less than 0.01 gr/dscf will receive additional scrutiny by DEQ and a source test of the baghouse may be required.*** *If a guarantee is not provided then you must document how you obtained the emission concentration. Without documentation the application is not complete.*
7 (b). Percentage PM_{10} Or Provide PM_{10} Emission Concentration	_____ % 0.003 gr/dscf	*What percentage of the PM concentration listed in question #7(a) is PM_{10}. You must provide documentation as to how the percentage was determined (i.e per the baghouse manufacturer). Without documentation the application is not complete.*
7 (c). Baghouse flow rate	est. 36,000 dscfm	*Provide the baghouse flow rate in dry standard cubic feet per minute. Actual cubic feet per minute may be given in lieu of dscfm* ***if it is documented*** *that moisture content is insignificant. You must provide documentation as to how this flow rate was determined (i.e. per the exhaust fan manufacturer, combustion evaluation, etc.). Without documentation the application is not complete.*
8. Baghouse particulate matter control efficiency. **Note: Not needed if section #7 is completed.**	_____ % PM control _____ % PM_{10} control	*Applicant's providing the control efficiency of the baghouse must provide control efficiency for both PM and PM_{10}. Provide a copy of the control efficiency documentation with the application. Documentation must include a description of the types of bags that must be used to achieve the control efficiency. Without documentation the application is not complete.*
9. Is the baghouse equipped with a bag leak detector?	☐ Yes ☒ No	*If a bag leak detector is installed provide documentation on the leak detector, including; how the leak detector functions and what level of the output signal indicates that a bag is leaking. Without documentation the application is not complete.*

IFG Comments on Facility Draft Permit, with DEQ action items included.

Permit Condition (PC) 1.1. (DEQ's action item). DEQ will change "identical" to "similar design", remove cyclone emissions estimation item, and simplify PC 1.1.

> IFG has included comments on the full list of permitting actions in the comments on the Statement of Basis.

Table 1.1 (IFG's action item). IFG will fill out forms for new equipment (e.g., new kilns, new cyclones, and new baghouses)

> IFG has included forms for the kilns, the planer shavings cyclone, the planer shavings baghouse (BH1), the chips baghouse (BH2) and the saw line baghouse (BH3).
>
> Table 1.1, line 2: change 2 Double-Track kilns to "manufacturer to be determined".
> Table 1.1, line 3: change to "Main Sawmill", and "Small Log Line". Take out all reference to buildings. IFG is trying to remove the term "new" throughout the permit.

Permit Condition 2.1, Table 2.1. "2 Double-Track kilns – manufacturer to be determined". "Each kiln has ~~20~~ multiple vents."

Permit Condition 2.2: "… six dry kilns…" (not six drying kiln vents).

PC 2.3 (IFG's action item). IFG will explain and certify that 10.02 mbf/hr is the maximum capacity of each kiln. DEQ will then remove PC 2.3 based on the information provided by IFG.

> A letter from the Responsible Official is attached certifying that the maximum capacity of each kiln is or will be as represented in the compliance demonstration.
>
> IFG preferred final language for PC 2.3: "The permittee shall not exceed the throughput of 44 million board feet per month and 470 million board feet per year."

PC 2.4 (DEQ's action item). DEQ will change weight % to volume %

PCs 2.7 through 2.9 (DEQ's action item). Once PC 2.3 is removed based on IFG's explanation and certification, PCs 2.7 through 2.9 will be removed.

PC 2.10 (DEQ's action item). DEQ will change weight % to volume %.

PC 3.6 (DEQ's action item). DEQ will put content of PC 3.6 into PC 3.8 and remove PC 3.6.

PC 3.1, process description. Comment A2, "transport" is ok. Comment A3. Description is fine. Planer Mill description strike redundant wording: "… and stored before shipment." ~~as final dimensional lumber product.~~

Page 4: Facility Information

Change Sawmill information to read as follows: "The existing sawmill building is under negative pressure resulting from the sawmill cyclones. The proposed additional saw line will allow processing of smaller logs and will be housed in a new building or an addition to the existing building, which will be under negative pressure from the cyclones and/or Saw line baghouse (BH3). The saw line baghouse will transport sawdust and wood residuals from the small log saw line and will be located on the south side of the sawmill building (s).

Response to Comment A1: all chips will be handled the same, wording is OK.

Planer Mill description strike redundant wording: "… and stored before shipment." ~~as final dimensional lumber product.~~

Application Scope

Second bullet: "Install two additional drying kilns <u>of similar design as the existing kilns</u>..."
Delete the note in parenthesis about the VOC limit. The VOC emission may be revised downward in the future and the calculations would change.

Third bullet: "Add new sawmill equipment that can process smaller diameter logs, located inside a building."

Fourth bullet: "Add a material handling baghouse (saw line baghouse, BH3) to collect sawdust from the small log saw line. The baghouse will create negative air in the sawmill building(s)."

Seventh bullet: Strike "new'.

Strike bullet item 15, this was an error in application materials not in the previous permit.

Technical Analysis, Table 1, pages 7-9.

This table asks for information on existing equipment that has been included in the Tier I permit since it was originally issued. IFG does not have access to this historical data, much of the equipment is field erected. The manufacturer of the proposed equipment has not been identified because the permittee cannot purchase this equipment until the permit is final. IFG asks that this table be pared down and included in the Tier I permit as needed.

Table 2, page 9 and 10. The values listed in this table were based on emission factors used in the October 25, 2012 permitting process. DEQ has since changed the emission factors for this equipment. Also, IFG corrected the method used to calculate emissions from the existing cyclones. The values in this table should be updated based on the values in Appendix A of the Statement of Basis.

Table 5, footnote, page 12. Please delete the comment about the 249 tpy VOC limit limiting production to 400 million board feet. Someone will be confused by this, and future changes to VOC emission factors could render this comment false.

Page 12, Existing Sawmill Cyclones. Please replace the paragraph with the following:

"According to the EI submitted November 21, 2013, IFG has assumed that the throughput to the existing sawmill cyclones would increase in proportion to the overall increase in allowable production. Specifically, the cyclone throughputs are set to 396 T/yr for CY1 and 503 T/yr for CY2A and CY2B."

Page 13, Table 6. This table compares calculations using old emission factors to calculations using new emission factors. Please update to be consistent with Appendix A.

Page 13, TAP emissions: Remove reference to Methyl Ethyl Ketone and Phenol and replace with acrolein and propionaldehyde.

Page 17, first paragraph. 0.035 should be 0.038. 0.351 should be 0.38.

Pages 16 – 22 will change as the permit is changed. IFG did not comment.

Response to Comment A5: LCP stands for Lewiston Cedar Products.

From: Diane Lorenzen <dianelorenzen@optimum.net>
Sent: Thursday, November 21, 2013 4:23 PM
To: Shawnee Chen; Kevin Schilling
Cc: 'Miller, Jim'
Subject: IFG Lewiston Runs
Attachments: IFG_Nov_21_2013.zip; IFG_Modeling_Calcs_rev4.xls

Follow Up Flag: Follow up
Flag Status: Flagged

Shawnee and Kevin,

The attached file contains the SIL and PM2.5 24-hour NAAQS modeling runs. The results are tabulated in the .xls file. I like to think the file naming convention is self-explanatory, it is the same as we've been using.

I'm currently running hotspot receptors using the new information. It is just a formality.

The calculation spreadsheet is also attached. The cyclone issues that Shawnee caught are fixed in this spreadsheet and the kiln emissions are based on the average factors as discussed. Every attempt has been made to ensure that the modeling is consistent with the calculations.

Diane Lorenzen
Lorenzen Engineering, Inc.
406-549-3995
dianelorenzen@optimum.net

From: Diane Lorenzen [mailto:dlorenzen@bresnan.net]
Sent: Thursday, November 21, 2013 4:18 PM
To: dianelorenzen@optimum.net
Subject: fsda

IFG - Lewiston

PM10 and PM2.5 Modeled Emission Rate Summary

IFG has made a number of changes to accompdate the emission factors assigned by DEQ in their August 19, 2013 letter and Oct. 28, 2013 email.

	Previously Analyzed Emissions				Current Modeled Emissions			
	PM10 LT (ton/yr)	PM10 ST (lb/hr)	PM2.5 LT (ton/yr)	PM2.5 ST (lb/hr)	PM10 LT (ton/yr)	PM10 ST (lb/hr)	PM2.5 LT (ton/yr)	PM2.5 ST (lb/hr)
Point Sources								
Lumber Drying								
Kilns (KILN1V5 - KILN6-V5)	6.67	1.52	5.79	1.32	8.93	2.28	7.76	1.98
Cyclones								
CWCY1, was CY-1, Removed in 2012	0.138	0.069	0.069	0.034	0.000	0.000	0.000	0.000
CWCY2, was CY-2, Removed in 2012	0.029	0.015	0.015	0.007	0.000	0.000	0.000	0.000
CWCY3, was CY-3, Removed in 2012	0.063	0.032	0.032	0.016	0.000	0.000	0.000	0.000
CWCY4, was CY-4, Removed in 2012	0.345	0.173	0.173	0.086	0.000	0.000	0.000	0.000
CWCY6, was CY-6, Removed in 2012	0.212	0.106	0.106	0.053	0.000	0.000	0.000	0.000
IFGCY1, was CY-18, to be removed	0.016	0.008	0.008	0.004	0.000	0.000	0.000	0.000
CY-24, removed prior to 2012	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
IFGCY2, was CY-25, routed to baghouse	0.640	0.320	0.320	0.160	0.000	0.000	0.000	0.000
IFGCY3, was CY-26	0.024	0.012	0.012	0.006	0.033	0.012	0.016	0.006
IFGCY4, was CY-27A and CY-27B	0.147	0.073	0.073	0.037	0.196	0.073	0.098	0.037
IFGCY5, Fuel Hog Cyc., was PNP782(1)	0.680	0.340	0.340	0.170	0.850	0.340	0.425	0.170
Baghouses								
IFGBH1, BH-1, to be removed	4.055	0.926	2.717	0.620	0.000	0.000	0.000	0.000
IFGBH2, BH-2, to be removed	4.280	0.977	2.868	0.655	0.000	0.000	0.000	0.000
IFGBH3, BH-3, to be removed	4.618	1.054	3.094	0.706	0.000	0.000	0.000	0.000
CWBH4, BH-4, removed 2012	5.068	1.157	3.396	0.775	0.000	0.000	0.000	0.000
CWBH5, BH-5, removed 2012	4.843	1.106	3.245	0.741	0.000	0.000	0.000	0.000
CWBH6, BH-6, removed 2012	3.942	0.900	2.641	0.603	0.000	0.000	0.000	0.000
CWBH7, BH-7, removed 2012	3.717	0.849	2.490	0.569	0.000	0.000	0.000	0.000
IFGBH4, to be removed	8.109	1.851	5.433	1.240	0.000	0.000	0.000	0.000
Hew Saw Baghouse	0.000	0.000	0.000	0.000	1.988	0.454	1.332	0.304
Chip Cyclone Baghouse	0.000	0.000	0.000	0.000	0.014	0.004	0.009	0.003
Shavings Cyclone Baghouse	0.000	0.000	0.000	0.000	1.600	0.440	1.072	0.295
Point Source Totals	**47.595**	**11.490**	**32.822**	**7.806**	**13.611**	**3.608**	**10.708**	**2.798**

SIL Modeling

	PM10 LT (ton/yr)	PM10 ST (lb/hr)	PM2.5 LT (ton/yr)	PM2.5 ST (lb/hr)		
KILN1V1-KILN4V5	-0.036	0.000	-0.031	0.000	**-0.0017896**	**-0.0015541**
KILN5V1-KILN6V5	0.298	0.076	0.259	0.066		
CWCY1, was CY-1, Removed in 2012	-0.138	-0.069	-0.069	-0.034		
CWCY2, was CY-2, Removed in 2012	-0.029	-0.015	-0.015	-0.007		
CWCY3, was CY-3, Removed in 2012	-0.063	-0.032	-0.032	-0.016		
CWCY4, was CY-4, Removed in 2012	-0.345	-0.173	-0.173	-0.086		
CWCY6, was CY-6, Removed in 2012	-0.212	-0.106	-0.106	-0.053		
IFGCY1, was CY-18, to be removed	-0.016	-0.008	-0.008	-0.004		
CY-24, removed prior to 2012	0.000	0.000	0.000	0.000		
IFGCY2, was CY-25, routed to baghouse	-0.640	-0.320	-0.320	-0.160		
IFGCY3, was CY-26	0.008	0.000	0.004	0.000		
IFGCY4, was CY-27A and CY-27B	0.050	0.000	0.025	0.000		
IFGCY5, Fuel Hog Cyc., was PNP782(1)	0.170	0.000	0.085	0.000		
IFGBH1, BH-1, to be removed	-4.055	-0.926	-2.717	-0.620		
IFGBH2, BH-2, to be removed	-4.280	-0.977	-2.868	-0.655		
IFGBH3, BH-3, to be removed	-4.618	-1.054	-3.094	-0.706		
CWBH4, BH-4, removed 2012	-5.068	-1.157	-3.396	-0.775		
CWBH5, BH-5, removed 2012	-4.843	-1.106	-3.245	-0.741		
CWBH6, BH-6, removed 2012	-3.942	-0.900	-2.641	-0.603		
CWBH7, BH-7, removed 2012	-3.717	-0.849	-2.490	-0.569		
IFGBH4, to be removed	-8.109	-1.851	-5.433	-1.240		
Hew Saw Baghouse	1.988	0.454	1.332	0.304		
Chip Cyclone Baghouse	0.014	0.004	0.009	0.003		
Shavings Cyclone Baghouse	1.600	0.440	1.072	0.295		

IDAHO FOREST GROUP, LEWISTON
Emission Inventory/Calculations
Production Information Supporting PTE Calculations

Lumber Production, Current Permit

Sawmill	351,009	mbdft/year
Dry Kilns	351,009	mbdft/year
Planer	351,009	mbdft/year
Logs Used	1,263,632	tons/year, based on std. ratio

Residuals Production. Based on specific equipment

	tons/year	Ratio from typical mill production	
Sawmill Chips to convey	263,000	0.75	GT chips/mbdft sawmill
Sawdust to convey	116,000	0.33	GT sawdust/mbdft sawmill
Fines to cyclones	5,033	from cyclone data	
Bark to fuel hog	105,000	0.3	GT bark/mbdft sawmill
Planer Chips	21,060	0.06	BDT chips/mbdft planer
Shavings	38,610	0.11	GT shavings/mbdft planer
Wood to Fuel Hog	7,200	estimated from production	

Sawmill and Planer	43,643	tons/year	to truck bins
LCP, When Operating	13,093	tons/year	to truck bins
	57,000	tons/year	to truck bins

Lumber Production, Proposed

Sawmill	470,000	mbdft/year, estimated based on dry kilns
Dry Kilns	470,000	mbdft/year, production level in permit
Planer	470,000	mbdft/year, estimated based on dry kilns
Logs Used	1,692,000	tons/year, based on std. ratio

Residuals Production. Based on specific equipment

	tons/year	Ratio from typical mill production	
Sawmill Chips to convey	353,000	0.75	GT chips/mbdft sawmill
Sawdust to convey	155,000	0.33	GT sawdust/mbdft sawmill
Fines to cyclones	28,785	from cyclone data	
Bark to fuel hog	141,000	0.3	GT bark/mbdft sawmill
Planer Chips	28,200	0.06	BDT chips/mbdft planer
Shavings	51,230	0.11	GT shavings/mbdft planer
Wood to Fuel Hog	10,000	estimated from production	

Total to Bins	80,015	tons/year	to truck bins
LCP, Now Closed	0	tons/year	to truck bins
	80,000	tons/year	to truck bins

LUMBER DRY KILN PARTICULATE EMISSIONS

Current Emissions, PM10 Prevously Analyzed

Current Annual Production PTE	351,009	Mbf/yr	
Max Daily PTE Production	962	Mbf/day	
PM10 Emission Factor:	0.038	lbs/Mbf	Based on USO Source Test, HF
Annual PM10 Emissions:	6.67	tons/year	PTE
Annual PM10 Emissions per Kiln	1.67	tons/year/kiln	annual rate, 4 kilns
Modeled Annual PM10:	0.381	lb/hr/kiln	annual rate, 4 kilns
	0.076	lb/hr/vent	KILN1V1-KILN4V5
Daily PM10 Emissions:	1.52	lb/hr	daily rate, 4 kilns
Modeled Daily PM10:	0.381	lb/hr/kiln	daily rate, 4 kilns
	0.076	lb/hr/vent	KILN1V1-KILN4V5
PM2.5 (not previously modeled)			
Emission Factor:	0.033	lbs/Mbf	As per DEQ email 10-29-13
Annual PM2.5 Emissions:	5.79	tons/year	PTE
Annual PM2.5 Emissions per Kiln	1.45	tons/year/kiln	annual rate, 4 kilns
Modeled Annual PM2.5:	0.331	lb/hr/kiln	annual rate, 4 kilns
Modeled Annual PM2.5:	0.066	lb/hr/vent	KILN1V1-KILN4V5
Daily PM2.5 Emissions:	1.32	lb/hr	daily rate, 4 kilns
Modeled Daily PM2.5:	0.331	lb/hr/kiln	daily rate, 4 kilns
	0.066	lb/hr/vent	KILN1V1-KILN4V5

Proposed Emissions, Analyzed in FIA Modeling

Proposed Annual Production PTE	470,000	Mbf/yr	
Max Daily PTE Production	1,443	Mbf/day	

Daily compliance based on equipment potential, not limited by permit.

PM10 Emission Factor:	0.038	lbs/Mbf	Based on USO Source Test, HF
Annual PM10 Emissions:	8.93	tons/year	PTE
Annual PM10 Emissions per Kiln	1.49	tons/year/kiln	annual rate, 6 kilns
Modeled Annual PM10:	0.340	lb/hr/kiln	annual rate, 6 kilns
Modeled Annual PM10:	0.068	lb/hr/vent	KILN1V1-KILN6V5
Daily PM10 Emissions:	2.28	lb/hr	daily rate, 6 kilns
Modeled Daily PM10:	0.381	lb/hr/kiln	daily rate, 6 kilns
Modeled Daily PM10:	0.076	lb/hr/vent	KILN1V1-KILN6V5
PM25 Emission Factor:	0.033	lbs/Mbf	As per DEQ email 10-29-13
Annual PM25 Emissions:	7.76	tons/year	PTE
Modeled Annual PM25:	1.29	tons/year/kiln	annual rate, 6 kilns
Modeled Annual PM25:	0.295	lb/hr/kiln	annual rate, 6 kilns
Modeled Annual PM25:	0.059	lb/hr/vent	KILN1V1-KILN6V5
Daily PM25 Emissions:	1.98	lb/hr	daily rate, 6 kilns
Modeled Daily PM2.5:	0.331	lb/hr/kiln	daily rate, 6 kilns
Modeled Daily PM2.5:	0.066	lb/hr/vent	KILN1V1-KILN4V5

Changes in Emissions, Analyzed in SIL (PA) Modeling

Model the changes and compare to the SCLs

Existing Kilns			
Modeled Annual PM10:	-0.008	lb/hr/vent	KILN1V1-KILN4V5
Modeled Daily PM10:	0.000	lb/hr/vent	KILN1V1-KILN4V5
Modeled Annual PM25:	-0.007	lb/hr/vent	KILN1V1-KILN4V5
Modeled Daily PM25:	0.000	lb/hr/vent	KILN1V1-KILN4V5
Proposed Kilns			
Modeled Annual PM10:	0.068	lb/hr/vent	KILN5V1-KILN6V5
Modeled Daily PM10:	0.076	lb/hr/vent	KILN5V1-KILN6V5
Modeled Annual PM25:	0.059	lb/hr/vent	KILN5V1-KILN6V5
Modeled Daily PM25:	0.066	lb/hr/vent	KILN5V1-KILN6V5

KILN VOLATILE ORGANIC COMPOUND (VOC) EMISSIONS

Using EPA VOC factors for temperatures greater than 200 F
Average Production 2008-2011: 17% cedar, 0% P.pine, 0% ESLP, 65% hem fir, 18% red fir-larch
VOC Emissions will be tracked to verify that emissions are below the permit limit of 249 tpy.

Annual Production Limit:	470,000	Mbf/yr	
Emission Factor:	1.147	lbs/Mbf	VOC Emissions based on
Emissions:	270	tons/year	mix shown below.

Wood Species:	% of Total	VOC (lb/Mbf)	Weighted (lb/Mbf)	Reference
Cedar	10%	0.14	0.014	U of Idaho, 1996
Hem Fir (use white fir)	65%	1.09	0.709	EPA Reg 10, Dec. 2012
Douglas Fir and larch	25%	1.70	0.424	EPA Reg 10, Dec. 2012
Ponderosa Pine	0%	3.81	0.000	EPA Reg 10, Dec. 2012
ESLP, use Lodgepole	0%	1.53	0.000	EPA Reg 10, Dec. 2012
Other (use ESLP)	0%	1.53	0.000	EPA Reg 10, Dec. 2012
Total	100%		**1.147**	

KILN HAZARDOUS AIR POLLUTANT (HAPS)

Total MBF processed	**351,009**		
% Douglas Fir	25%	87,752	*MBF/Yr by species*
% Hem-Fir	65%	228,156	
% Ponderosa Pine	0%	0	
% ESLP	0%	0	
% Cedar	10%	35,101	
% Other (name species**)**	0%	0	
	100%	351,009	

EMISSION FACTORS:	EPA 12/12, except cedar					
Pollutant	Total HAP	Methanol	Formal-dehyde	Acetal-dehyde	Propion-aldehyde	Acrolein
Douglas Fir	0.1913	0.1170	0.0043	0.0682	0.0007	0.0011
Hem Fir (HF, WW)	0.4956	0.4200	0.0163	0.0550	0.0018	0.0026
Ponderosa Pine	0.2029	0.1440	0.0092	0.0420	0.0032	0.0045
ESLP	0.1166	0.0628	0.0041	0.0420	0.0032	0.0045
Cedar	0.0678	0.0298	0.0016	0.0355	0.0003	0.0005

EMISSIONS — Emission lb/Yr

Species	Total HAP	Methanol	Formal-dehyde	Acetal-dehyde	Propion-aldehyde	Acrolein
Douglas Fir	16787	10267	377	5985	61	97
Western Hemlock	113074	95825	3719	12549	411	593
Ponderosa Pine	0	0	0	0	0	0
White Fir (white wood)	0	0	0	0	0	0
Cedar	2380	1046	56	1246	11	18
TOTAL, lb/yr	132,241	107,138	4,152	19,779	483	707
TOTAL, ton/yr	66.12	53.57	2.08	9.89	0.24	0.35

BAGHOUSES

Removed Baghouses

Source	rate (gr/cf)	Flow cfm	PM10 e.f. lb/hr	PM25 e.f.* lb/hr
BH-1, Surfacing Baghouse	0.003	36000	0.926	0.620
BH-2, Surfacing Baghouse	0.003	38000	0.977	0.655
BH-3, Surfacing Baghouse	0.003	41000	1.054	0.706
IFGBH4, truck bin baghouse	0.003	72000	1.851	1.240
BH-4, Specialties Baghouse	0.003	45000	1.157	0.775
BH-5, Profiles Baghouse	0.003	43000	1.106	0.741
BH-6, Profiles Baghouse	0.003	35000	0.900	0.603
BH-7, Specialties Baghouse	0.003	33000	0.849	0.569
Conversion of minutes to hours	60 min/hr			
Conversion of grains to lbs	7000 gr/lb			

* PM2.5 e.f. is set at 67% ofPM10 e.f.

Added Baghouses

Source/Pollutants	rate (gr/cf)	Flow cfm	PM10 e.f. lb/hr	PM25 e.f.* lb/hr
Hew Saw Baghouse	0.003	17655	0.454	0.304
Source/Pollutants	**PM10 ef (lb/ton)**	**reference(1)**	**PM2.5 ef (lb/ton)**	**reference**
Chip Cyclone Baghouse	0.001	AQ-EF02, chips	0.001	67% of PM10
Shavings Cyclone Baghouse	0.040	AQ-EF02, shavings	0.027	67% of PM10

(1) Based on Oregon DEQ Wood Product Emission Factors, for cyclones with baghouse control

BAGHOUSE EMISSIONS INCLUDED IN PREVIOUS PERMIT ANALYSIS

HOURS OF OPERATION 8760 HOURS PER YEAR
ANNUAL PLANER PRODUCTION 351,009 MBDFT/YR

Modeled Source Name/Status	Emissions Basis (hrs/yr)	Previously Analyzed Emissions (PM2.5 not modeled)			
		PM10 (ton/yr)	Daily PM10 (lb/hr)	PM2.5 (ton/yr)	PM2.5 (lb/hr)
IFGBH1, BH-1, to be removed	8,760	4.055	0.926	2.717	0.620
IFGBH2, BH-2, to be removed	8,760	4.280	0.977	2.868	0.655
IFGBH3, BH-3, to be removed	8,760	4.618	1.054	3.094	0.706
CWBH4, BH-4, removed 2012	8,760	5.068	1.157	3.396	0.775
CWBH5, BH-5, removed 2012	8,760	4.843	1.106	3.245	0.741
CWBH6, BH-6, removed 2012	8,760	3.942	0.900	2.641	0.603
CWBH7, BH-7, removed 2012	8,760	3.717	0.849	2.490	0.569
IFGBH4, to be removed	8,760	8.109	1.851	5.433	1.240

BAGHOUSE EMISSIONS INCLUDED IN THIS MODELING

HOURS OF OPERATION 8760 HOURS PER YEAR
ANNUAL PLANER PRODUCTION 470,000 MBDFT/YR

Modeled Source Name/Status	Emissions Basis (hrs/yr, ton/yr)	Currently Analyzed Emissions			
		PM10 (ton/yr)	Daily PM10 (lb/hr)	PM2.5 (ton/yr)	PM2.5 (lb/hr)
Hew Saw Baghouse	8,760	1.988	0.454	1.332	0.304
Chip baghouse, tons per year	27,886	0.014		0.009	
Chip baghouse, hours per year	6,240		0.004		0.003
Shavings Cyc/BH, tons per year	80,000	1.600		1.072	
Shavings Cyc/BH, hours per year	7,280		0.440		0.295

CYCLONE EMISSION FACTORS

Potlatch developed cyclone emission factors for PM. IFG is using those emissions factors where possible, with corresponding factors for PM10 and PM2.5.

Source	PM10 e.f. (lb/ton) (1)	PM2.5 e.f. (lb/ton) (2)	Status
CY-1, Specialties Gang Rip Cyclone	0.778	0.389	REMOVED
CY-2, Specialties Gang Rip Cyc.	0.164	0.082	REMOVED
CY-3, Specialties GRECON	0.164	0.082	REMOVED
CY-4, Specialties NULOC	0.522	0.261	REMOVED
CY-6, Specialties	0.164	0.082	REMOVED
CY-18, Surfacing, #4 Splitter	0.600	0.300	IFG-CY1
CY-24, Surfac., Brooks Chip., Fines	0.778	0.389	REMOVED IN PAST
CY-25, Surfac., Brooks Chip., Chips (3)	0.062	0.031	IFG-CY2
CY-26, Sawmill, All Machine Ctrs	0.165	0.082	IFG-CY3
CY-27A, Sawmill, All Machine Ctrs	0.780	0.390	IFG-CY4A
CY-27B, Sawmill, All Machine Ctrs	0.780	0.390	IFG-CY4B
CY-FH, Complex, Fuel Hog	0.170	0.085	IFG-CY5

Notes:

(1) Original note from Potlatch said: Calculated using cyclone and dust parameters per Rex. M. Robbins, Pollution Engineering, March, 1988 , with number of turns (Ne) calc. According to Wark and Warner, 1981

(2) Revised as required in DEQ August 19, 2013 lettter.

CYCLONE EMISSIONS INCLUDED IN PREVIOUS PERMIT ANALYSIS

HOURS OF OPERATION 4000 used inprevious analysis
ANNUAL SAWMILL PRODUCTION 351,009 MBDFT/YR

Modeled Source Name/Status	Current Throughput tons	Previously Analyzed Emissions (PM2.5 not modeled)			
		PM10 (ton/yr)	Daily PM10 (lb/hr)	PM2.5 (ton/yr)	PM2.5 (lb/hr)
CWCY1, was CY-1, Removed in 2012	354	0.138	0.069	0.069	0.034
CWCY2, was CY-2, Removed in 2012	354	0.029	0.015	0.015	0.007
CWCY3, was CY-3, Removed in 2012	773	0.063	0.032	0.032	0.016
CWCY4, was CY-4, Removed in 2012	1,324	0.345	0.173	0.173	0.086
CWCY6, was CY-6, Removed in 2012	2,582	0.212	0.106	0.106	0.053
IFGCY1, was CY-18, to be removed	53	0.016	0.008	0.008	0.004
CY-24, removed prior to 2012	0	0.000	0.000	0.000	0.000
IFGCY2, was CY-25, routed to baghouse	20,826	0.640	0.320	0.320	0.160
IFGCY3, was CY-26	296	0.024	0.012	0.012	0.006
IFGCY4, was CY-27A and CY-27B	376	0.147	0.073	0.073	0.037
IFGCY5, Fuel Hog Cyc., was PNP782(1)	8,000	0.680	0.340	0.340	0.170

(1) CW called this the Trash Hog, and it was modeled at a high emission rate, apparently in error. Values shown are what should have been modeled

CYCLONE EMISSIONS INCLUDED IN THIS MODELING

HOURS OF OPERATION 5356 hours per year, consistent with production inc.
ANNUAL SAWMILL PRODUCTION 470,000 MBDFT/YR

Modeled Source Name/Status	Current Throughput tons	Emissions Modeled for This Application			
		PM10 (ton/yr)	Daily PM10 (lb/hr)	PM2.5 (ton/yr)	PM2.5 (lb/hr)
CWCY1, was CY-1, Removed in 2012	0	0.000	0.000	0.000	0.000
CWCY2, was CY-2, Removed in 2012	0	0.000	0.000	0.000	0.000
CWCY3, was CY-3, Removed in 2012	0	0.000	0.000	0.000	0.000
CWCY4, was CY-4, Removed in 2012	0	0.000	0.000	0.000	0.000
CWCY6, was CY-6, Removed in 2012	0	0.000	0.000	0.000	0.000
IFGCY1, was CY-18, to be removed	0	0.000	0.000	0.000	0.000
CY-24, removed prior to 2012	0	0.000	0.000	0.000	0.000
IFGCY2, was CY-25, routed to baghouse(1)	27,886	0.000	0.000	0.000	0.000
IFGCY3, was CY-26	396	0.033	0.012	0.016	0.006
IFGCY4, was CY-27A and CY-27B	503	0.196	0.073	0.098	0.037
IFGCY5, was PNP782	10,000	0.850	0.340	0.425	0.170

(1) IFGCY2 routed to baghouse. IFGCY3 and -4 output re-routed to baghouse.

Dry Kiln Particulate Emission Factors

IFG and DEQ now have two particulate matter source tests on dry kilns, both performed by the same testing firm using the same methodology in 1998. The two tests were performed on two separate species, but there is no reason to think that the differences between the tests are all due to species differences. Even the individual test runs used to develop the average test varied widely.

IFG is proposing that we recognize the value of all the test data, but also the limitations. IFG is proposing that we average the results of the two available test results, and use them to represent the groups of tree species that IFG plans to dry.

Excellent descriptions of the forests of Idaho and the grouping of timber trees can be found on the Idaho Wood Products Commission and the Western Wood Products Association websites (www.idahoforests.org, www2.wwpa.org). IFG dries predominately two wood groups, hem-fir and Douglas-fir/larch, as well as a smaller amount of cedar. The following is the description of the hem-fir and Douglas-fir/larch wood groups as the species are used in the lumber industry:

> *In the Western Woods region, the 12 contiguous Western states plus Alaska, there are approximately 20 commercially important species well suited to softwood lumber production. While each has unique characteristics, physical and mechanical working properties, making it appropriate for specific applications, these Western softwood species are grouped into six primary combinations. These combinations simplify production, inventories and distribution, and facilitate engineering and product specification for design.*
>
> *Hem-Fir is a species combination of Western Hemlock (Tsuga heterophylla) and five of the True Firs: California Red Fir (Abies magnifica), Grand Fir (Abies grandis), Noble Fir (Abies procera), Pacific Silver Fir (Abies amabilis), and White Fir (Abies concolor). While Western Hemlock and the True Firs are sometimes marketed separately in products graded for appearance, these species share similar design values making products graded for structural applications interchangeable.*
>
> *The Hem-Fir species combination is one of the most important in the Western region, second only to the Douglas Fir-Larch species group in terms of abundance, production volumes, strength, and versatility in end use.*
>
> *Douglas Fir lumber products are identified by region. Products from trees growing west of the Cascade Crest to the Pacific Ocean, the most abundant region for Douglas Fir, are simply identified as "DF" on the grade stamp. East of the Cascades, Western Larch grows intermixed with Douglas Fir. The two species are often kept separate in appearance grade products but are combined in Dimension products and marketed as "DF-L". Because Douglas Fir and Western Larch share nearly identical structural characteristics and physical working properties, the two species are interchangeable in Dimension products.*

Both of the 1998 source tests used wood from western Oregon, with the Douglas-fir coming from the Vaughn, Oregon mill and the coastal hemlock coming from the Warrenton, Oregon

mill. It can't be proved, but based on the source of the coastal hemlock, there is a good chance the lumber contained higher concentrations of salt than found in inland species. The salt would account for both the higher total particulate matter and the higher percentage of condensable particulate matter.

The IFG Lewiston mill describes their white wood group as hem-fir, as is the industry practice. At Lewiston, however, the hem-fir group contains only 2% mountain hemlock and the rest is grand fir and other white fir species. IFG could make a case that the Douglas-fir emission test results are much more representative of the central Idaho hem-fir species group. However, as discussed above, IFG feels that it is better to recognize the consistencies in the available source test data and to permit all the kiln emissions based on an average of the test results.

IFG is proposing to permit the Lewiston dry kilns based on an average of the test results and use those values for estimating emissions from the kilns. These emission factors would be appropriate for the Idaho forest industry and would provide for efficient permitting and consistent regulation of sawmills throughout the state.

Idaho Forest-based Dry Kiln Emission Factors
Units are pounds per thousand board feet (lb/MBF)

1998 Source Test	PM Total (lb/MBF)	PM_{10} (lb/MBF)	$PM_{2.5}$ (lb/MBF)
coastal hemlock	0.051	0.051	0.048
Douglas-fir	0.024	0.024	0.018
Average	0.038	0.038	0.033

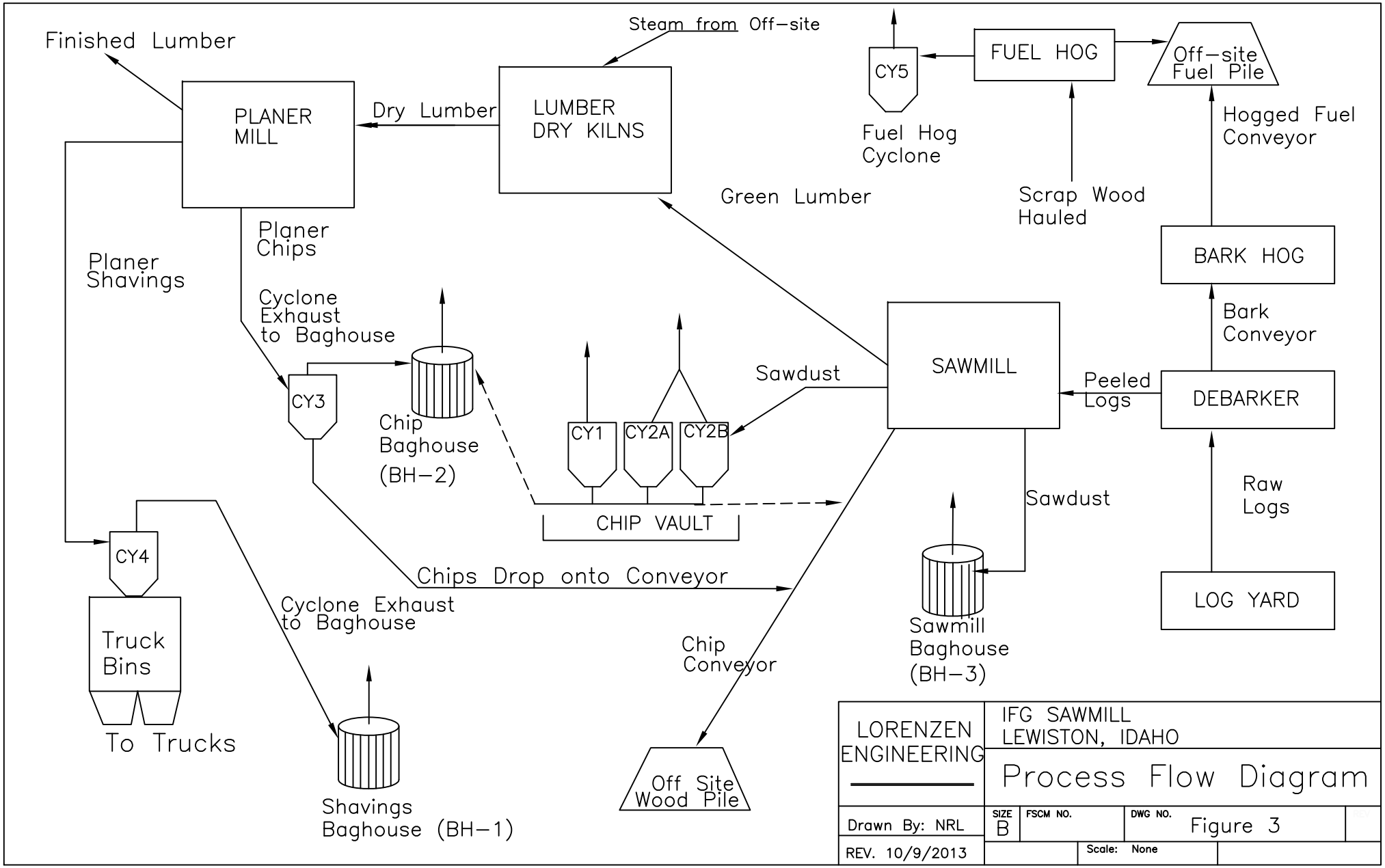
From: Diane Lorenzen <dianelorenzen@optimum.net>
Sent: Thursday, October 10, 2013 3:36 PM
To: Shawnee Chen
Cc: 'Miller, Jim'
Subject: IFG Lewiston Revised Flow Diagram
Attachments: IFG flow v 2 Model (1).pdf

Shawnee,

The revised flow diagram for IFG Lewiston is attached. The flow diagram reflects all the proposed changes to the material handling systems including baghouses and cyclones. Please let me know if you have any questions.

Diane

Diane Lorenzen
Lorenzen Engineering, Inc.
406-549-3995
dianelorenzen@optimum.net


Finished Lumber
PLANER MILL
Dry Lumber
LUMBER DRY KILNS
Steam from Off-site
CY5
Fuel Hog Cyclone
FUEL HOG
Off-site Fuel Pile
Hogged Fuel Conveyor
Green Lumber
Scrap Wood Hauled
BARK HOG
Bark Conveyor
Planer Shavings
Planer Chips
Cyclone Exhaust to Baghouse
CY3
Chip Baghouse (BH-2)
CY1
CY2A
CY2B
Sawdust
SAWMILL
Peeled Logs
DEBARKER
Raw Logs
CHIP VAULT
Sawdust
CY4
Chips Drop onto Conveyor
Cyclone Exhaust to Baghouse
Truck Bins
To Trucks
Chip Conveyor
Sawmill Baghouse (BH-3)
LOG YARD
Shavings Baghouse (BH-1)
Off Site Wood Pile
LORENZEN ENGINEERING
IFG SAWMILL
LEWISTON, IDAHO
Process Flow Diagram
Drawn By: NRL
REV. 10/9/2013
SIZE B
FSCM NO.
DWG NO. Figure 3
Scale: None

From: Diane Lorenzen <dianelorenzen@optimum.net>
Sent: Thursday, September 12, 2013 4:27 PM
To: Shawnee Chen
Cc: 'Miller, Jim'
Subject: Notes on IFG Application

Follow Up Flag: Follow up
Flag Status: Flagged

Shawnee,

The response information we sent included Figures 8 and 9. Jim Miller noted that Figure 8 was an earlier version of the mill changes. It included an additional cyclone colleting the material deposited by CY1, CY2A and CY2B. That was an earlier version of the plan, and would have had the exhaust from the intermediate cyclone being cleaned by the new BH-2. Figure 9 is the final version, in which the intermediate cyclone is eliminated. The emissions and source locations do not change.

Diane Lorenzen
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From: Diane Lorenzen <dianelorenzen@optimum.net>
Sent: Monday, September 09, 2013 7:42 PM
To: Shawnee Chen
Cc: 'Miller, Jim'; 'Short, Jesse'
Subject: IFG Lewiston Modeling Files
Attachments: IFG_NAAQS_rev_09082013.zip; IFG_SIL_Rev_09082013.zip

Follow Up Flag: Follow up
Flag Status: Flagged

Shawnee, I forgot to send these yesterday. Diane

Diane Lorenzen
Lorenzen Engineering, Inc.
406-549-3995
dianelorenzen@optimum.net

From: Diane Lorenzen <dianelorenzen@optimum.net>
Sent: Sunday, September 08, 2013 10:55 PM
To: Shawnee Chen
Cc: 'Miller, Jim'; 'Short, Jesse'
Subject: IFG - Lewiston Source Test Reference
Attachments: 1079A Willamette Ind at OSU.pdf

Follow Up Flag: Follow up
Flag Status: Flagged

Diane Lorenzen
Lorenzen Engineering, Inc.
406-549-3995
dianelorenzen@optimum.net

HORIZON ENGINEERING LLC

13585 N.E. Whitaker Way • Portland, OR 97230
Phone (503)255-5050 • Fax (503)255-0505
horizone@teleport.com

Dab B, DRR
2-12-99

Project No. 1079 A

SOURCE EVALUATION REPORT

WILLAMETTE INDUSTRIES, INC

Dry Kiln Particulate and VOC Emissions while Drying Douglas Fir

16 Ft. Wellons Dry Kiln at Oregon State University
Corvallis, Oregon

December 14-19, 1998

Prepared for

Vaughn Laminating Complex
Warrenton Saw Mill
Willamette Industries, Inc.
Western Administrative & Sales Office
P.O. Box 907
Albany, OR 97321

by
David R. Rossman, P.E.

REGISTERED PROFESSIONAL ENGINEER
8913
David R. Rossman
OREGON
2/12/99
July 30, 1976
DAVID R. ROSSMAN

Expires 12/31/00

CERTIFICATION

I certify that to the best of my knowledge the enclosed information is authentic and accurate and that the procedures were conducted according to the EPA Methods referenced in the report.

David Rossman 2/4/99

David R. Rossman, P.E. Date
Horizon Engineering

David Broderick Date
Team Leader

Introduction

Source tests were made December 14-19, 1998 on the exhaust of the 16-foot Wellons dry kiln at the Oregon State University Forest Research Lab in Corvallis, Oregon. Particulate and volatile organic compounds (VOC) as total gaseous organic compounds (TGOC) were monitored throughout two complete drying cycles of Douglas Fir. The testing was done to verify emission factors in the Title V operating permit for the Willamette Industries Warrenton saw mill and Vaughn Laminating Complex.

David Broderick, Joe Fiedler and David Bagwell of Horizon Engineering did the testing. Jon Lund of Willamette Industries arranged for the testing; Dr. Michael Milota and Mark Lavery of OSU operated the Kiln. A source test plan was filed with Jack Herbert of the Oregon Department of Environmental Quality (ODEQ) and Gracia Castro of Lane Regional Air Pollution Authority. Tom Freeman of LRAPA visited the site during the testing.

Summary of Results

The test results are summarized in Table 1. Although the testing periods covered about 93% of the actual drying cycles, the results have been extrapolated to the entire drying cycle times and have been calculated on a production basis. Detailed results and sampling parameters are included in the Appendix.

Particulate numbers include the "back half" condensable material collected in the impingers and on a filter following the impingers (as specified in ODEQ Method 7). The condensable fraction of material averaged about 70% for the two test cycles. Particulate emissions using EPA Method 5 would not include this material.

VOC results were obtained using the continuous flame ionization detector method of EPA Method 25A. The sample was diluted with dry air to avoid attenuation from the high moisture gas stream.

Table 1

Douglas Fir Test Results, Wellons Dry Kiln, OSU

Test Dates: December 14-19, 1998

	Units	Cycle 1	Cycle 2	Average
Particulate (ODEQ M-7)	lb/mbf	0.020	0.024	0.022
	lb/hr	0.0008	0.0010	0.0009
	gr/dscf	0.0016	0.0017	0.0017
Volatile Organic Compounds				
TGOC, dry basis (EPA M-25A)	lbC/mbf	0.40	0.38	0.39
	lbC/hr	0.017	0.016	0.017
	ppmC	150	123	137
Source Parameters				
Flow Rate, standard	dscf/min	60	69	65
Flow Rate, actual	acf/min	86	97	92
Exhaust Moisture	%	23	21	22
Exhaust Temperature	°F	146	145	146

Description of the Source and Its Operation

The 16-foot Wellons kiln located in the Forest Research Lab at OSU is a small version of a production kiln and is set up to dry about 2000 board feet at a time. A computer in an adjoining lab room controls the drying cycle. Photographs at the end of the report text show the kiln and sampling setup.

The kiln is steam-heated with coils located above the lumber on either side of an axial fan. The fan reversed every three hours (all programmed on the computer) to keep the drying process more uniform.

There are two exhaust vents with motorized dampers, one from each side of the

steam coils. As the fan blows in one direction, the positive-pressure side (between the steam coils and the lumber stack) exhausts through one vent while the negative-pressure side vent is drawing in ambient air. The dampers are controlled to keep the wet bulb temperature at the programmed level, so it is expected that exhaust flow rates will vary over the cycle.

The exhausts were sampled above the roof of the building through ports located to meet EPA Method 1 criteria. Two traverses were made on each exhaust for each test run. VOC was sampled through another port just upstream from the particulate sampling ports.

Although not directly related to this work, it is notable that the aluminum exhausts and screens over their exits showed no deposits of material. According to Dr. Milota, the kiln was installed in 1989 and has been in regular use (about 25% overall) since then and the aluminum of the exhausts is still bright material, inside and out.

Two loads of Douglas Fir were dried to less than 13% moisture, dry basis, over 60-hour cycles. The wood dried during testing was from the Willamette Industries Vaughn facility. The logs were 20 to 60 days old when cut on November 9, 1998. The lumber was shipped under cover on December 11 to OSU and stored outside under cover until the testing. The lumber was 16-foot sections of 2 x 6's. A total of about 2,560 board feet were dried in the first cycle and about 2,304 board feet in the second cycle.

The drying schedule is summarized in Table 2; Table 3 is the drying data summary. Graphs 1 and 2 show the dry and wet bulb temperatures inside the kiln.

Table 2

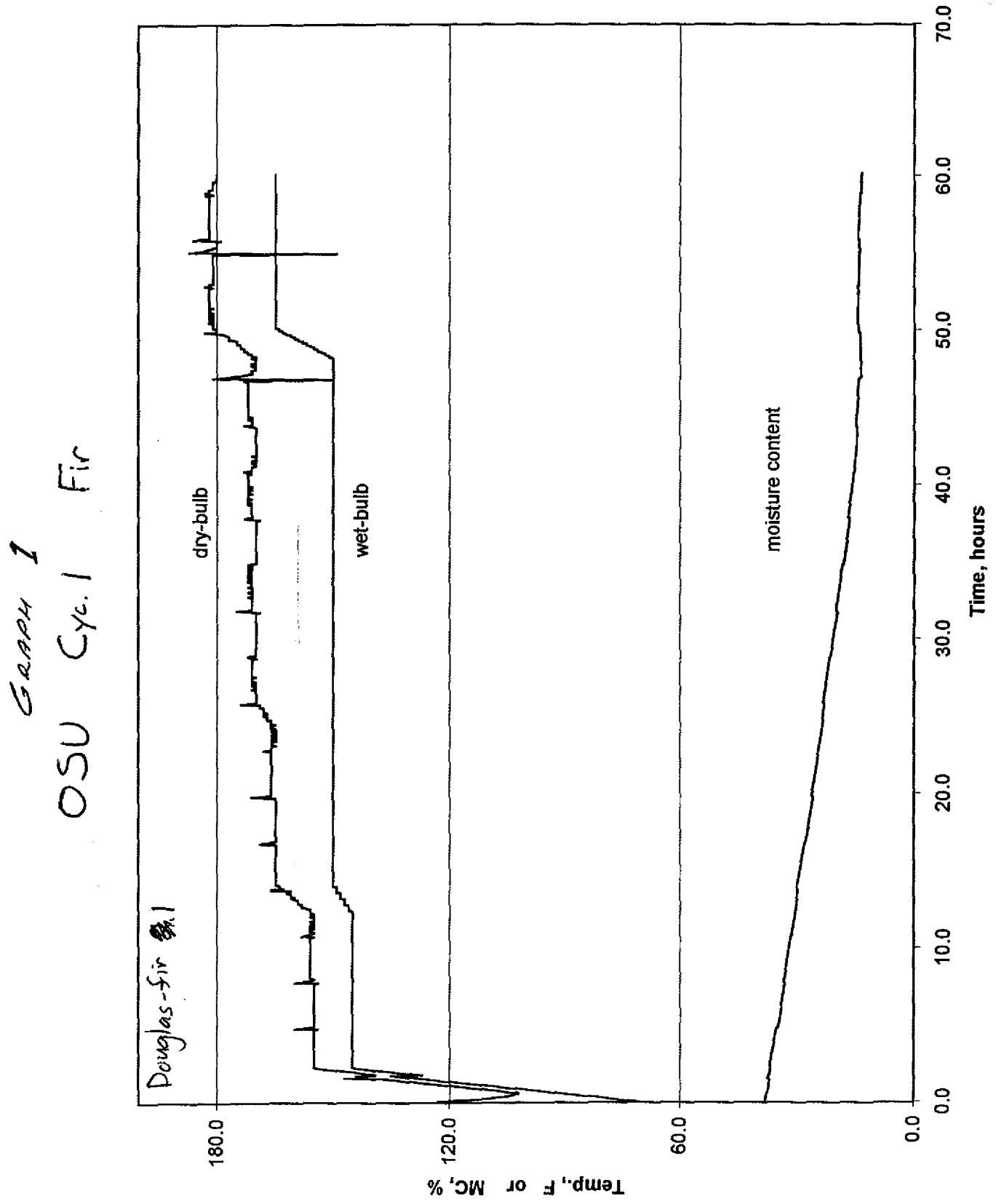
Drying Schedule

Period	Hour	Tdry	Twet	Time	Fan Reversals (hours)
Cycle 1					
1	0-2	80	70	2	1.5
2	2-12	155	145	10	3
3	12-24	165	150	12	3
4	24-48	170	150	24	3
5	48-60	180	165	12	3
Cycle 2					
1	0-2	80	70	2	1.5
2	2-12	155	145	10	3
3	12-24	165	150	12	3
4	24-36	170	140	12	3
5	36-52	170	140	16	3
6	52-60	180	165	8	3

Table 3

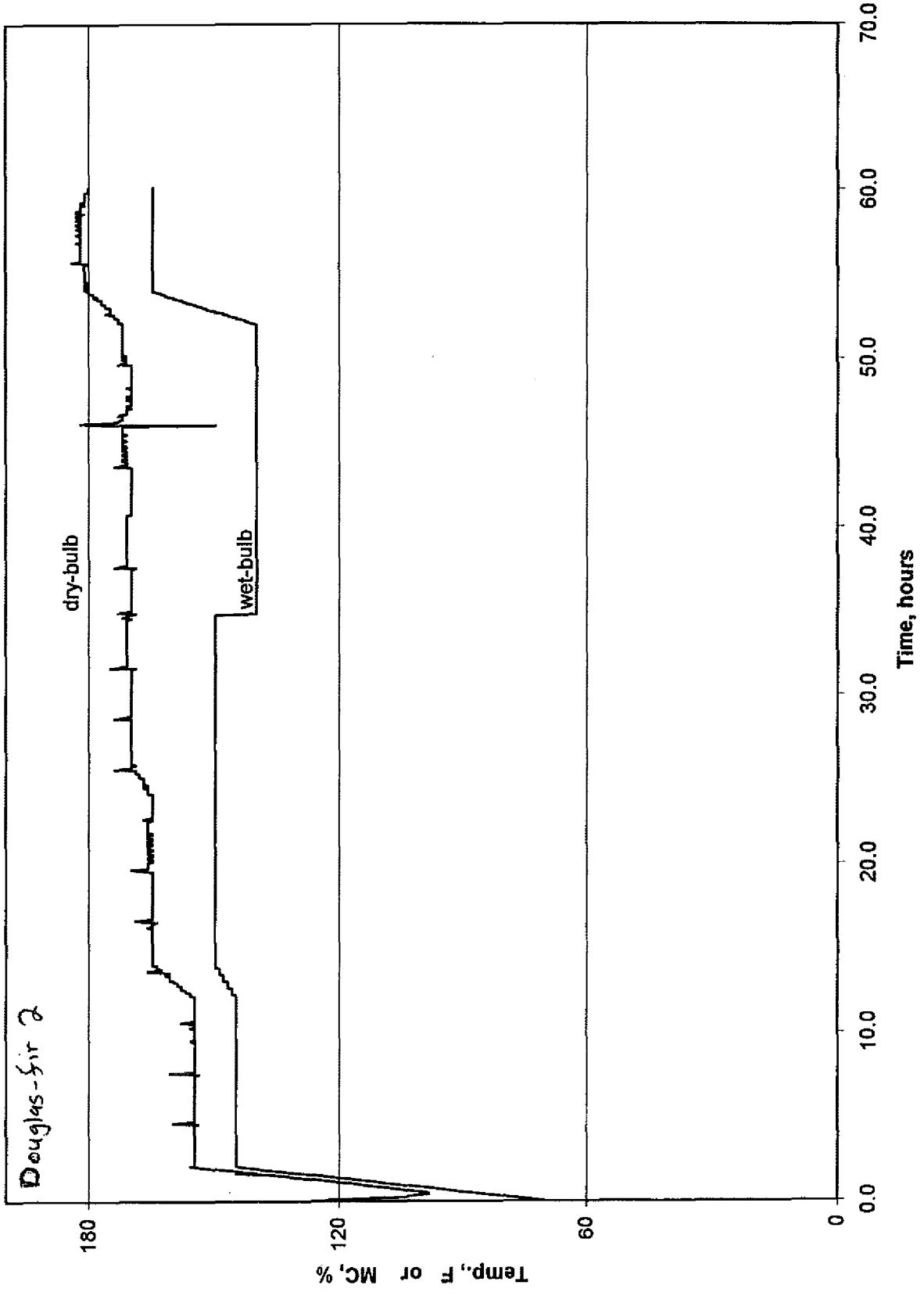
Drying Data Summary

	Units	Charge 1	Charge 2
Run Time	Hours	60	60
Initial MC	% dry basis	38	38
Hot Check MC	% dry basis, hr:min	13.1@46:38 12@54:56	14.2@46:08
Final MC	% dry basis	12.8	11.9
Charge size	Board feet	2,560	2,304


Graph 1
OSU Cyc. 1 Fir
Douglas-fir #1
dry-bulb
wet-bulb
moisture content
Temp., F or MC, %
180.0
120.0
60.0
0.0
Time, hours
0.0
10.0
20.0
30.0
40.0
50.0
60.0
70.0

Graph 2

OSU Cyc. 2 Fir



Sampling and Analytical Procedures

General Two loads of lumber were dried; particulate and TGOCs were monitored almost continuously. The TGOC testing equipment was moved every three hours to the exhausting stack. For the particulate testing, one sampling train (set of filters and glassware) were used on each exhaust, keeping the same sample gear together for each individual stack over the entire cycle.

Problems During Run 7 of the first cycle the VOC probe was not moved to the exhausting stack for about two of the three hours. A time weighted average of the previous and following tests was used to fill in the time gap.

Total Particulate Oregon DEQ Method 7 equipment and operating methods were followed. DEQ Method 7 particulate includes the normal "front half" heated probe and filter material specified in EPA Method 5, as well as condensable material caught in the impingers in the "back half" of the train and a back half filter located between the last two impingers. Probe and front filter temperatures were maintained at 250°F during the sampling.

Supporting EPA Methods 1, 2 and 4 were followed for determination of traverse point locations, exhaust flow rates and moisture content. According to Method 2, the duct geometry required two perpendicular traverses of 6 points each for the particulate testing. Because of the extremely slow exhaust velocity, a Shortridge AirData 870 digital micro manometer was used to measure the velocity pressures instead of the normal inclined manometer. During much of the testing the velocity pressure differential was below 0.0010 inch of water. The micro manometer reads to 0.0000 inches of water.

Moisture was determined (through impinger weight gain) for each run (three-hour period) to allow moisture correction of the TGOC results. Blank correction calculations are in the Appendix. Blank water values apply only to the initial 200-ml of de-ionized water in the impingers at the beginning of the tests on each exhaust. Approximately 200 ml of condensed water was left in the first two impingers after each run.

Temperatures were monitored with k-type thermocouples and the indicators built into the Graseby Model 2010A pump/meter box. Calibrations on these and other equipment used are in the Appendix. Leak checks were made on the pitot lines and the sampling trains before and after each three-hour cycle. Isokinetic sampling conditions were determined with the aid of a Hewlett-Packard 48 series calculator programmed with the operating equations.

Lab analysis of the collected particulate samples was by Antech of Corbett, Oregon. Their results and worksheets are in the Appendix.

The lab has noted that the filter for Cycle 1 (east) had a shredded edge. This happens occasionally during sample recovery when the filter paper sticks to the filter holder. The glass fiber filter media is very fragile and breaks easily if stressed. In this event, the person recovering the sample is very aware that all of the filter (even tiny fragments) must be included in the sample. As much as possible is included in the petrie dish that contains the filter after its use. Any filter fragments not included with the filter (normally this is a layer sticking to glass front half of the filter holder), end up in the front acetone as that component is cleaned.

The result of this is that the net filter weight may be low or even negative, but the front acetone will be higher because it includes the filter fragments. The distribution of sample weight would appear different for that run, but unless part of the filter is actually lost, which is unlikely, there is no net effect on the calculated final sample weight for the run.

VOC A continuous analyzer was used for VOC determination as total gaseous organic compounds (TGOC) according to EPA Method 25A. A JUM Engineering Model VE-7 heated flame ionization detector was used on the 0-100 ppm range.

The gas sampling probe was moved at every fan reversal to stay in the exhausting stack. The sample stream was drawn through a heated stainless steel probe and heated glass fiber filter, passed through heated Teflon sample line to the heated FID analyzer in an equipment trailer. All sample-exposed lines and surfaces were stainless steel or Teflon. The sample was diluted at the

analyzer with charcoal filtered ambient air to keep the moisture going into the FID below 20%.

Calibrations on the TGOC analyzer were made using mixtures of propane in nitrogen. All calibration standards used in the testing are traceable to NIST standards. Introducing calibration gas just ahead of the heated filter made all calibration checks "bias" checks. Zero, span, and calibration error (linearity) were made at the beginning of each cycle. Before and after each three-hour test, bias checks were made first with no adjustments to the dilution air rotameter, then again with the dilution air shut off. The analyzer was very stable and rarely needed adjustments.

All of the analyzer checks were well within allowable limits. The calculated results are corrected for dilution air, moisture content (from the M-7 tests) and for minor instrument drift. Documentation for the quality assurance checks on the analyzer system and calibration gas certificates are in the Appendix.

The analyzer output was read every minute and recorded by a Rustrak Ranger II data logger. A strip chart record was also made as a backup. Data logger information and the accompanying software were used to determine the reported results. Graphic printouts of the data logger information are in the Appendix.

Calculations To calculate emissions for the entire drying cycle periods, data during calibration gaps and leak check periods had to be generated. Calibration periods were filled in with averages of the preceding and following tests. Any missing data periods due to equipment interruptions were also estimated using averages on both sides of the missing data. The process was very steady so this should have little or no effect on the results.

Discussion

All quality assurance checks, including leak checks and instrument calibrations, were within allowable tolerances. The isokinetics on a few of the runs were somewhat higher than normal Method 7 limits, but the fact that most of the particulate was in the back half makes isokinetics of little importance.

Particulate concentrations measured according to DEQ Method 7 and are accurate to ± 5% or less. Sample volumes were relatively large, sample weights were well above the interference level, and the long runs minimized the effect of reagent blank weights.

VOC concentrations measured according to EPA Method 25A and are accurate to ± 5% or less. Corrections were made for minor instrument drift.

The velocity measurements were made with a digital micro manometer because of the low velocity pressures. The uncertainty of the velocities and flow rates are estimated to be ±15%. There were some velocities measured at the micro manometer's lower limit of 0.0000 inches of water. The percent uncertainty in these values can become significant. That these numbers were small minimizes the uncertainty effect on the final results. The average velocity pressure for all of the test runs was about 0.0006 inches. Also, the accuracy of the S-type pitot coefficient at these low velocities is an unknown.

It is unlikely that all of the uncertainty will be in the same direction and overall we estimate that the VOC emission results are ± 20% or better. The VOC emission factor generated in this work is similar to the Douglas Fir emission factors published in NCASI Technical Bulletin 718.

Figure 1

Forest Research Lab with Kiln Exhausts (Looking East)

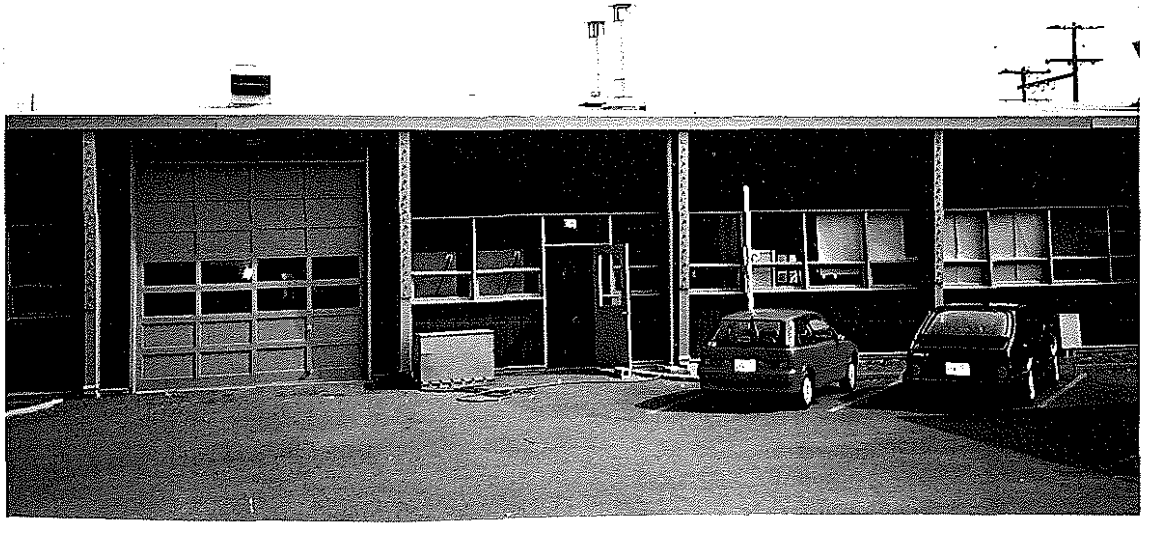


Figure 2

Kiln Exhausts During Sampling

(TGOC analyzer is in trailer)

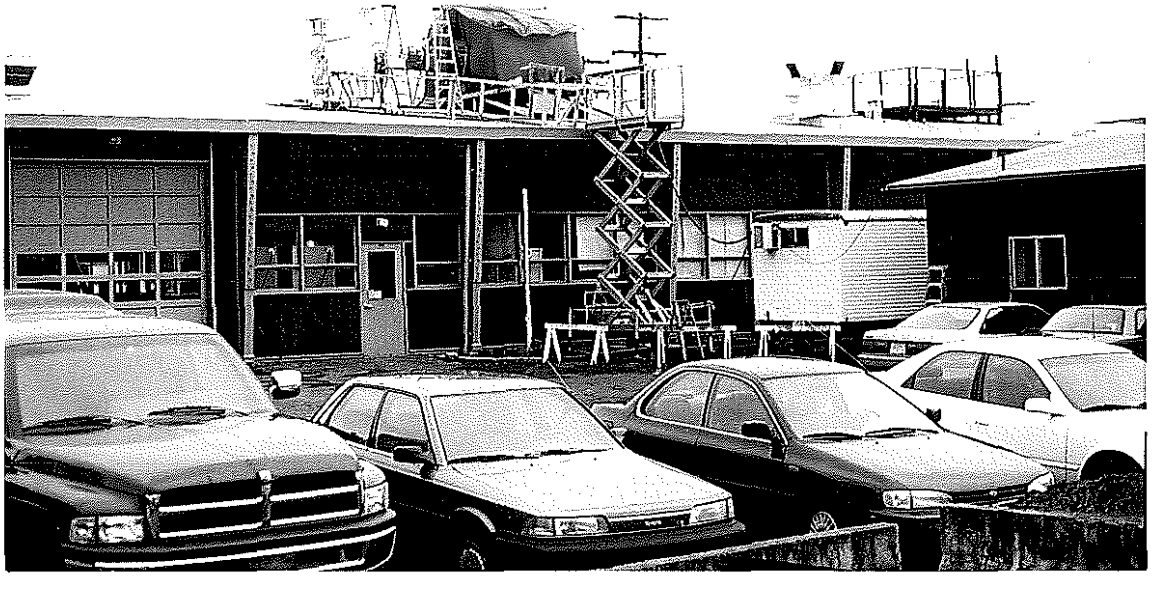


Figure 3

16 Ft. Wellons Kiln (Loading End)

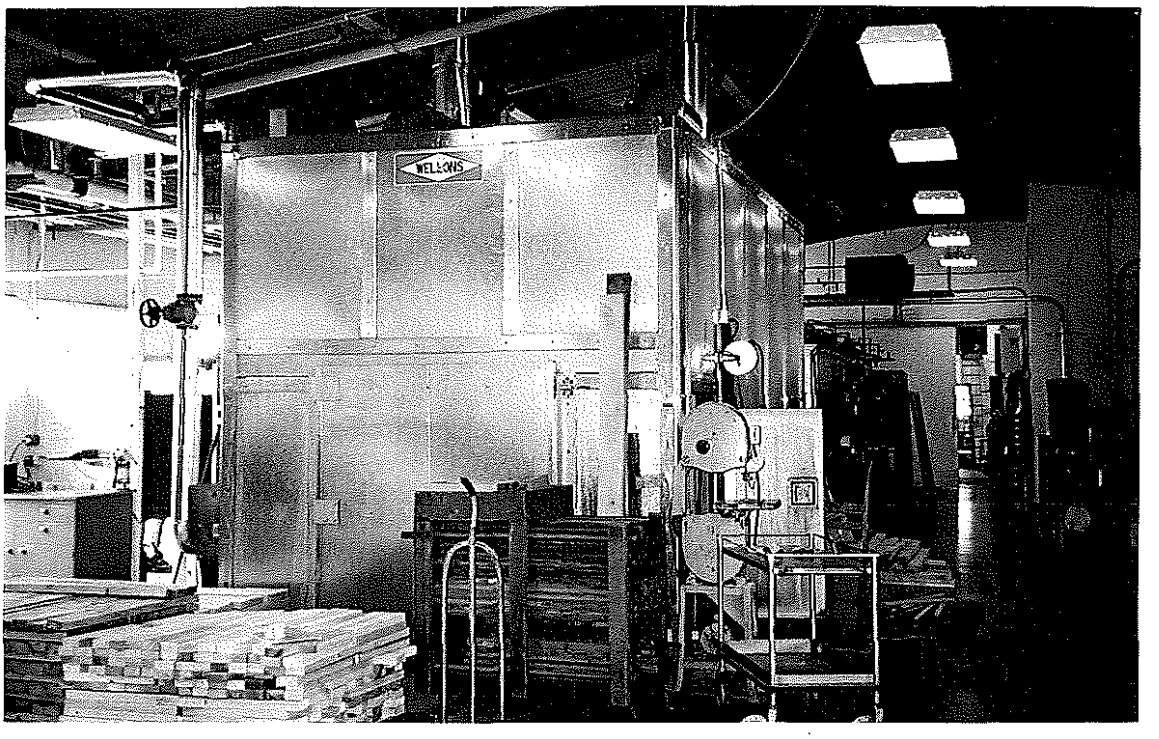


Figure 4

16 ft. Wellons Kiln (Opposite End)

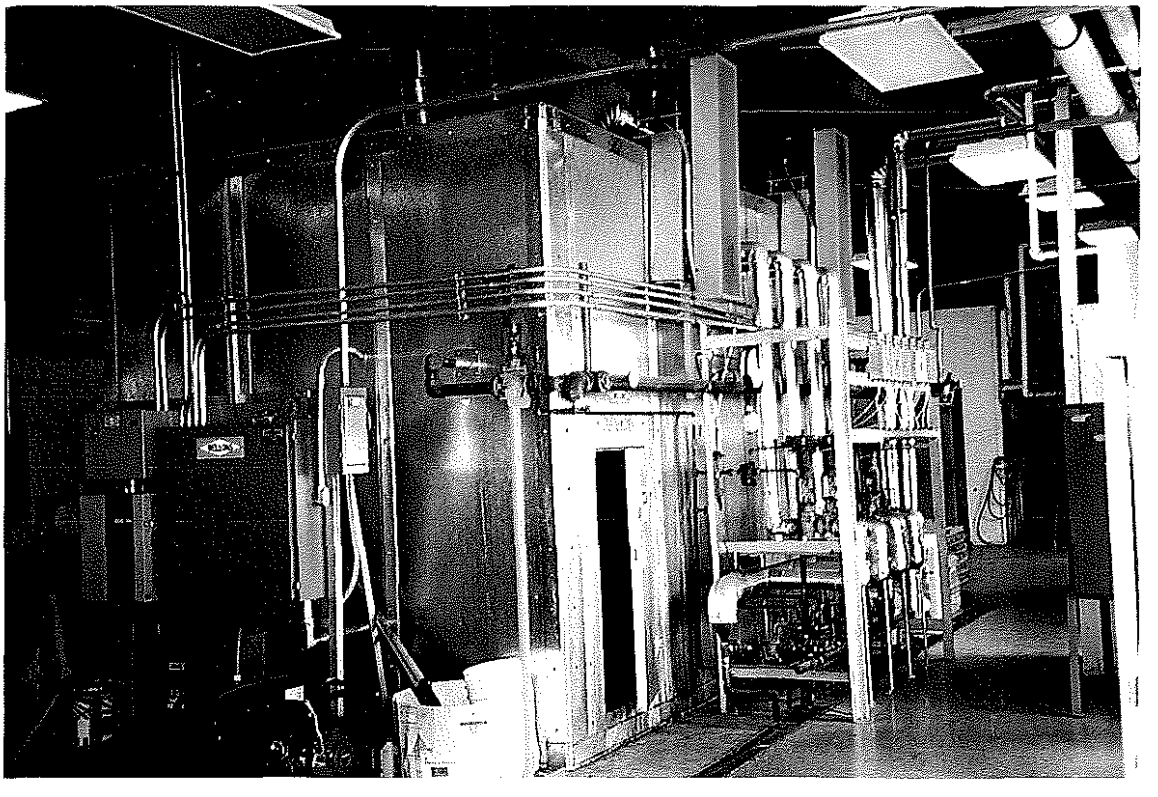


Figure 5
Kiln Exhaust Ducts (West Side)

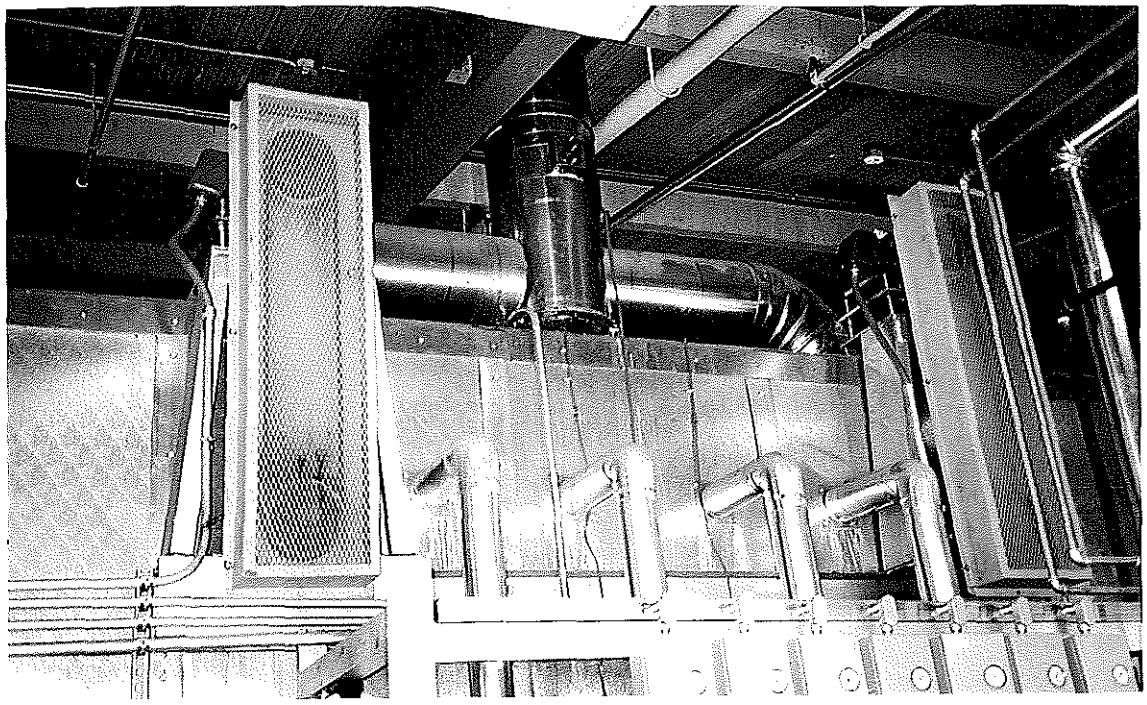


Figure 6

East Side of Kiln Interior (no lumber)

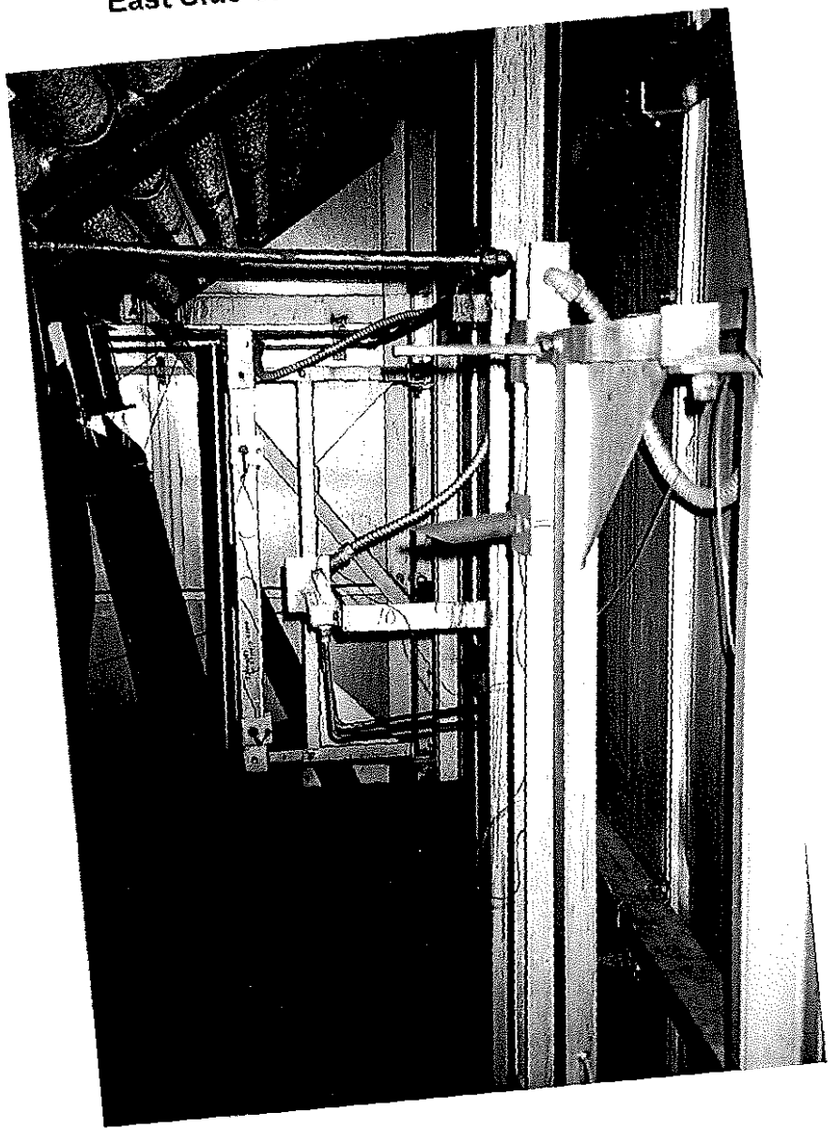


Figure 7
Rooftop Sampling

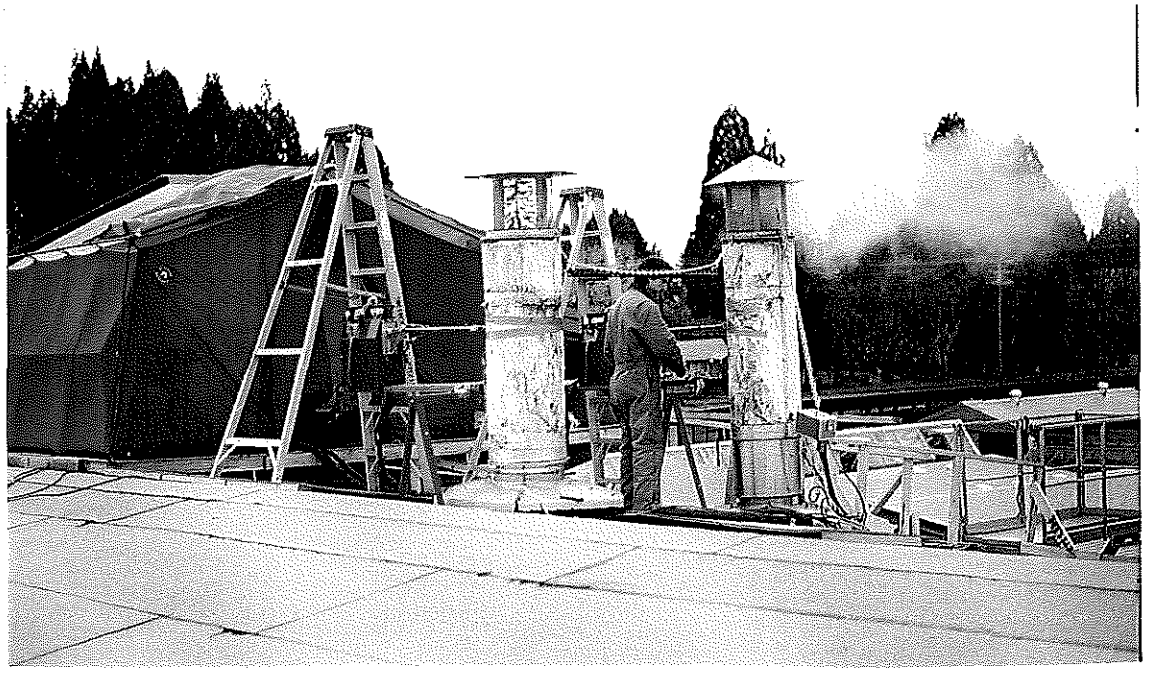


Figure 8
Exhausts During Testing (Skin Removed)

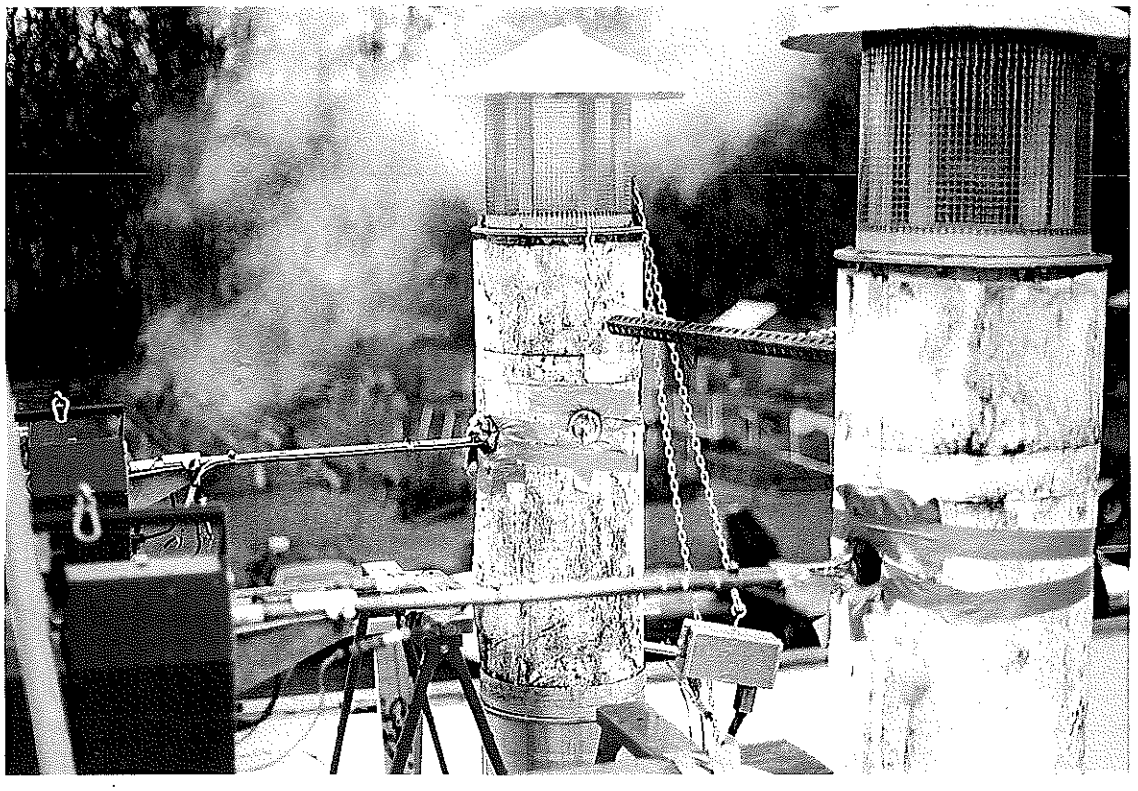


Figure 9

Close-up of Exhaust Outlet (after nine years)

Figure 10

Particulate Control Boxes During Sampling

APPENDIX

Nomenclature & Drift Correction Documentation

Total Particulate

- Particulate Emissions Summary
- Particulate Emissions Determinations
- Sample Calculations
- Field Data Sheets
- Blank Correction Sheets
- Laboratory Results and Worksheets
- Moisture Catch Sheets
- Moisture Catch Field Data Sheets
- Traverse Point Locations

Gases

- TGOC Emissions Summaries
- Gaseous Determinations (Bias Checks)
- Data Logger Gas Charts
- Strip Chart
- Calibration Gas Certificates

Calibration Data

- Meter Box
- Pitots
- Micromanometer
- Thermocouples and Indicators
- Nozzle Diameters
- Barometer

Kiln Information

Administrative

- Source Test Plan and Correspondence

NOMENCLATURE
AND
DRIFT CORRECTION
DOCUMENTATION

Nomenclature

Constants	Value	Units	Definition	Ref
Pstd(1)	29.92129	inHg	Standard Pressure	CRC
Pstd(2)	2116.22	lbf / ft²		CRC
Tstd	527.67	°R	Standard Temperature	CRC
R	1545.33	ft lbf / lbmol °R	Ideal Gas Constant	CRC
MWatm	28.965	lbm / lbmole	Atmospheric (20.946 %O2, 0.033% CO2, Balance N2+Ar)	
MWc	12.011	lbm / lbmole	Carbon	CRC
MWco	28.010	lbm / lbmole	Carbon Monoxide	CRC
MWco2	44.010	lbm / lbmole	Carbon Dioxide	CRC
MWh2o	18.015	lbm / lbmole	Water	CRC
MWno2	46.006	lbm / lbmole	Nitrogen Dioxide	CRC
MWo2	31.999	lbm / lbmole	Oxygen	CRC
MWso2	64.063	lbm / lbmole	Sulfur Dioxide	CRC
MWn2+ar	28.154	lbm / lbmole (Balance with 98.82% N2 & 1.18% Ar)	Emission balance	
C1	385.3211	ft³ / lbmol	Ideal Gas Constant @ Standard Conditions	
C2	816.5455	inHg in²/ °R ft²	Isokentics units correction constant	
Kp	5129.4	ft / min [(inHg lbm/mole) / (°R inH2O)] ^½	Pitot tube constant	Ref 2.5.1
Symbol	**Units**	**Definition**	**Calculating Equation or Source of Data**	**EPA**
As	in²	Area, Stack		
An	in²	Area, Nozzle		
Bws	%	Moisture, % Stack gas	[100 Vw(std) / [Vw(std)+Vm(std)]]	Eq. 5-3
C	ppmv-C	Carbon (General Reporting Basis for Organics)		
C1	ft3/lbmol	Gas Constant @ Standard Conditions	[R Tstd / Pstd(2)]	
C2	inHg in²/ °R ft²		[14,400 Pstd / Tstd]	
Cd	lbm-GAS / MMdscf	Mass of gas per unit volume	[Cgas MWgas / C1]	
cg	gr/dscf	Grain Loading, Actual	[15.432 mn / Vm(std) 1,000]	Eq. 5-6
cg @ X%CO2	gr/dscf	Grain Loading Corrected to X% Carbon Dioxide	[X% / CO2%]	
cg @ X%O2	gr/dscf	Grain Loading Corrected to X% Oxygen	[(20.946-X%) / (20.946-O2%)]	
Cgas	ppmv, %	Gas Concentration, (Corrected)		
Cgas @ X%CO2	ppmv	Gas Concentration Correction to X% Carbon Dioxide	[X% / CO2%]	
Cgas @ X%O2	ppmv	Gas Concentration Correction to X% Oxygen	[(20.946-X%) / (20.946-O2%)]	
CO	ppmv	Carbon Monoxide		
Co	ft	Outer Circumference of Circular Stack		
Ci	ft	Inner Circumference of Circular Stack		
CO2	%	Carbon Dioxide		
Cp		Pitot tube coefficient		
Ct	lb/hr	Particulate Mass Emissions	[60 cg Qsd/ 7,000]	
dH	in H2O	Pressure differential across orifice		
Dn	in	Diameter, Nozzle		
dp^½		Average square root of velocity pressure		
Ds	in	Diameter, Stack		
E	lb / MMBtu	Pollutant Emission Rate	Cgas Fd MWgas (20.946 / (20.946-O2%)) / (1,000,000 C1)	
Fd	dscf / MMBtu	F Factor for Various Fuels		Table 19-1
I	%	Percent Isokinetic	[C2 Ts(abs) Vm(std) / (vs Ps mfg An Ø)]	Eq. 5-8*
Md	lbm / lbmole	Molecular weight, Dry Stack Gas	[(1-%O2-%CO2)(MWn2+ar)+(%O2 MWo2)+(%CO2 MWco2)	Eq. 3-1*
mfg		Mole fraction of dry stack gas	[1-Bws/100]	
Mgas	lbm/hr	Gaseous Mass Emisisons	[60 Cgas(ppmv) MW Pstd(2) Qsd / 1,000,000 R Tstd]	
mn	mg	Particulate lab sample weight		
Ms	lbm / lbmole	Molecular weight, Wet Stack	[Md mfg +MWh2o (1-mfg)]	Eq. 2-5
MW	lbm / lbmole	Molecular Weight		
NO2	ppmv-NO2	Nitrogen Dioxide (General Reporting Basis for NOx)		
NOx	ppmv-NO2	Nitrogen Oxides (Reported as NO2)		
O2	%	Oxygen		
OPC	%	Opacity		
Pbar	in Hg	Pressure, Barometric		
Pg	in H2O	Pressure, Static Stack		
Po	in Hg	Pressure, Absolute across Orifice	[Pbar+dH/13.5955]	
Ps	in Hg	Pressure, Absolute Stack	[Pbar+Pg/13.5955]	Eq. 2-6*
Qa	acf/min	Volumetric Flowrate, Actual	[As vs / 144]	
Qsd	dscf/min	Volumetric Flowrate, Dry Standard	[Qa Tstd mfg Ps] / [Pstd(1) Ts(abs)]	Eq 2-10*
Rf	MMBtu/hr		[1,000,000 Mgas (20.946-O2)]/ [Cd Fd 20.946]	
SO2	ppmv-SO2	Sulfur Dioxide		
t	in	Wall thickness of a stack or duct		
TGOC	ppmv-C	Total Gaseous Organic Concentration (Reported as C)		
Tm	°F	Temperature, Dry gas meter		
Tm(abs)	°R	Temperature, Absolute Dry Meter	[Tm + 459.67]	
Ts	°F	Temperature, Stack gas		
Ts(abs)	°R	Temperature, Absolute Stack gas	[Ts + 459.67]	
Vlc	ml	Volume of condensed water		
Vm	dcf	Volume, Gas sample		
Vm(std)	dscf	Volume, Dry standard gas sample	[Y Vm Tstd Po]/ [Pstd(1) Tm(abs)]	Eq. 5-1
vs	fpm	Velocity, Stack gas	Kp Cp dp^½ [Ts(abs) / (Ps Ms)]^ ½	Eq. 2-9*
Vw(std)	scf	Volume, Water Vapor	0.04707 Vlc	Eq. 5-2
Y		Dry gas meter calibration factor		Fig. 5.6
Ø	min	Time, Total sample		

* Based on equation.

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DRIFT CORRECTION DOCUMENTATION

EPA Drift Equations:

- Method 3A: Oxygen and Carbon Dioxide

$$C_{gas} = \frac{(C_{ma} - C_{oa})(C - C_m) + C_{ma}}{(C_m - C_o)} \qquad \text{(Eq. 3A-1)}$$

- Method 6C: Sulfur Dioxide

$$C_{gas} = \frac{C_{ma}(C - C_o)}{(C_m - C_o)} \qquad \text{where } C_{oa} = 0 \qquad \text{(Eq. 6C-1)}$$

- Method 7E: Nitrogen Oxides, Section 8 of Method 7E states: "Follow Section 8 of Method 6C (Eq. 6C-1)"
- Method 10: Carbon Monoxide, the EPA does not currently address Gas Filter Correlation instruments, therefore there are no current standards.
- Method 25A: Total Gaseous Organic Concentration (TGOC), this method does not mention correcting for drift although there are established limits.

Horizon Engineering Drift Correction Equations:

$$C_{gas} = \frac{(C_{id} - Z_x)(C_{ma} - C_{oa})}{(S_x - Z_x)} \qquad S_x = \frac{C_{mf} - C_{mi})(T_x - T_{ci})}{(T_{cf} - T_{ci})} + C_{mi}$$

$$Z_x = \frac{(C_{of} - C_{oi})(T_x - T_{ci})}{(T_{cf} - T_{ci})} - +C_{oi} \qquad T_x = \frac{(T_{te} - T_{ts})}{2} + T_{ts}$$

EPA	Definition	Horizon
C_{gas}	Effluent gas concentration, dry basis	C_{gas}
C_{ma}	Actual upscale calibration gas concentration	C_{ma}
C_{oa}	Actual zero/low calibration gas concentration	C_{oa}
C_m	Average of initial and final system upscale calibration bias responses	
	Initial system upscale calibration bias response	C_{mi}
	Final system upscale calibration bias response	C_{mf}
C_o	Average of initial and final system zero/low calibration bias responses	
	Initial system zero/low calibration bias response	C_{oi}
	Final system zero/low calibration bias response	C_{of}
C	Average gas concentration indicated by gas analyzer, dry basis	C_{id}
	Starting test time	T_{ts}
	Ending test time	T_{te}
	Initial system bias calibration response time	T_{ci}
	Final system bias calibration response time	T_{cf}
	Mid-point of test time or gas sampling interval to be analyzed	T_x
	Approximate upscale response at mid-point test time	S_x
	Approximate zero/low response at mid-point test time	Z_x

Notes or exceptions:
TGOC is first recorded on a wet basis, then corrected to a dry basis
The TGOC instruments used by Horizon have some historic data on instrument response to different hydrocarbons. For propane the response is 1 to 1 molecule while methane is 1.037 to 1 molecule. We correct for the instrument's "over response" to methane.

TOTAL PARTICULATE

Particulate Emissions - Cycle No.1 Summary

Willamette Ind. - OSU
Cycle No. 1 Douglas Fur - Particulate
Dec 14-16, 1998

Run ID	Start	End	Test min	Interval Time min	Bws Kiln	Qsd dscfm	Isokinetics %
1	08:52	10:12	75.0	80.0	5.7%	181.9	88.5
	10:12	10:26		14.0			
2	10:26	13:49	180.0	203.0	17.7%	50.1	109.9
	13:49	13:53		4.0			
3	13:53	16:44	165.0	171.0	20.5%	81.8	100.7
	16:44	16:55		11.0			
4	16:55	19:50	175.0	175.0	12.2%	73.6	100.4
	19:50	19:55		5.0			
5	19:55	22:50	175.0	175.0	18.8%	66.1	112.7
	22:50	22:55		5.0			
6	22:55	01:44	165.0	169.0	20.4%	61.1	102.8
	01:44	01:56		12.0			
7	01:56	04:45	165.0	169.0	23.0%	46.0	116.4
	04:45	04:57		12.0			
8	04:57	07:55	175.0	178.0	22.7%	48.3	107.4
	07:55	07:58		3.0			
9	07:58	10:53	170.0	175.0	22.8%	57.3	106.2
	10:53	10:58		5.0			
10	10:58	13:52	170.0	174.0	23.0%	49.4	105.8
	13:52	13:57		5.0			
11	13:57	16:53	175.0	176.0	23.5%	57.4	110.3
	16:53	16:57		4.0			
12	16:57	19:52	175.0	175.0	20.4%	59.4	103.7
	19:52	19:56		4.0			
13	19:56	22:51	175.0	175.0	22.0%	56.3	113.8
	22:51	22:58		7.0			
14	22:58	01:51	170.0	173.0	21.7%	50.9	109.5
	01:51	01:56		5.0			
15	01:56	04:45	170.0	169.0	22.6%	70.4	109.2
	04:45	04:59		14.0			
16	04:59	07:57	175.0	178.0	22.2%	46.5	109.1
	07:57	08:17		20.0			
17	08:17	11:07	165.0	170.0	24.5%	76.4	100.0
	11:07	11:16		9.0			
18	11:16	14:09	170.0	173.0	31.2%	45.0	106.9
	14:09	14:15		6.0			
19	14:15	17:31	175.0	196.0	32.6%	53.3	105.6
	17:31	17:35		4.0			
20	17:35	20:30	175.0	175.0	30.4%	47.9	102.5
	20:30	20:36		6.0			
21	20:36	21:52	75.0	76.0	29.0%	53.6	100.7
	21:52	22:17		25.0			

		Time Weighted Averages				
		H2O %	Qsd dscfm	Iso %	gr/dscf	lbm/hr
Total Cycle Time	3,685 min					
Total Test Interval	3,660 min					
Total Actual Testing Time	3,415 min	22.5%	60.3	106.5	0.0016	0.0008
Percent Actual Testing of Cycle Time	92.7%					

Production 2,560 bft
0.018 lbm/Mdbft (For actual testing time)
0.020 lbm/Mdbft (Corrected for untested intervals between runs and port changes)

NOTES
[A] Emissions for untested intervals are time weighted average of previous and following tests.
[B] Results for individual runs are not availiable

Particulate Emissions - Cycle No.2 Summary

Willamette Ind. - OSU
Cycle No. 2 Douglas Fur - Particulate
Dec 16-19, 1998

Run ID	Start	End	Test min	Interval Time min	Bws Kiln	Qsd dscfm	Isokinetics %
1	23:07	00:32	85.0	85.0	4.2%	247.3	36.9
	00:32	00:37		5.0			
2	00:37	03:34	175.0	177.0	18.3%	45.3	103.0
	03:34	03:37		3.0			
3	03:37	06:29	170.0	172.0	20.6%	53.9	95.0
	06:29	06:37		8.0			
4	06:37	09:28	170.0	171.0	20.3%	61.1	105.0
	09:28	09:36		8.0			
5	09:36	12:31	155.0	175.0	20.8%	75.8	105.2
	12:31	12:36		5.0			
6	12:36	15:33	175.0	177.0	23.0%	53.2	108.2
	15:33	15:37		4.0			
7	15:37	18:35	175.0	178.0	22.6%	89.0	104.9
	18:35	18:37		2.0			
8	18:37	21:35	175.0	178.0	22.7%	62.7	103.3
	21:35	21:37		2.0			
9	21:37	00:30	170.0	173.0	22.7%	76.2	115.5
	00:30	00:39		9.0			
10	00:39	03:32	170.0	173.0	22.6%	44.2	112.0
	03:32	03:40		8.0			
11	03:40	06:31	150.0	171.0	23.0%	81.8	108.2
	06:31	06:40		9.0			
12	06:40	09:29	165.0	169.0	22.9%	49.2	108.0
	09:29	09:38		9.0			
13	09:38	12:30	165.0	172.0	17.9%	79.2	98.5
	12:30	12:38		8.0			
14	12:38	15:31	170.0	173.0	17.1%	54.6	100.4
	15:31	15:39		8.0			
15	15:39	18:35	175.0	176.0	17.8%	92.8	103.6
	18:35	18:40		5.0			
16	18:40	21:47	170.0	187.0	17.0%	52.0	111.2
	21:47	21:55		8.0			
17	21:55	00:48	170.0	173.0	17.1%	93.5	111.9
	00:48	00:57		9.0			
18	00:57	03:50	170.0	173.0	17.3%	50.4	109.2
	03:50	03:59		9.0			
19	03:59	06:52	170.0	173.0	30.6%	68.2	125.8
	06:52	06:57		5.0			
20	06:57	09:49	170.0	172.0	29.0%	45.6	106.0
	09:49	09:55		6.0			
21	09:55	11:15	80.0	80.0	33.9%	57.3	102.6
	11:15	11:21		6.0			

			Time Weighted Averages				
			H2O %	Qsd dscfm	Iso %	gr/dscf	lbm/hr
Total Cycle Time	3,614	min					
Total Test Interval	3,608	min					
Total Actual Testing Time	3,375	min	21.1%	69.0	105.2	0.0017	0.0010
Percent Actual Testing of Cycle Time	93.4%						

Production 2,304 bft
0.025 lbm/Mdbft (For actual testing time)
0.027 lbm/Mdbft (Corrected for untested intervals between runs and port changes)

NOTES
[A] Emissions for untested intervals are time weighted average of previous and following tests.
[B] Results for individual runs are not availiable

Particulate Data Summation 1 of 2

Client	Willamette Industries - OSU													14-Dec-98	Date
Source	Kiln Test No. 2 Cycle No. 1 Douglas Fir													drb	Operator
Location	Corvalis, OR													part_gas	File
Methods	EPA 1-4, ODEQ 5													mew	Analysist/QA
Definitions	Symbol	Units	1	2	3	4	5	6	7	8	9	10	11	Sum	Average
			West	East	West	East	West	East	West	East	West	East	West		Time Weight
Date			14-Dec	14-Dec	14-Dec	14-Dec	14-Dec	14-Dec	15-Dec	15-Dec	15-Dec	15-Dec	15-Dec		
Time, Starting			08:52	10:26	13:53	16:55	19:55	22:55	01:56	04:57	07:58	10:58	13:57		
Time, Ending			10:12	13:49	16:44	19:50	22:50	01:44	04:45	07:55	10:53	13:52	16:53		
			80.0	203.0	171.0	175.0	175.0	169.0	169.0	178.0	175.0	174.0	176.0	3,505	
Volume, Gas sample	Vm	dcf	55.082	47.497	64.926	61.636	62.164	49.341	41.985	43.315	48.982	42.399	53.246	1,030.915	
Temperature, Dry gas meter	Tm	°F	48.1	78.5	70.4	76.1	68.8	74.7	66.5	75.8	64.8	75.9	73.0		70.5
Temperature, Stack gas	Ts	°F	103.4	135.7	144.1	123.2	139.4	142.6	148.8	147.3	148.5	146.8	149.7		146.3
Temperature, Stack Dry Bulb	Tdb	°F	na	na	na	na	na	na	na	na	na	na	na		
Temperature, Stack Wet Bulb	Twb	°F	na	na	na	na	na	na	na	na	na	na	na		
Pressure differential across orifice	dH	in H2O	1.871	0.203	0.575	0.376	0.331	0.302	0.166	0.191	0.272	0.202	0.276		
Average square root velocity pressure	dp^½	in H2O^½	0.054	0.018	0.029	0.024	0.023	0.022	0.017	0.018	0.021	0.018	0.021		
Diameter, Nozzle	Dn	in	0.9880	0.9880	0.9880	0.9880	0.9880	0.9880	0.9880	0.9880	0.9880	0.9880	0.9880		
Pitot tube coefficient	Cp		0.8054	0.7900	0.8054	0.7900	0.8054	0.7900	0.8054	0.7900	0.8054	0.7900	0.8054		
Dry gas meter calibration factor	Y		0.9773	0.9897	0.9773	0.9897	0.9773	0.9897	0.9773	0.9897	0.9773	0.9897	0.9773		
Pressure, Barometric	Pbar	in Hg	30.90	30.90	30.90	30.90	30.90	30.90	30.90	30.90	30.90	30.90	30.90		
Pressure, Static Stack	Pg	in H2O	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		
Time, Total sample	Ø	min	75.0	180.0	165.0	175.0	175.0	165.0	165.0	175.0	170.0	170.0	175.0	3,415	
Stack Area	As	in²	159.5	159.5	159.5	159.5	159.5	159.5	159.5	159.5	159.5	159.5	159.5		
Nozzle Area	An	in²	0.7667	0.7667	0.7667	0.7667	0.7667	0.7667	0.7667	0.7667	0.7667	0.7667	0.7667		
Volume of condensed water	Vlc	ml	75.1	217.4	357.6	289.5	326.6	295.5	270.5	272.5	311.6	271.5	347.6		
Particulate sample weight-Total	mn	mg												108.32	
Oxygen	Atmos.	% O2	20.95	20.95	20.95	20.95	20.95	20.95	20.95	20.95	20.95	20.95	20.95		
Carbon Dioxide	Atmos.	% CO2	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03		
Molecular weight, Dry Stack	Md	lbm / lbmole	28.96	28.96	28.96	28.96	28.96	28.96	28.96	28.96	28.96	28.96	28.96		
Pressure, Absolute Stack	Ps	in Hg	30.90	30.90	30.90	30.90	30.90	30.90	30.90	30.90	30.90	30.90	30.90		
Pressure, avg arcoss orifice	Po	in Hg	31.04	30.91	30.94	30.93	30.92	30.92	30.91	30.91	30.92	30.91	30.92		
Volume, Dry standard gas sample	Vm(std)	dscf	58.03	47.62	65.32	62.10	62.70	49.83	42.51	43.65	49.77	42.71	53.27	1,042.420	
Volume, Water Vapor	Vw(std)	scf	3.54	10.23	16.83	13.63	15.37	13.91	12.73	12.83	14.66	12.78	16.36	303.715	
Moisture, % Stack (EPA 4)	Bws(1)	%	5.74	17.69	20.49	18.00	19.69	21.82	23.05	22.71	22.76	23.03	23.50		23.08
Moisture, % Stack (Psychometry-Sat)	Bws(2)	%	6.84	17.11	21.22	12.16	18.83	20.43	23.83	23.01	23.70	22.72	24.42		23.10
Moisture, % Stack (Theoretical)	Bws(3)	%	na	na	na	na	na	na	na	na	na	na	na		
Moisture, % Stack (Psychometry)	Bws(4)	%	na	na	na	na	na	na	na	na	na	na	na		
Moisture, % Stack (Predicted)	Bws(5)	%	15.0	15.0	20.0	20.0	20.0	20.0	15.0		19.0		18.0		
Mole Fraction dry Gas	mfg		94.3%	82.3%	79.5%	87.8%	81.2%	79.6%	77.0%	77.3%	77.2%	77.0%	76.5%		
Molecular weight, Wet Stack	Ms	lbm / lbmole	28.34	27.03	26.72	27.63	26.90	26.73	26.44	26.48	26.47	26.44	26.39		
Velocity, Stack gas	vs	fpm	180.0	60.0	102.9	80.9	80.8	76.7	60.3	62.8	74.8	64.5	75.8		77.5
Volumetric Flowrate, Actual	Qa	acf/min	199.4	66.5	113.9	89.6	89.5	84.9	66.8	69.6	82.8	71.4	84.0		85.8
Volumetric Flowrate, Dry Standard	Qsd	dscf/min	181.9	50.1	81.8	73.6	66.1	61.1	46.0	48.3	57.3	49.4	57.4		60.3
Percent Isokinetic	I	%	88.5	109.9	100.7	100.4	112.7	102.8	116.4	107.4	106.2	105.8	110.3		106.5
Grain Loading, Actual	cg	gr / dscf													0.0016
		mg / dscm													3.7
Particulate Mass Emissions	Ct	lbm / hr													0.0008
		gm / hr													0.38

Particulate Data Summation 2 of 2

Client	Willamette Industries - OSU												14-Dec-98	Date
Source	Kiln Test No. 2 Cycle No. 1 Douglas Fir												drb	Operator
Location	Corvalis, OR												part_gas	File
Methods	EPA 1-4, ODEQ 5												mew	Analysist/QA
Definitions	Symbol	Units	12	13	14	15	16	17	18	19	20	21	Sum	Average
			East	West	East	West	East	West	East	West	East	West		Time Weight
Date			15-Dec	15-Dec	15-Dec	16-Dec	16-Dec	16-Dec	16-Dec	16-Dec	16-Dec	16-Dec		
Time, Starting			16:57	19:56	22:58	01:56	04:59	08:17	11:16	14:15	17:35	20:36		
Time, Ending			19:52	22:51	01:51	04:45	07:57	11:07	14:09	17:31	20:30	21:52		
			175.0	175.0	173.0	169.0	178.0	170.0	173.0	196.0	175.0	76.0	3,505	
Volume, Gas sample	Vm	dcf	51.445	53.281	44.845	61.708	42.100	60.093	38.790	47.052	41.525	19.503	1,030.915	
Temperature, Dry gas meter	Tm	°F	76.0	66.8	71.8	63.5	72.1	64.0	67.4	64.2	77.8	69.1		70.5
Temperature, Stack gas	Ts	°F	142.5	145.4	145.3	150.2	146.5	153.1	159.7	163.8	161.6	156.6		146.3
Temperature, Stack Dry Bulb	Tdb	°F	na	na	na	na	na	na	na	na	na	na		
Temperature, Stack Wet Bulb	Twb	°F	na	na	na	na	na	na	na	na	na	na		
Pressure differential across orifice	dH	in H2O	0.281	0.269	0.216	0.410	0.172	0.465	0.168	0.241	0.174	0.236		
Average square root velocity pressure	dp^½	in H2O^½	0.022	0.020	0.019	0.026	0.017	0.029	0.019	0.022	0.020	0.021		
Diameter, Nozzle	Dn	in	0.9880	0.9880	0.9880	0.9880	0.9880	0.9880	0.9880	0.9880	0.9880	0.9880		
Pitot tube coefficient	Cp		0.7900	0.8054	0.7900	0.8054	0.7900	0.8054	0.7900	0.8054	0.7900	0.8054		
Dry gas meter calibration factor	Y		0.9897	0.9773	0.9897	0.9773	0.9897	0.9773	0.9897	0.9773	0.9897	0.9773		
Pressure, Barometric	Pbar	in Hg	30.90	30.90	30.90	30.90	30.90	30.60	30.60	30.60	30.60	30.60		
Pressure, Static Stack	Pg	in H2O	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		
Time, Total sample	Ø	min	175.0	175.0	170.0	170.0	175.0	165.0	170.0	175.0	175.0	75.0	3,415	
Stack Area	As	in²	159.5	159.5	159.5	159.5	159.5	159.5	159.5	159.5	159.5	159.5		
Nozzle Area	An	in²	0.7667	0.7667	0.7667	0.7667	0.7667	0.7667	0.7667	0.7667	0.7667	0.7667		
Volume of condensed water	Vlc	ml	308.5	323.6	268.5	390.7	259.5	417.7	398.7	486.9	383.7	179.3		
Particulate sample weight-Total	mn	mg											108.32	
Oxygen	Atmos.	% O2	20.95	20.95	20.95	20.95	20.95	20.95	20.95	20.95	20.95	20.95		
Carbon Dioxide	Atmos.	% CO2	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03		
Molecular weight, Dry Stack	Md	lbm / lbmole	28.96	28.96	28.96	28.96	28.96	28.96	28.96	28.96	28.96	28.96		
Pressure, Absolute Stack	Ps	in Hg	30.90	30.90	30.90	30.90	30.90	30.60	30.60	30.60	30.60	30.60		
Pressure, avg arcoss orifice	Po	in Hg	30.92	30.92	30.92	30.93	30.91	30.63	30.61	30.62	30.61	30.62		
Volume, Dry standard gas sample	Vm(std)	dscf	51.82	53.93	45.53	62.88	42.72	60.58	39.32	47.39	41.28	19.46	1,042.420	
Volume, Water Vapor	Vw(std)	scf	14.52	15.23	12.64	18.39	12.21	19.66	18.77	22.92	18.06	8.44	303.715	
Moisture, % Stack (EPA 4)	Bws(1)	%	21.89	22.02	21.73	22.63	22.23	24.50	32.31	32.59	30.43	30.25		23.08
Moisture, % Stack (Psychometry-Sat)	Bws(2)	%	20.38	21.93	21.87	24.70	22.56	26.76	31.22	34.29	32.60	29.04		23.10
Moisture, % Stack (Theoretical)	Bws(3)	%	na	na	na	na	na	na	na	na	na	na		
Moisture, % Stack (Psychometry)	Bws(4)	%	na	na	na	na	na	na	na	na	na	na		
Moisture, % Stack (Predicted)	Bws(5)	%	18.0	18.0	18.0	18.0		24.5	25.0	25.0	28.0	25.0		
Mole Fraction dry Gas	mfg		79.6%	78.0%	78.3%	77.4%	77.8%	75.5%	68.8%	67.4%	69.6%	71.0%		
Molecular weight, Wet Stack	Ms	lbm / lbmole	26.73	26.55	26.59	26.49	26.53	26.28	25.55	25.40	25.63	25.78		
Velocity, Stack gas	vs	fpm	74.5	72.4	65.2	92.0	60.1	103.7	67.8	82.5	71.5	77.9		77.5
Volumetric Flowrate, Actual	Qa	acf/min	82.5	80.2	72.2	101.9	66.6	114.9	75.1	91.4	79.2	86.3		85.8
Volumetric Flowrate, Dry Standard	Qsd	dscf/min	59.4	56.3	50.9	70.4	46.5	76.4	45.0	53.3	47.9	53.6		60.3
Percent Isokinetic	I	%	103.7	113.8	109.5	109.2	109.1	100.0	106.9	105.6	102.5	100.7		106.5
Grain Loading, Actual	cg	gr / dscf												0.0016
		mg / dscm												3.7
Particulate Mass Emissions	Ct	lbm / hr												0.0008
		gm / hr												0.38

Particulate Data Emissions 1 of 2

Client	Willamette Industries - OSU														16-Dec-98	Date
Source	Kiln Test No. 2 Cycle No. 2 Douglas Fir														drb	Operator
Location	Corvalis, OR														part_gas	File
Methods	EPA 1-4, ODEQ 5														mew	Analysist/QA
Definitions	Symbol	Units	1	2	3	4	5	6	7	8	9	10	11	12	Sum	Average
			West	East	West	East	West	East	West	East	West	East	West	East		Time Weight
Date			16-Dec	16-Dec	16-Dec	16-Dec	16-Dec	16-Dec	17-Dec	17-Dec	17-Dec	17-Dec	17-Dec	17-Dec		
Time, Starting			23:07	00:37	03:37	06:37	09:36	12:36	15:37	18:37	21:37	00:39	03:40	06:40		
Time, Ending			00:32	03:34	06:29	09:28	12:31	15:33	18:35	21:35	00:30	03:32	06:31	09:29		
Volume, Gas sample	Vm	dcf	37.432	39.244	41.976	52.517	59.248	48.697	78.743	54.718	72.278	40.239	63.249	42.250	1,126.354	
Temperature, Dry gas meter	Tm	°F	77.8	67.8	76.2	68.9	75.4	72.4	78.0	71.9	79.1	67.0	71.8	65.8		70.0
Temperature, Stack gas	Ts	°F	102.7	138.0	142.0	143.3	142.4	149.0	148.5	150.0	144.7	149.0	150.1	146.9		145.2
Pressure differential across orifice	dH	in H2O	0.755	0.126	0.194	0.276	0.495	0.226	0.633	0.298	0.486	0.155	0.533	0.190		
Average square root velocity pressure	dp^½	in H2O^½	0.075	0.016	0.020	0.022	0.028	0.020	0.033	0.023	0.028	0.016	0.031	0.018		
Diameter, Nozzle	Dn	in	0.9880	0.9880	0.9880	0.9880	0.9880	0.9880	0.9880	0.9880	0.9880	0.9880	0.9880	0.9880		
Pitot tube coefficient	Cp		0.7901	0.8054	0.7901	0.8054	0.7901	0.8054	0.7901	0.8054	0.7901	0.8054	0.7901	0.8054		
Dry gas meter calibration factor	Y		0.9897	0.9773	0.9897	0.9773	0.9897	0.9773	0.9897	0.9773	0.9897	0.9773	0.9897	0.9773		
Pressure, Barometric	Pbar	in Hg	30.60	30.60	30.60	30.60	30.70	30.70	30.70	30.70	30.70	30.70	30.70	30.40		
Pressure, Static Stack	Pg	in H2O	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		
Time, Total sample	Ø	min	85.0	175.0	170.0	170.0	155.0	175.0	175.0	175.0	170.0	170.0	150.0	165.0	3,375	160.7
Stack Area	As	in²	159.5	159.5	159.5	159.5	159.5	159.5	159.5	159.5	159.5	159.5	159.5	159.5		
Nozzle Area	An	in²	0.7667	0.7667	0.7667	0.7667	0.7667	0.7667	0.7667	0.7667	0.7667	0.7667	0.7667	0.7667		
Volume of condensed water	Vlc	ml	35.1	206.4	230.4	283.5	330.6	307.5	487.9	339.6	447.8	251.4	405.7	265.5		
Particulate sample weight-Total	mn	mg													125.45	
Oxygen	Atmos.	% O2	20.95	20.95	20.95	20.95	20.95	20.95	20.95	20.95	20.95	20.95	20.95	20.95		
Carbon Dioxide	Atmos.	% CO2	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03		
Molecular weight, Dry Stack	Md	lbm / lbmole	28.96	28.96	28.96	28.96	28.96	28.96	28.96	28.96	28.96	28.96	28.96	28.96		
Pressure, Absolute Stack	Ps	in Hg	30.60	30.60	30.60	30.60	30.70	30.70	30.70	30.70	30.70	30.70	30.70	30.40		
Pressure, avg arcoss orifice	Po	in Hg	30.66	30.61	30.61	30.62	30.74	30.72	30.75	30.72	30.74	30.71	30.74	30.41		
Volume, Dry standard gas sample	Vm(std)	dscf	37.27	39.25	41.85	52.44	59.40	48.45	78.59	54.51	71.96	40.44	63.85	42.15	1,127.641	
Volume, Water Vapor	Vw(std)	scf	1.65	9.71	10.85	13.34	15.56	14.48	22.96	15.99	21.08	11.84	19.10	12.50	308.384	
Moisture, % Stack (EPA 4)	Bws(1)	%	4.24	19.84	20.58	20.29	20.76	23.00	22.61	22.68	22.65	22.64	23.02	22.87		21.39
Moisture, % Stack (Psychometry-Sat)	Bws(2)	%	6.77	18.32	20.32	20.98	20.48	24.15	23.84	24.71	21.68	24.12	24.79	23.14		22.47
Moisture, % Stack (Theoretical)	Bws(3)	%	na	na	na	na	na	na	na	na	na	na	na	na		
Moisture, % Stack (Psychometry)	Bws(4)	%	na	na	na	na	na	na	na	na	na	na	na	na		
Moisture, % Stack (Predicted)	Bws(5)	%	na	na	na	18.00	na	na	na	na	na	na	na	na		
Mole Fraction dry Gas	mfg		95.8%	81.7%	79.4%	79.7%	79.2%	77.0%	77.4%	77.3%	77.3%	77.4%	77.0%	77.1%		78.9%
Molecular weight, Wet Stack	Ms	lbm / lbmole	28.50	26.96	26.71	26.74	26.69	26.45	26.49	26.48	26.48	26.49	26.44	26.46		
Velocity, Stack gas	vs	fpm	243.0	55.5	68.3	77.3	96.0	70.2	116.7	82.5	99.3	58.0	108.1	65.2		87.4
Volumetric Flowrate, Actual	Qa	acf/min	269.1	61.4	75.7	85.6	106.3	77.7	129.2	91.4	110.0	64.2	119.7	72.2		96.8
Volumetric Flowrate, Dry Standard	Qsd	dscf/min	247.3	45.3	53.9	61.1	75.8	53.2	89.0	62.7	76.2	44.2	81.8	49.2		69.0
Percent Isokinetic	I	%	36.9	103.0	95.0	105.0	105.2	108.2	104.9	103.3	115.5	112.0	108.2	108.0		105.2
Grain Loading, Actual	cg	gr / dscf														0.0017
		mg / dscm														3.9
Particulate Mass Emissions	Ct	lbm / hr														0.0010
		gm / hr														0.46

Particulate Data Emissions 2 of 2

Client	Willamette Industries - OSU												16-Dec-98	Date
Source	Kiln Test No. 2 Cycle No. 2 Douglas Fir												drb	Operator
Location	Corvalis, OR												part_gas	File
Methods	EPA 1-4, ODEQ 5												mew	Analysist/QA
Definitions	Symbol	Units	12	13	14	15	16	17	18	19	20	21	Sum	Average
			East	West	East	West	East	West	East	West	East	West		Time Weight
Date			17-Dec	17-Dec	17-Dec	18-Dec	18-Dec	18-Dec	18-Dec	18-Dec	18-Dec	18-Dec		
Time, Starting			06:40	09:38	12:38	15:39	18:40	21:55	00:57	03:59	06:57	09:55		
Time, Ending			09:29	12:30	15:31	18:35	21:47	00:48	03:50	06:52	09:49	11:15		
Volume, Gas sample	Vm	dcf	42.250	62.363	44.993	81.509	47.237	84.586	44.257	68.485	39.279	23.054	1,126.354	
Temperature, Dry gas meter	Tm	°F	65.8	75.5	67.3	76.0	64.4	66.0	56.5	59.2	61.4	81.4		70.0
Temperature, Stack gas	Ts	°F	146.9	144.0	141.3	142.6	141.2	138.4	143.7	159.9	156.2	162.9		145.2
Pressure differential across orifice	dH	in H2O	0.190	0.444	0.248	0.651	0.208	0.738	0.191	0.500	0.183	0.260		
Average square root velocity pressure	dp^½	in H2O^½	0.018	0.028	0.019	0.033	0.018	0.033	0.017	0.028	0.018	0.025		
Diameter, Nozzle	Dn	in	0.9880	0.9880	0.9880	0.9880	0.9880	0.9880	0.9880	0.9880	0.9880	0.9880		
Pitot tube coefficient	Cp		0.8054	0.7901	0.8054	0.7901	0.8054	0.7901	0.8054	0.7901	0.8054	0.7901		
Dry gas meter calibration factor	Y		0.9773	0.9897	0.9773	0.9897	0.9773	0.9897	0.9773	0.9897	0.9773	0.9897		
Pressure, Barometric	Pbar	in Hg	30.40	30.40	30.40	30.40	30.40	30.40	30.40	30.40	30.40	30.40		
Pressure, Static Stack	Pg	in H2O	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		
Time, Total sample	Ø	min	165.0	165.0	170.0	175.0	170.0	170.0	170.0	170.0	170.0	80.0	3,375	160.7
Stack Area	As	in²	159.5	159.5	159.5	159.5	159.5	159.5	159.5	159.5	159.5	159.5		
Nozzle Area	An	in²	0.7667	0.7667	0.7667	0.7667	0.7667	0.7667	0.7667	0.7667	0.7667	0.7667		
Volume of condensed water	Vlc	ml	265.5	287.5	196.3	371.7	205.4	375.7	199.4	658.2	419.7	246.4		
Particulate sample weight-Total	mn	mg											125.45	
Oxygen	Atmos.	% O2	20.95	20.95	20.95	20.95	20.95	20.95	20.95	20.95	20.95	20.95		
Carbon Dioxide	Atmos.	% CO2	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03		
Molecular weight, Dry Stack	Md	lbm / lbmole	28.96	28.96	28.96	28.96	28.96	28.96	28.96	28.96	28.96	28.96		
Pressure, Absolute Stack	Ps	in Hg	30.40	30.40	30.40	30.40	30.40	30.40	30.40	30.40	30.40	30.40		
Pressure, avg arcoss orifice	Po	in Hg	30.41	30.43	30.42	30.45	30.42	30.45	30.41	30.44	30.41	30.42		
Volume, Dry standard gas sample	Vm(std)	dscf	42.15	61.89	44.77	80.86	47.25	85.53	44.94	70.12	39.52	22.62	1,127.641	
Volume, Water Vapor	Vw(std)	scf	12.50	13.53	9.24	17.49	9.67	17.68	9.38	30.98	19.76	11.60	308.384	
Moisture, % Stack (EPA 4)	Bws(1)	%	**22.87**	**17.94**	**17.11**	**17.79**	**16.98**	**17.13**	**17.27**	**30.64**	33.33	**33.90**		21.39
Moisture, % Stack (Psychometry-Sat)	Bws(2)	%	23.14	21.52	20.10	20.79	20.06	18.66	21.37	31.57	**28.97**	33.80		22.47
Moisture, % Stack (Theoretical)	Bws(3)	%	na	na	na	na	na	na	na	na	na	na		
Moisture, % Stack (Psychometry)	Bws(4)	%	na	na	na	na	na	na	na	na	na	na		
Moisture, % Stack (Predicted)	Bws(5)	%	na	na	na	na	na	na	na	na	30.00	na		
Mole Fraction dry Gas	mfg		**77.1%**	**82.1%**	**82.9%**	**82.2%**	**83.0%**	**82.9%**	**82.7%**	**69.4%**	**71.0%**	**66.1%**		78.9%
Molecular weight, Wet Stack	Ms	lbm / lbmole	26.46	27.00	27.09	27.02	27.10	27.09	27.07	25.61	25.79	25.25		
Velocity, Stack gas	vs	fpm	65.2	98.2	66.7	114.5	63.4	113.7	61.9	102.6	66.6	90.9		87.4
Volumetric Flowrate, Actual	Qa	acf/min	72.2	108.7	73.8	126.8	70.2	125.9	68.5	113.6	73.8	100.7		96.8
Volumetric Flowrate, Dry Standard	Qsd	dscf/min	49.2	79.2	54.6	92.8	52.0	93.5	50.4	68.2	45.6	57.3		69.0
Percent Isokinetic	I	%	108.0	98.5	100.4	103.6	111.2	111.9	109.2	125.8	106.0	102.6		105.2
Grain Loading, Actual	cg	gr / dscf												0.0017
		mg / dscm												3.9
Particulate Mass Emissions	Ct	lbm / hr												0.0010
		gm / hr												0.46

Sample Calculation Worksheet

Client/Source/Location WI/Cyc 1, Run4/OSU/East Stack Run # 4
Flow & Isokinetics
Date 12-14-98

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Constants	Value	Units	Constants	Value	Units
Pstd(1)	29.92129	inHg	MWc	12.011	lbm / lbmole
Pstd(2)	2116.22	lbf / ft²	MWco2	44.010	lbm / lbmole
Tstd	527.67	°R	MWh2o	18.015	lbm / lbmole
R	1545.33	ft lbf / lbmol °R	MWno2	46.006	lbm / lbmole
C1	385.3211	ft³ / lbmol	MWo2	31.999	lbm / lbmole
C2	816.5455	inHg in²/ °R ft²	MWso2	64.063	lbm / lbmole
MWco	28.010	lbm / lbmole	MWn2+ar	28.154	lbm / lbmole
MWatm	28.965	lbm / lbmole	Kp	5129.4	ft / min [(inHg lbm/mole) / (°R inH2O)] ^½

Symbol	Units	Data Entry	Symbol	Units	Data Entry
Vm	dcf	61.636	Pg	in H2O	0
Tm	°F	76.1	Ø	min	175
Ts	°F	123.2	As	in²	159.5
dH	in H2O	0.376	An	in²	0.766
dp^½	in H2O^½	0.024	Vlc	ml	289.5
Dn	in	0.998	mn	mg	—
Cp		0.79	O2	% O2	20.95
Y		0.99	CO2	% CO2	0.03
Pbar	in Hg	30.9			

Definitions	Symbol	Units	Equations
Molecular weight, Dry Stack	Md	lbm / lbmole	[(1-(%O2/100)-(%CO2/100))(MWn2+ar)]+ [(%O2/100) MWo2]+[(%CO2/100) MWco2]

$Md = [1-(.2095)-(0.0003)]28.15 + [(.2095)(31.99)] + [(.0003)(44.01)] = 28.96$

Pressure, Absolute Stack	Ps	in Hg	[Pbar+Pg/13.5955]

$P_s = 30.90 + 0/13.6 = 30.90$ inHg

Pressure, avg across orifice	Po	in Hg	[Pbar+dH/13.5955]

$P_o = 30.9 + .376/13.5955 = 30.93$ in Hg

Volume, Dry standard gas sample	Vm(std)	dscf	[Y Vm Tstd Po]/ [Pstd(1) Tm (°R)]

$V_m(std) = (0.99)(61.636)(527.67)(30.93)/(29.92129)(536) = 62.096$

Volume, Water Vapor	Vw(std)	scf	0.04707 Vlc

$V_w(std) = 0.04707(289.5) = 13.63$ scf

Moisture, % Stack (EPA 4)	Bws(1)	%	100 {Vw(std) / [Vw(std)+Vm(std)]}

$Bws(1) = 100[13.63/[(13.63 + 62.096)]] = 18.00$

* note this is over saturation, % H_2O @ Sat. is used

Mole fraction gas	mfg	1-(Bws/100)

$mfg = 1-(12.6/100) = 0.874$

Sample Calculation Worksheet

Client/Source/Location WI/Cycle 1 Run4/OSU/East Stack Run # 4

Date 12-14-98 Flow & Isokinetics

Definitions	Symbol	Units	Equations
Molecular weight, Wet Stack	Ms	lbm / lbmole	[(Md mfg) +(MWh2o (1-mfg))]

$M_s = [(28.96)(0.87) + (18.015(1-.87))] = 27.54$

Velocity, Stack gas	vs	fpm	Kp Cp dp^½ [Ts(abs) / (Ps Ms)]^ ½

$vs = (5129.4)(0.79)(0.024)[(583.2)/(30.9)(27.54)]^{1/2} = 80.5$ fpm

Volumetric Flowrate, Actual	Qa	acf/min	[As vs / 144]

$Qa = (159.5)\ 80.5/144 = 89.2$ acf/min

Volumetric Flowrate, Dry Standard	Qsd	dscf/min	[Qa Tstd mfg Ps] / [Pstd(1) Ts(abs)]

$Qsd = (89.2)(527.7)(.874)(30.90)/(29.92)(583.2) = 72.86$

Percent Isokinetic	I	%	[C2 Ts(abs) Vm(std) / (vs Ps mfg An Ø)]

$I = (816.54)(583.2)(62.1)/(80.5)(30.9)(.874)(.766)(175) = 101.7$

Grain Loading, Actual	cg	gr / dscf	[15.432 mn / Vm(std) 1,000]

See total cycle emissions

Particulate Mass Emissions	Ct	lbm / hr	[60 cg Qsd/ 7,000]

Sample Calculation Worksheet

Client/Source/Location WI / Kiln@ OSU — Total Cycle Emissions Run # Cyc 1

Date 12-14-98

Constants	Value	Units	Constants	Value	Units
Pstd(1)	29.92129	inHg	MWc	12.011	lbm / lbmole
Pstd(2)	2116.22	lbf / ft²	MWco2	44.010	lbm / lbmole
Tstd	527.67	°R	MWh2o	18.015	lbm / lbmole
R	1545.33	ft lbf / lbmol °R	MWno2	46.006	lbm / lbmole
C1	385.3211	ft³ / lbmol	MWo2	31.999	lbm / lbmole
C2	816.5455	inHg in³/ °R ft²	MWso2	64.063	lbm / lbmole
MWco	28.010	lbm / lbmole	MWn2+ar	28.154	lbm / lbmole
MWatm	28.965	lbm / lbmole	Kp	5129.4	ft / min [(inHg lbm/mole) / (°R inH2O)] ^½

Symbol	Units	Data Entry	Symbol	Units	Data Entry
Vm	dcf	1030.9	Pg	in H2O	0
Tm	°F	70.5 °R	Ø	min	3415
Ts	°F	146.3 °R	As	in²	159.5
dH	in H2O	—	An	in²	0.766
dp^½	in H2O^½	—	Vlc	ml	—
Dn	in	0.988	mn	mg	108.3
Cp		—	O2	% O2	20.95
Y		—	CO2	% CO2	0.03
Pbar	in Hg	—			

Definitions	Symbol	Units	Equations
Molecular weight, Dry Stack	Md	lbm / lbmole	[(1-(%O2/100)-(%CO2/100))(MWn2+ar)]+ [(%O2/100) MWo2]+[(%CO2/100) MWco2]

$Md = [(1-(20.95/100)-(0.03/100))(28.154)] + [(20.95/100)31.999] + [0.03/100)44.01] = 28.96$

Pressure, Absolute Stack	Ps	in Hg	[Pbar+Pg/13.5955]

See Calculation for Run 4

Pressure, avg across orifice	Po	in Hg	[Pbar+dH/13.5955]
Volume, Dry standard gas sample	Vm(std)	dscf	[Y Vm Tstd Po]/ [Pstd(1) Tm (°R)]
Volume, Water Vapor	Vw(std)	scf	0.04707 Vlc
Moisture, % Stack (EPA 4)	Bws(1)	%	100 {Vw(std) / [Vw(std)+Vm(std)]}
Mole fraction gas	mfg		1-(Bws/100)

Sample Calculation Worksheet

Client/Source/Location WI/Kiln @ OSU - Total Emissions Run # CyC1

Date 12-14-98

Definitions	Symbol	Units	Equations
Molecular weight, Wet Stack	Ms	lbm / lbmole	[(Md mfg) +(MWh2o (1-mfg))]
See Calculations for Run 4			
Velocity, Stack gas	vs	fpm	Kp Cp dp^½ [Ts(abs) / (Ps Ms)]^ ½
Volumetric Flowrate, Actual	Qa	acf/min	[As vs / 144]
Volumetric Flowrate, Dry Standard	Qsd	dscf/min	[Qa Tstd mfg Ps] / [Pstd(1) Ts(abs)]
Percent Isokinetic	I	%	[C2 Ts(abs) Vm(std) / (vs Ps mfg An Ø)]
Grain Loading, Actual	cg	gr / dscf	[15.432 mn / Vm(std) 1,000]
$cg = (15.432)(108.3)/(1030.9)(1000) = 0.0016$ gr/dscf			
Particulate Mass Emissions	Ct	lbm / hr	[60 cg Qsd/ 7,000]
$Ct = (60)(0.0016)(60.3)/(7000) = 0.00083$ lbm/hr			

Field Data Sheet

[redacted] orizon [redacted] ngineering

Date 12-14-98

Test Method 7

Concurrent Testing 25A

Run# 1 West Cyc 1

Operator DRB Support

Temperature, Am (Ta) 38

Pressure, Bar (Pb) 30.9

Pressure, Static (Pstat) 0

Filters 98m-283 98s-51

Client/Plant/Location: OSU Cycle 1

Probe 3-2 Cp 80537 Heat Set 250

Pilot	Pretest	in		in/mh
Leak Check	Post	4	in	0	in/mh

Nozzle .9880

Sample Box 3 Heat Set 250

Meter Box 7 dH@ Y

Meter	Pretest	0.005	cfm	14	inHg
Leak Check	Post	0.00	cfm	10	inHg

Moisture 10-20 Tdb Twb

Stack Diagram

Cyclonic Flow ?

Traverse Point Number	Sampling Time (min)	Clock Time (24 hr)	Dry Gas Meter Reading (Vm)	Orifice Pressure Drop (dH)	Filter Pressure Drop	Filter Pressure Drop Total (dH)	STACK °F (Ts) Amb:	REFER Inlet/Avg °F (Tm in) Amb:	REFER Outlet °F (Tm out) Amb:	FRONT °F (Tp) Amb:	OVER Filter °F (To) Amb:	IMPINGER Outlet °F (Tf) Amb:	AUX °F (Ta)	Pump Vacuum inHg (Pv)
		852m	328.152											
1	5			.035		.7	107	41	38	264	261	40		7
1	10		322.950	.035		.7	106	41	38	264	261	40		7
2	15		335.97	.03		2.0	100	46	39	264		40		6
2	20			.03		2.0	100	46	39			40		6
3	25			.04		2.0	98	49	40			40		6
3	30			.04		3.0	98	51	41			40		9
4	35		351.995	.045		3.0	98	54	42			40		9
4	40	937	356.740	.04		3.0	98	56	44	264	261	40		9
5	45			.003	2.0	2.0								7
5	50											55		
6	55		368.901	.0018	1.2	1.8	106	64	51	261	261	60		6
6	60	957	372.62	.0020	1.47	1.5	108	65	53	262	260	61		6
6	65			.0020		1.5								6
6	70			.0020		1.5								6
5	75	1012	388.240	.0020		1.5	118	65	55	261	258	58		6

Notes:

Field Data Sheet

[redacted] orion [redacted] ngineering

Date 12-14-98
Test Method 7
Concurrent Testing 25A
Run # 2 East Cycl
Operator ORB Support
Temperature, Am (Ta) 40
Pressure, Bar (Pb) 30.9
Pressure, Static (Pstat) 0
Filters 98m-250 98s-52

Client/Plant/Location: OSU Cyc 1
Probe 3-1 Cp .79 Heat Set 250
Pitot Pretest in in/min
Leak Check Post in in/min
Nozzle .988
Sample Box 2 Heat Set 250
Meter Box 4 dH@ Y
Meter Pretest 0.012 cfm 14 inHg
Leak Check Post cfm inHg
Moisture 15 Tdb Twb

Stack Diagram

Cyclonic Flow ?

Desired Pitot Reading	Sampling Time (min)	Clock Time (24hr)	Dry Gas Meter Reading (cu ft) (Vm)	Orifice Head (inH2O) (dHa)	Orifice Pressure Drop (inH2O) (dH)	Orifice Pressure Drop Actual (inH2O) (dH)	STACK °F (Ts) Amb:	METER Inlet/Avg °F (Tm in/avg) Amb:	METER Outlet °F (Tm out) Amb:	PROBE °F (Tp) Amb:	OVEN Filter °F (To) Amb:	IMPINGER Outlet °F (Ti) Amb:	AIR °F (Ta)	Pump Vacuum inHg (Pv)
		1026	999.939											
1	5		2.651	.0006		0.5	109	50	47	253	244	39		5
1			.	.0004		.5								
2														
2														
		1055	6.5											
3	20	1100	8.185	.0003	.199	0.2	125	61	59	250	245	45		2
3	25	1105	.	.0003		.2	121	64	59	256	250	45		2
4	30		.											
4	35		11.85	.0003		.2	116	68	63	257	251	47		2
5	40		.	.0004	26	.26	116	68	63	256	251	47		2
5	45		.											
6	50		.											
6	55		17.660	.0003		.26	142	75	68	255	251	47		2
6	60		18.775	.0003		.16	140	76	69	254	251	48		2
6	65		.	.0003		.16	144	77	71	255	251	48		2
5	70		21.095	.0003		.16	142	79	72	254	251	48		2
5	75		22.22			.16	142	80	73	254	251	48		2
4	80		23.37	.0002		.16	136	82	77	255	251	48		2
4	85		24.444	.0002	.115	.12	135	82	77	254	252	49		2
3	90		25.39	.0003		.12	134	82	77	254	250	49		2
3	95		26.48	.0007	.40	.40	127	83	78	256	251	47		2½
2	100		.	.0005	.29	.29	127	84	79	234	251	47		2
2	105		30.21	.0004	.23	.23	138	86	80	256	252	50		2
1	110		31.87	.0004		.23	142	87	81	256	252	50		2½
1	115		32.87	.0003	.17	.17	142	87	82	257	251	50		2
1	120		33.864	.0003		.17	142	87	82	255	251	50		2

Kiln went down

Re Cal SUM

Notes:

Field Data Sheet

Horizon Engineering

Client/Plant/Location: OSU East Cycl

Date 12-14-98

Test Method 4 & 7

Concurrent Testing 25A

Run # 2 cont

Operator DRB Support

Temperature, Am (Ta) 45

Pressure, Bar (Pb) 30.8

Pressure, Static (Pstat) 0

Stack Diagram

Probe 3-1 Cp Heat Set °F

Pitot	Pretest	in		in/min
Leak Check	Post	3 in	0.0	in/min

Nozzle 988

Sample Box 2 Heat Set 250 °F

Meter Box 4 dH@ 1.768 Y .989

Meter	Pretest	cfm		inHg
Leak Check	Post	0.005 cfm	7	inHg

Filters Cyclonic Flow ? Moisture Tdb Twb

Traverse Point Number	Sampling Time min (dt)	Clock Time (24 hr)	Dry Gas Meter Reading cuft (Vm)	Velocity Head inH2O (dPs)	Orifice Pressure inH2O DESIRED	Orifice Pressure inH2O ACTUAL (dH)	STACK °F (Ts)	METER Inlet/Avg. °F (Tm-in)	METER Outlet °F (Tm-out)	PROBE °F (Tp)	OVEN Filter °F (To)	IMPINGER Outlet °F (Ti)	AUX °F (Tx)	Pump Vacuum inHg (Pv)
		1249	33 .864				Amb:	Amb:	Amb:	Amb:	Amb:	Amb:		
1	5		34.985	.0001		0.06	138	84	83	257	253	54		5
2	10		35 .682	.0001		.06	139	85	83	257	251	55		1
3	15	1304	36 .645	.0002	.115	.12	140	85	83	257	252	55		2
4	20		—	.0003	.172	.17	140	86	84	257	251	55		2
5	25		38 .77	.0001		.06	140	86	84	256	252	57		2
6	30		39 .555	.0002	.115	.12	140	86	84	258	252	56		2
7	35		40 .590	.0002		.12	141	87	84	253	253	54		2
8	40	1329	41 .77	.0003	.17	.17	141	87	85	256	250	55		2
9	45		42.91	.0003		.17	142	87	85	258	254	56		2
10	50		44 .459	.0005	.287	.29	142	88	85	255	250	55		3
11	55	1344	46 .321	.0005		.29	143	88	85	255	253	55		3
12	60	1349	47 .436	.0004		.23	142	89	86	254	250	55		3
13														
14														
15														
16														
17														
18														
19														
20														
21														
22														
23														
24														
25														

Notes:

Field Data Sheet

Horizon Engineering

Date 12-14-98
Test Method 7
Concurrent Testing 25A
Run # 3 West cycl
Operator PRB Support
Temperature, Am (Ta) 45
Pressure, Bar (Pb) 30.9
Pressure, Static (Pstat) 0
Filters [illegible]

Client/Plant/Location : OSU / West / cycl
Probe 3-2 Cp .80 Heat Set 250 °F
Pitot Pretest in in/min
Leak Check Post in in/min
Nozzle .988
Sample Box 3 Heat Set [illegible] °F
Meter Box 7 dH@ 1.75 Y [illegible]
Meter Pretest 0.005 cfm 14 inHg
Leak Check Post cfm inHg

Stack Diagram
Cyclonic Flow ?
Moisture 20 Tdb Twb

Traverse Point Number	Sampling Time min (dt)	Clock Time (24 hr)	Dry Gas Meter Reading cuft (Vm)	Velocity Head inH2O (dPs)	Orifice Pressure inH2O DESIRED	Orifice Pressure inH2O ACTUAL (dH)	STACK °F (Ts)	METER Inlet/Avg. °F (Tm-in)	METER Outlet °F (Tm-out)	PROBE °F (Tp)	OVEN Filter °F (To)	IMPINGER Outlet °F (Ti)	AUX °F (Tx)	Pump Vacuum inHg (Pv)
		1353	383.598				Amb:	Amb:	Amb:	Amb:	Amb:	Amb:		
1	5		386.908	.0027	.55	1.55	143	70	69	256	256	49		8
2	10		—	.0032		1.6								
3	15		393.802	.0020	1.09	1.1	144	71	69	261	258	49		6½
4	20		—	.0024	1.32	1.3	144	71	69	261	257	51		7
5	25		—	.0024		1.3	144	74	70	262	258	52		7
6	30		403.65	.0022	1.21	1.2	144	75	70	261	258	52		7
7	35		407.20	.0021	1.15	1.15	144	75	70	262	258	54		7
8	40		409.790	.0022	1.21	1.2	144	75	71	261	257	55		7
9	45			.0024	1.32	1.3	144	75	71	262	258	57		7
10	50		416.621	.0006		1.25	144							
11	55		—	.0002	.11	.11	144	75	71	261	257	59		2
12	60		418.750	.0006	.33	.33	144							
13	65		420.475	.0007		.36	144	74	71	263	258	58		2
14	70		422.075	.0008	.44	.44	144	73	71	262	258	59		2
15	75			.0005	.27	.27								
16	80					.31								
17	85		Recal Sum											
18	90					↓								
19	95		430.395	.0007		.31	145	71	69	264	258	67		2
20	100		432.264	.0007	.38	.4	144	71	69	264	257	65		2
21	105		434.179	.0006		.4	144	70	69	262	256	65		
22	110		435.830	.0006	.33	.33	144	77	69	263	257	56		4
23	115		437.32	.0005	.27	.27	145	70	68	263	257	55		3
24	120	1353	439.050	.0006		.33	144	70	68	265	258	55		4
25														

Notes:

Field Data Sheet

Horizon Engineering

Client/Plant/Location : OSU/west/cycl

Date 12-14-98

Test Method 7

Concurrent Testing 25A

Run # 3 Cont Cycl

Operator JDF Support DRB

Temperature, Am (Ta) 45

Pressure, Bar (Pb) 30.9

Pressure, Static (Pstat) 0

Filters 98M-283 985-51

Probe 3-2 Cp Heat Set 250 °F

Pitot	Pretest	in		in/min
Leak Check	Post	in	0	in/min

Nozzle .988

Sample Box 3 Heat Set °F

Meter Box 7 dH@ Y

Meter	Pretest	cfm		inHg
Leak Check	Post .002	cfm	5	inHg

Stack Diagram

Cyclonic Flow ?

Moisture 20 Tdb Twb

Traverse Point Number	Sampling Time min (dt)	Clock Time (24 hr)	Dry Gas Meter Reading cuft (Vm)	Velocity Head inH2O (dPs)	Orifice Pressure inH2O DESIRED	Orifice Pressure inH2O ACTUAL (dH)	STACK °F (Ts)	METER Inlet/Avg °F (Tm-in)	METER Outlet °F (Tm-out)	PROBE °F (Tp)	OVEN Filter °F (To)	IMPINGER Outlet °F (Ti)	AUX °F (Tx)	Pump Vacuum inHg (Pv)
		1559	439.050				Amb:	Amb:	Amb:	Amb:	Amb:	Amb:		
1	6	5	1604	.	.0003	.166	.17							
2	6	10	1609	441.44										
3	5	15	1614	442.60	.0002	.11	.11	144	69	68	264	258	54	3.0
4	5	20	1619	443.24	.0001	.05	.05	144	69	68	264	257	54	2.5
5	4	25	1624	444.58	.0004	.22	.22	144	69	68	264	258	54	3.0
6	4	30	1629	446.01	.0004	.22	.22	144	69	68	264	257	54	3.0
7	3	35	1634	446.75	.0001	.05	.05	144	68	68	264	258	55	2.5
8	3	40	1639	447.44	.0001	.05	.05	144	68	67	266	258	57	2.5
9	2	45	1644	448.524	.0002	.11	.11	144	68	67	265	257	57	3.0
10			.											
11			.											
12			.											
13			.											
14			.											
15			.											
16			.											
17			.											
18			.											
19			.											
20			.											
21			.											
22			.											
23			.											
24			.											
25			.											

Notes:

Field Data Sheet

Horizon Engineering

Date 12-14-98

Test Method ODEQ M7

Concurrent Testing EPA M25A

Run # 4 East Cycle 1

Operator JDF Support

Temperature, Am (Ta) 40

Pressure, Bar (Pb) 30.9

Pressure, Static (Pstat) 0

Filters 98M-250, 98J-52

Cyclonic Flow? No

Client/Plant/Location: OSU / Run 4 / East / Cycle 1

Probe 3-1 Cp .79 Heat Set 250 °F

Pitot	Pretest	in	in/min
Leak Check	Post	in	in/min

Nozzle .988

Sample Box 2 Heat Set 250 °F

Meter Box 4 dH@ 1.77 Y .99

Meter	Pretest 0.002	cfm 12	inHg
Leak Check	Post	cfm	inHg

Stack Diagram

Moisture 7.6 Tdb NA Twb NA

Traverse Point Number	Sampling Time min (dt)	Clock Time (24 hr)	Dry Gas Meter Reading cuft (Vm)	Velocity Head inH2O (dPs)	Orifice Pressure inH2O DESIRED	Orifice Pressure inH2O ACTUAL (dH)	STACK °F (Ts)	METER Inlet/Avg °F (Tm-in)	METER Outlet °F (Tm-out)	PROBE °F (Tp)	OVEN Filter °F (To)	IMPINGER Outlet °F (Ti)	AUX °F (Tx)	Pump Vacuum inHg (Pv)
		1655	047.67				Amb:	Amb:	Amb:	Amb:	Amb:	Amb:		
1	5	1700	.	.0019	1.04	1.05	88	63	65	258	249	50		5.5
2	10	1705	JUM		BIAS									
3	15	1710												
4	20	1715	059.18	.0010	.55	.55	100	67	63	252	249	61		4.0
5	25	1720	061.30	.0008	.47	.47	135	68	63	257	249	62		3.5
6	30	1725	063.28	.0004	.24	.24	134	69	64	257	248	59		2.5
7	35	1730	064.58	.0001	.06	.06	135	68	65	255	248	53		1.5
8	40	1735	065.19	.0003	.17	.17	137	69	65	256	248	51		2.0
9	45	1740	066.24	.0003	.17	.17	136	69	65	257	248	50		2.0
10	50	1745	066.92	.0001	.06	.06	133	70	66	257	247	51		1.5
11	55	1750	068.06	.0003	.17	.17	142	71	67	257	248	52		2.0
12	60	1755	069.51	.0005	.28	.28	142	74	69	257	248	56		2.5
13	65	1800	070.64	.0003	.17	.17	143	75	69	256	253	55		2.0
14	70	1805	072.10	.0005	.28	.28	143	77	70	258	249	57		2.5
15	75	1810	073.44	.0004	.24	.24	143	78	71	257	248	58		2.5
16	80	1815	074.78	.0004	.24	.24	143	78	72	258	248	61		2.5
17	85	1820	076.10	.0004	.24	.24	143	79	72	258	247	64		2.5
18	90	1825	076.93	.0002	.11	.11	144	79	73	258	247	65		2.0
19	95	1830	077.79	.0002	.11	.11	143	79	74	258	247	58		2.0
20	100	1835	078.63	.0002	.11	.11	143	80	75	257	247	48		2.0
21	105	1840	080.59	.0009	.50	.50	103	80	75	257	248	47		3.5
22	110	1845	082.92	.0011	.65	.65	108	82	77	257	248	49		4.5
23	115	1850	084.88	.0008	.48	.48	108	84	77	257	248	48		4.0
24	120	1855	086.84	.0008	.48	.48	107	85	78	255	247	45		4.0
25														

Notes:

Field Data Sheet

Horizon Engineering

Client/Plant/Location: OSU/K4/Exit/Cycle 1

Date 12-14-98

Test Method ~~BPA~~ M7

Concurrent Testing 25A

Run # 4

Operator SDF Support

Temperature, Am (Ta) 40

Pressure, Bar (Pb) 30.9

Pressure, Static (Pstat) 0

Filters 98M-280, 985-52

Probe 3-1 Cp .79 Heat Set 250 °F

Pitot	Pretest	in	in/min
Leak Check	Post	in	in/min

Nozzle .988

Sample Box 2 Heat Set 250 °F

Meter Box 4 dH@ 1.77 Y .99

Meter	Pretest	cfm	inHg
Leak Check	Post .005	cfm	3 inHg

Stack Diagram

Cyclonic Flow?

Moisture 20 Tdb NA Twb NA

Traverse Point Number	Sampling Time min (dt)	Clock Time (24 hr)	Dry Gas Meter Reading cuft (Vm)	Velocity Head inH2O (dPs)	Orifice Pressure inH2O DESIRED	Orifice Pressure inH2O ACTUAL (dH)	STACK °F (Ts) Amb:	METER Inlet/Avg. °F (Tm-in) Amb:	METER Outlet °F (Tm-out) Amb:	PROBE °F (Tp) Amb:	OVEN Filter °F (To) Amb:	IMPINGER Outlet °F (Ti) Amb:	AUX °F (Tx)	Pump Vacuum inHg (Pv)
1	1	125	1900	088 .81	.0008	.48	.48	109	86	79	255	246	45		4.0
2	1	130	1905	091 .21	.0011	.66	.66	108	86	78	256	248	48		5.0
3	2	135	1910	093 .31	.0009	.54	.54	114	87	80	257	248	50		4.5
4	2	140	1915	095 .13	.0007	.42	.42	112	87	80	256	248	50		3.5
5	3	145	1920	097 .29	.0009	.54	.54	112	86	81	257	248	52		4.0
6	3	150	1925	099 .42	.0009	.54	.54	111	87	81	255	251	52		4.0
7	4	155	1930	101 .83	.0012	.73	.73	110	87	81	256	245	54		5.0
8	4	160	1935	103 .81	.0008	.48	.48	111	88	81	256	248	57		4.0
9	5	165	1940	105 .81	.0008	.48	.48	108	88	82	256	246	56		4.0
10	5	170	1945	107 .29	.0004	.24	.24	108	88	82	256	249	57		3.0
11	6	175	1950	109 .306	.0008	.48	.48	109	87	82	256	248	58		4.0
12														
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Notes:

Field Data Sheet

Horizon Engineering

Client/Plant/Location: West OSU cycle 1 Run 5

Date 12-14-98

Test Method OAQP 7

Concurrent Testing EPA 25A

Run # 5

Operator JPF Support

Temperature, Am (Ta) 40

Pressure, Bar (Pb) 30.9

Pressure, Static (Pstat) 0

Filters 98M-293, 985-57

Probe 3-2 Cp Heat Set 250 °F

Pitot	Pretest	in	in/min
Leak Check	Post	in	in/min

Nozzle .988

Sample Box 3 Heat Set 250 °F

Meter Box 7 dH@ Y

Meter	Pretest 0.00	cfm	10	inHg
Leak Check	Post	cfm		inHg

Stack Diagram

Cyclonic Flow? NO

Moisture 20 Tdb NA Twb NA

Traverse Point Number	Sampling Time min (dt)	Clock Time (24 hr)	Dry Gas Meter Reading cuft (Vm)	Velocity Head inH2O (dPs)	Orifice Pressure inH2O DESIRED	Orifice Pressure inH2O ACTUAL (dH)	STACK °F (Ts)	METER Inlet/Avg. °F (Tm-in)	METER Outlet °F (Tm-out)	PROBE °F (Tp)	OVEN Filter °F (To)	IMPINGER Outlet °F (Ti)	AUX °F (Tx)	Pump Vacuum inHg (Pv)
		1955	448.801				Amb:	Amb:	Amb:	Amb:	Amb:	Amb:		
1 1	5	2000	41	.0029	1.76	1.75	128	65	65	264	260	55		6.0
2 1	10	2005	SUM		BIAS									
3 2	15	2010												
4 2	20	2015	463.31											
5 3	25	2020	465.19	.0007	.42	.42	138	68	64	264	257	66		3.0
6 3	30	2025	466.46	.0003	.18	.18	141	68	65	263	258	66		2.5
7 4	35	2030	468.22	.0006	.36	.36	138	68	65	261	257	65		3.0
8 4	40	2035	469.83	.0005	.30	.30	139	68	65	261	257	60		3.0
9 5	45	2040	471.34	.0005	.28	.28	139	68	65	263	258	61		3.0
10 5	50	2045	472.65	.0003	.17	.17	139	69	66	264	259	61		2.5
11 6	55	2050	474.40	.0006	.34	.34	140	69	66	263	258	61		3.0
12 6	60	2055	476.14	.0006	.34	.34	140	69	66	261	258	64		3.0
13 6	65	2100	477.57	.0005	.28	.28	140	70	66	263	257	65		3.0
14 6	70	2105	478.71	.0003	.17	.17	137	70	67	264	258	63		2.5
15 5	75	2110	480.67	.0008	.45	.45	140	70	68	265	259	63		4.0
16 5	80	2115	482.51	.0007	.40	.40	140	71	68	264	258	68		3.5
17 4	85	2120	484.32	.0007	.40	.40	140	71	68	263	257	61		3.5
18 4	90	2125	485.79	.0004	.27	.23	140	71	68	256	257	57		3.0
19 3	95	2130	487.81	.0008	.45	.45	136	71	68	264	256	54		3.5
20 3	100	2135	489.58	.0006	.34	.34	141	71	68	257	257	55		3.0
21 2	105	2140	491.12	.0006	.34	.34	136	71	69	262	257	54		3.0
22 2	110	2145	492.73	.0006	.34	.34	140	71	69	267	258	55		3.0
23 1	115	2150	494.24	.0005	.28	.28	141	71	69	254	258	53		3.0
24 1	120	2155	495.72	.0005	.28	.28	141	71	69	263	257	54		3.0
25														

Notes: The M25A probe was not moved to the west stack until ~2200 - two hours of lost data

Field Data Sheet

Horizon Engineering

Date 12-14-98
Test Method ODEQ 7
Concurrent Testing EPA 25A
Run # 5
Operator SDF Support
Temperature, Am (Ta) 40
Pressure, Bar (Pb) 30.9
Pressure, Static (Pstat) 0
Filters 98M-283, 98S-51

Client/Plant/Location: OSU / R5 / Cycle 1 / West
Probe 3-2 Cp Heat Set 250 °F
Pitot Pretest in in/min
Leak Check Post in in/min
Nozzle .988
Sample Box 3 Heat Set 250 °F
Meter Box 7 dH@ Y
Meter Pretest cfm inHg
Leak Check Post .008 cfm 8 inHg

Stack Diagram
Cyclonic Flow? No
Moisture 20 Tdb NA Twb NA

Traverse Point Number	Sampling Time min (dt)	Clock Time (24 hr)	Dry Gas Meter Reading cuft (Vm)	Velocity Head inH2O (dPs)	Orifice Pressure inH2O DESIRED	Orifice Pressure inH2O ACTUAL (dH)	STACK °F (Ts) Amb:	METER Inlet/Avg. °F (Tm-in) Amb:	METER Outlet °F (Tm-out) Amb:	PROBE °F (Tp) Amb:	OVEN Filter °F (To) Amb:	IMPINGER Outlet °F (Ti) Amb:	AUX °F (Tx)	Pump Vacuum inHg (Pv)
1 1	125	2200	497.28	.0005	.28	.28	141	71	69	264	257	56		3.0
2 1	130	2205	499.04	.0006	.34	.34	142	71	69	264	258	57		3.5
3 2	135	2210	500.45	.0004	.23	.23	142	71	69	263	258	61		3.0
4 2	140	2215	501.56	.0003	.17	.17	142	71	69	263	257	60		2.5
5 3	145	2220	502.50	.0002	.11	.11	137	71	69	264	256	59		2.5
6 3	150	2225	503.46	.0002	.11	.11	138	70	69	264	257	57		2.5
7 4	155	2230	504.92	.0004	.23	.23	141	70	69	255	257	57		3.5
8 4	160	2235	506.40	.0004	.23	.23	144	70	69	263	257	62		3.5
9 5	165	2240	507.97	.0005	.28	.28	140	71	69	263	257	62		3.5
10 5	170	2245	509.45	.0004	.23	.23	140	71	69	263	257	60		3.0
11 6	175	2250	510.965	.0005	.28	.28	140	71	68	263	257	61		3.5
12 ~~6~~	~~180~~	~~2255~~												
13														
14														
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23														
24														
25														

Notes:

Field Data Sheet

Horizon Engineering

Date 12/14/98
Test Method OEPA M 7
Concurrent Testing 25A
Run # 6
Operator CDB Support
Temperature, Am (Ta) 35
Pressure, Bar (Pb)
Pressure, Static (Pstat) 0
Filters 9BM-250, 985-52

Client/Plant/Location: OSU East Cycle 1
Probe 3-1 Cp .79 Heat Set 250 °F

Pitot	Pretest	in		in/min
Leak Check	Post	in		in/min

Nozzle
Sample Box Heat Set 250 °F
Meter Box 4 dH@ Y

Meter	Pretest	.005	cfm	10	inHg
Leak Check	Post	.003	cfm	10	inHg

Stack Diagram
Cyclonic Flow ?
Moisture Tdb Twb

Traverse Point Number	Sampling Time min (dt)	Clock Time (24 hr)	Dry Gas Meter Reading cuft (Vm)	Velocity Head inH2O (dPs)	Orifice Pressure inH2O DESIRED	Orifice Pressure inH2O ACTUAL (dH)	STACK °F (Ts)	METER Inlet/Avg. °F (Tm-in)	METER Outlet °F (Tm-out)	PROBE °F (Tp)	OVEN Filter °F (To)	IMPINGER Outlet °F (Ti)	AUX °F (Tx)	Pump Vacuum inHg (Pv)
		2255	109.710				Amb:	Amb:	Amb:	Amb:	Amb:	Amb:		
1 1	5	2300	112.27	.0019	1.08	1.1	82	67	67	258	250	53		9.0
2 1	10	2305	~~114~~ .	.0002	.11	.11	116	68	66	257	250	50		3.0
3 2	15	2310	114.15	~~.0007~~	~~.40~~	~~.40~~	SUM		BIAS					
4 2	20	2315	115.95	.0007	.40	.40	134	71	68	255	250	53		6.0
5 3	25	2320	117.41	.0005	.28	.28	123	73	69	256	248	52		4.5
6 3	30	2325	118.72	.0004	.23	.23	121	74	70	256	249	49		4.0
7 4	35	2330	120.20	.0005	.28	.28	146	73	68	256	248	49		4.5
8 4	40	2335	121.54	.0004	.23	.23	147	74	69	256	248	56		4.0
9 5	45	2340	123.31	.0007	.40	.40	148	75	70	256	250	56		5.0
10 5	50	2345	124.79	.0005	.28	.28	148	76	71	256	251	59		4.0
11 6	55	2350	126.21	.0006	.34	.34	148	76	71	254	247	56		4.5
12 6	60	2355	128.25	.0006	.34	.34	148	77	72	255	248	56		4.5
13 6	65	2400	129.98	.0007	.40	.40	148	78	72	256	253	58		5
14 6	70		131.83	.0007	.40	.40	148	78	72	255	252	60		5
15 5	75		133.23	.0004	.23	.23	148	78	73	256	253	62		3
16 5	80		134.96	.0006	.34	.34	148	78	73	256	251	55		4
17 4	85		136.72	.0006	.34	.34	148	79	74	254	252	49		4
18 4	90		138.51	.0006	.34	.34	148	78	74	255	252	51		4
19 3	95		140.29	.0007	.40	.40	147	80	75	255	253	53		4
20 3	100		141.92	.0005	.28	.28	148	80	75	256	252	55		3
21 2	105		143.61	.0007	.40	.40	148	80	75	255	252	55		5
22 2	110		145.50	.0007	.40	.40	148	81	75	256	252	57		5
23 1	115		147.41	.0006	.40	.40	148	80	75	255	253	53		5
24 1	120	1256	149.403	.0006	.40	.40	148	80	75	255	253	54		5
25														

Notes:

Field Data Sheet

Horizon Engineering

Client/Plant/Location: OSU East Cycle

Date 12/15/98

Test Method 7

Concurrent Testing 25A

Run # 6

Operator CD/Support

Temperature, Am (Ta) 35

Pressure, Bar (Pb)

Pressure, Static (Pstat) 0

Filters 98M-250, 985-52 Cyclonic Flow ?

Probe Cp Heat Set 250 °F

Pitot	Pretest	in		in/min
Leak Check	Post	4 in	0	in/min

Nozzle

Sample Box Heat Set 250 °F

Meter Box dH@ 1.76899 Y .98968

Meter	Pretest	cfm	inHg
Leak Check	Post	cfm	inHg

Stack Diagram

Moisture Tdb Twb

Traverse Point Number	Sampling Time min (dt)	Clock Time (24 hr)	Dry Gas Meter Reading cuft (Vm)	Velocity Head inH2O (dPs)	Orifice Pressure inH2O DESIRED	Orifice Pressure inH2O ACTUAL (dH)	STACK °F (Ts)	METER Inlet/Avg °F (Tm-in)	METER Outlet °F (Tm-out)	PROBE °F (Tp)	OVEN Filter °F (To)	IMPINGER Outlet °F (Ti)	AUX °F (Tx)	Pump Vacuum inHg (Pv)
		1258	149.403				Amb:	Amb:	Amb:	Amb:	Amb:	Amb:		
1 1	5		150.86	.0005	.28	.28	144	78	75	257	255	56		3
2 1	10		152.05	.0003	.1704	.17	148	79	75	255	254	58		3
3 2	15		153.17	.0003	.17	.17	148	78	74	255	254	56		3
4 2	20		154.10	.0002	.1136	.11	148	79	75	257	253	56		2
5 3	25		155.06	.0002	.11	.11	148	79	75	257	253	51		2
6 3	30		156.22	.0003	.17	.17	148	78	75	256	253	46		3
7 4	35		157.17	.0002	.11	.11	147	78	75	257	254	53		2
8 4	40		158.11	.0002	.11	.11	148	78	75	258	252	53		2
9 5	45	1344	159.051	.0002	.11	.11	148	78	75	257	253	52		2
10 5	50		.											
11 6	55		.											
12 6	60		.											
13			.											
14			.											
15			.											
16			.											
17			.											
18			.											
19			.											
20			.											
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22			.											
23			.											
24			.											
25			.											

Notes:

Field Data Sheet

[redacted]orizon [redacted]ngineering

Date 12/15/98
Test Method 7
Concurrent Testing 25A
Run # 7
Operator CDB Support
Temperature, Am (Ta) 40
Pressure, Bar (Pb)
Pressure, Static (Pstat) 0
Filters 98M-283 985-51 Cyclonic Flow ?

Stack Diagram

Client/Plant/Location: OSU West Cycle 1
Probe 3-2 Cp .80537 Heat Set 250
Pilot Pretest in in/m
Leak Check Post in in/m
Nozzle .988
Sample Box Heat Set 250
Meter Box 7 dH@ 1.25783 Y .97229
Meter Pretest 0 cfm 15 in
Leak Check Post cfm in
Moisture 10-20 Twb

Traverse Point Number	Sampling Time min (θ)	Clock Time (24 hr)	Dry Gas Meter Reading cuft (Vm)	Velocity Head (inH2O) (dPs)	Orifice Pressure (inH2O) DESIRED	Orifice Pressure (inH2O) ACTUAL (dH)	STACK °F (Ts) Amb:	BETTER Inlet/Avg °F (Tm in) Amb:	BETTER Outlet °F (Tm out) Amb:	THIMBLE °F (Tp) Amb:	OVEN Filter °F (To) Amb:	IMPINGER Outlet °F (Ti) Amb:	AUX °F (Ta)	Fan Vacuum (in) (Pv)
		156	511.058											
1 1	5		512.40	.0003	.1704	.17	138	62	62	225	230	46		8
1 1	10		.	.0003	.17	.17	147	62	61	238	242	50		
1 2	15		—	Jump	Bias	Checks								
1 2	20		517.05	.0007	.3977	.40	149	61	61	301	252	46		8
1 3	25		519.02	.0003	.1704	.17	149	61	61	301	252	46		8
1 3	30		520.52	.0004	.2273	.23	149	63	61	273	252	44		8
1 4	35		521.91	.0004	.23	.23	149	64	62	275	252	44		6
1 4	40		523.49	.0004	.23	.23	149	65	62	276	252	44		5
1 5	45		524.38	.0002	.1136	.11	149	65	63	277	253	46		3
10 5	50		525.68	.0003	.1704	.17	149	66	63	276	252	47		5
11 6	55		526.97	.0003	.1704	.17	149	66	63	275	252	47		5
11 6	60		527.97	.0002	.11	.11	149	67	64	276	254	47		4
11 1	65		529.17	.0003	.1704	.17	149	67	65	278	253	52		5
11 1	70		530.31	.0003	.17	.17	149	68	65	276	254	54		5
11 2	75		532.02	.0004	.2273	.23	149	68	66	275	251	51		5
11 2	80		533.22	.0003	.17	.17	149	69	66	275	257	52		4
11 3	85		534.34	.0003	.17	.17	150	69	66	276	254	53		4
11 3	90	326	535.61	.0003	.17	.17	149	69	66	277	254	54		4
11 1	5	329	536.77	.0003	.17	.17	149	69	68	222	250	54		4
11 1	10		538.27	.0004	.23	.23	150	69	67	277	252	52		4
11 2	15		—	.0002	.11	.11	150	69	68	276	252	54		3
11 2	20		540.64	.0003	.17	.17	149	69	68	276	252	56	4	
11 3	25		542.00	.0002	.11	.11	149	69	68	276	254	59		4
11 3	30		543.04	.0002	.11	.11	150	69	68	276	254	60		4
11														

South Port

East Port

Notes:

Field Data Sheet

[redacted] orizon [redacted] ngineering

Date 12/15/98

Test Method ODEQ 7

Concurrent Testing

Run # 7

Operator Support

Temperature, Amb (Ta)

Pressure, Bar (Pb)

Pressure, Static (Pstat)

Client/Plant/Location: OSU West

Probe Cp Heat Set

Pitot Pretest in in/in

Leak Check Post 4 in 0 in/in

Nozzle

Sample Box Heat Set

Meter Box dH@ Y

Meter Pretest cfm inH

Leak Check Post .005 cfm 10 inH

Stack Diagram

Cyclonic Flow ?

Moisture Tdb Twb

Filters

	Traverse Point Number	Sampling Time min (dt)	Check Time (Ptot)	Dry Gas Meter Reading cuft (Vm)	Velocity Head (dPs)	Orifice Pressure Drop (dH)	Orifice Pressure Drop Actual (dH)	STACK °F (Ts) Amb:	Meter Inlet/Avg °F (Tm in) Amb:	Meter Outlet °F (Tm out) Amb:	FRONT °F (Tp) Amb:	OVEN Filter °F (Tc) Amb:	IMPINGER Outlet °F (Ti) Amb:	ABX °F (Tx)	Pump Vacuum inHg (Pv)
				543.04											
1	4	35		—	.0002	.11	.11	150	69	68	277	253	58		4
2	4	40		545.00	.0002	.11	.11	149	69	68	276	251	60		4
3	5	45		545.99	.0002	.11	.11	149	69	68	276	252	61		4
4	5	50		547.46	.0004	.2273	.23	149	70	68	276	252	62		5
5	6	55		—	.0003	.17	.17	149	70	68	276	253	64		5
6	6	60		549.85	.0002	.11	.11	149	71	68	276	253	64		5
7	1	65		550.92	.0002	.11	.11	149	70	69	278	254	63		4
8	1	70		551.98	.0002	.11	.11	149	70	69	276	253	63		4
9	2	75	445	553.043	.0002	.11	.11	149	71	69	276	252	63		4
10	2	80													
11	3	85													
12	3	90													
13	4														
14	4														
15	5														
16	5														
17	6														
18	6														
19															
20															
21															
22															
23															
24															
25															

Notes:

Field Data Sheet

[redacted] orizon [redacted] ngineering

Date 12/15/98
Test Method M4
Concurrent Testing 25A
Run # 8
Operator CDB Support
Temperature, Amb (Ta) 40
Pressure, Bar (Pb)
Pressure, Static (Pstd) 0
Filters 98M-250, 98-52

Client/Plant/Location: OSU East Cycle 1
Probe 3-1 Cp .79 Heat Set 250
Pitot Pretest in in/m
Leak Check Post in in/m
Nozzle .988
Sample Box Heat Set 250
Meter Box 4 dH@ Y .98968
Meter Pretest 0 cfm 1.5 inH
Leak Check Post cfm inH

Stack Diagram

Cyclonic Flow?

Moisture Tdb Twb

Traverse Point Number	Sampling Time min (dt)	Check Time (24 hr)	Dry Gas Meter Reading cum (Vm)	Velocity Head (inH2O) (dPs)	Orifice Pressure (inH2O) DESIRED	Orifice Pressure (inH2O) ACTUAL (dH)	STACK °F (Ts) Amb:	SPLIT Inlet/Avg °F (Tm in) Amb:	METER Outlet °F (Tm out) Amb:	FRONT Filter °F (Tp) Amb:	OVEN Filter °F (To) Amb:	IMPINGER Outlet °F (Ti) Amb:	AUX °F (Ta)	Pump Vacuum inHg (Pv)
		457	159.315											
1 1	5		161.48	.0009	.5113	.51	136	69	68	253	254	46		15
1 1	10		.	.0003	.1704	.17	144	68	68	253	254	45		6
1 2	15		163.99	Bias check			J	u	n					
1 2	20		164.93	.0002	.1136	.11	147	70	68	248	252	42		4
1 3	25		165.99	.0002	.116	.11	147	71	69	248	254	42		4
1 3	30		167.23	.0004	.2273	.23	147	73	69	248	253	42		6
1 4	35		168.60	.0004	.2273	.23	148	73	69	248	253	43		6
1 4	40		169.76	.0003	.1704	.17	147	74	70	248	254	43		5
1 5	45		170.95	.0003	.1704	.17	147	75	71	248	253	44		5
1 5	50		172.15	.0003	.1704	.17	147	76	72	248	254	46		5
1 6	55		173.34	.0004	.2273	.23	148	76	72	249	254	47		5
1 6	60		174.55	.0003	.1704	.17	147	77	73	248	253	46		5
1 1	65		175.68	.0003	.1704	.17	147	77	73	248	251	47		5
1 1	70		176.66	.0002	.11	.11	147	78	74	248	253	47		4
1 2	75		178.98	.0004	.2273	.23	148	77	74	249	253	48		5
1 2	80		179.51	.0005	.2841	.28	148	78	74	250	255	51		6
1 3	85		181.07	.0005	.2841	.28	148	79	75	248	253	53		6
1 3	90		182.60	.0005	.28	.28	148	79	75	248	255	53		6
1 4	95		184.13	.0004	.23	.23	148	80	76	249	253	55		5
1 4	100		185.69	.0005	.28	.28	148	80	76	248	254	57		6
1 5	105		187.55	.0006	.3409	.34	148	80	76	247	253	60		7
1 5	110		188.68	.0003	.1704	.17	148	80	76	248	254	60		4
1 6	115		189.88	.0003	.1704	.17	148	80	76	247	254	60		4
1 6	120	657	191.290	.0004	.23	.23	149	81	77	247	253	58		4
1														

South Port

Notes:

Field Data Sheet

[redacted] orizon [redacted] ngineering

Date 12/15/98

Test Method ODEQ 7

Concurrent Testing

Run # 8

Operator Support

Temperature, Amb (Ta)

Pressure, Bar (Pb)

Pressure, Static (Pstat)

Filters

Client/Plant/Location: OSU East

Probe Cp Heat Set

Pilot Pretest in in/m

Leak Check Post 3 in 0.0 in/m

Nozzle

Sample Box Heat Set

Meter Box dH@ Y

Meter Pretest cfm in/H

Leak Check Post 0.010 cfm 16 in/H

Stack Diagram

Cyclonic Flow?

Moisture Tdb Twb

Traverse Point Number	Sampling Time min (dt)	Check Time (Ttc)	Dry Gas Meter Reading cuft (Vm)	Velocity Head (dPs)	Orifice Pressure (dH@)	Orifice Pressure (dH)	STACK °F (Ts) Amb:	METER Inlet/Avg °F (Tm in) Amb:	METER Outlet °F (Tm out) Amb:	FRONT °F (Tp) Amb:	OVEN Filter °F (To) Amb:	IMPINGER Outlet °F (Ti) Amb:	AUX °F (Tx)	Pump Vacuum inHg (Pv)
		700	191.290											
1 1	5		192.64	.004	.23	.23	148	80	78	250	250	53		5
1 1	10		—.—	.002	.11	.11	148	81	78	248	252	60		3
1 2	15		194.63	.002	.11	.11	148	81	78	249	252	60		3
1 2	20		195.62	.002	.11	.11	148	81	79	247	253	56		3
1 3	25		196.61	.002	.11	.11	149	81	78	249	253	52		3
1 3	30		197.61	.002	.11	.11	149	79	76	249	252	50		3
1 4	35		198.60	.002	.11	.11	147	79	77	248	254	51		3
1 4	40		199.98	.004	.2273	.23	148	79	77	249	253	52		5
1 5	45		200.87	.002	.11	.11	148	79	77	249	253	52		3
1 5	50		—.—	.002	.11	.11	148	79	77	249	254	52		3
1 6	55	755	202.630	.002	.11	.11	148	79	77	249	253	52		3
1 6	60													
13														
14														
15														
16														
17														
18														
19														
20														
21														
22														
23														
24														
25														

Notes:

Field Data Sheet

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Date 12-15-98
Test Method 7
Concurrent Testing 25A
Run # 9 West cyc 1
Operator DRB Support
Temperature, Am (Ta) 35
Pressure, Bar (Pb) 30.9
Pressure, Static (Pstat) 0
Filters 78m 283 98s-51

Client/Plant/Location: OSU / West / Cyc 1
Probe S-2 Cp .80 Heat Set 250

Pitot	Pretest	in		in/h
Leak Check	Post	in		in/h

Nozzle .988
Sample Box 3 Heat Set 250
Meter Box 7 dH@ 1.75 Y .97

Meter	Pretest	cfm		inl
Leak Check	Post	cfm		inl

Stack Diagram

Cyclonic Flow ?

Moisture 19 Tdb Twb

Traverse Point Number	Sampling Time (min)	Clock Time (24 hr)	Dry Gas Meter Reading cuft (Vm)	Velocity Head (inH2O) (dPs)	Orifice Pressure (inH2O) DESIRED	Orifice Pressure (inH2O) ACTUAL (dH)	STACK °F (Ts) Amb:	BEFORE Filter/Avg °F (Tm in) Amb:	AFTER Filter °F (Tm out) Amb:	CHORE °F (Tp) Amb:	OVEN Filter °F (Ta) Amb:	IMPINGER Outlet °F (Ti) Amb:	AUX °F (Ta)	Fo Vac inl (P
		758am	553.170											
1 6	5		554.621	.0002	.11	.11	145	65	65	270	258	52		.5
1 6	10		.	.0002		.11	146	65	65	270	259	50		5
1 5	15		556.625	.0003	.167	.17								
1 5	20		557.93	.0003	.167	.17	149	65	65	270	250	50		6
1 4	25		559.17	.0003		.17	149	63	64	270	255	50		6
1 4	30		.	.0003		.17	149	63	64	270	255	50		6
1 3	35		.											
1 3	40		.	.0006	.335	.34	150	64	63	272	256	52		6
1 2	45		564.400	.0004	.22	.34	149	64	63	275	254	52		6
1 2	50		565.749	.0004		.22	149	64	63	270	253	53		6
1 1	55		567.41	.0008	.447	.45	150	64	63	263	253	53		6½
1 1	60		569.42	.0008		.45	143	65	63	262	255	52		6½
1 1	65		571.13	.0007	.39	.39	144	65	63	263	255	53		5½
1 1	70		.	.0008	.45	.45	143	66	63	263	253	52		6
1 2	75		575.021	.00068		.45	143	66	63	265	253	52		6
1 2	80		577.175	.0008		.45	144	66	63	262	255	52		6
1 3	85		579.42	.0003		.17	150	66	63	261	252	52		4
1 3	90		580.	.0005		.30	150	66	63	264	253	49		5
1 4	95		581.65	.0005		.30	150	66	63	263	252	48		5
1 4	100		582.62	.0002		.11	150	66	63	264	252	46		3
1 5	105		583.61	.0002		.11	149	66	63	264	252	46		3
1 5	110		585.85	.0010	.561	.56	150	66	63	263	253	46		6
1 6	115		588.52	.0010		.56	150	66	64	263	252	47		6
1 6	120	958	589.905	.0010		.56	150	66	64	262	252	47		6
1			.											

Notes:

Field Data Sheet

Horizon Engineering

Client/Plant/Location: OSU / West / Cycl 1

Date 12-15-98

Test Method 7

Concurrent Testing 25A

Run # 9 cont West cycl

Operator RB Support

Temperature, Am (Ta) 37

Pressure, Bar (Pb) 30.9

Pressure, Static (Pstat) 0

Probe 3-2 Cp Heat Set 250 °F

Pitot	Pretest	in		in/min
Leak Check	Post	3½ in	0.0	in/min

Nozzle 988

Sample Box 3 Heat Set °F

Meter Box 7 dH@ 1.76 Y .99

Meter	Pretest	cfm		inHg
Leak Check	Post	0.005 cfm	11	inHg

Stack Diagram

Filters Cyclonic Flow? Moisture 1.9 Tdb Twb

Traverse Point Number	Sampling Time min (dt)	Clock Time (24 hr)	Dry Gas Meter Reading cuft (Vm)	Velocity Head inH2O (dPs)	Orifice Pressure inH2O DESIRED	Orifice Pressure inH2O ACTUAL (dH)	STACK °F (Ts) Amb:	AFTER Inlet/Avg °F (Tm-in) Amb:	METER Outlet °F (Tm out) Amb:	PROBE °F (Tp) Amb:	OVEN Filter °F (To) Amb:	IMPINGER Outlet °F (Ti) Amb:	AUX °F (Tx)	Pump Vacuum inHg (Pv)
		1003	589.905											
1 1	5		591.090	.0003	.169	.17	149	68	65	262	253	50		3
1 1	10		592.22	.0003		.17	149	68	65	263	252	48		3
1 2	15		593.38	.0003		.17	150	67	65	266	253	47		3½
1 2	20		594.600	.0003		.17	150	67	65	265	254	49		3½
1 3	25		595.72	.0003		.17	151	67	65	264	253	49		3½
1 3	30	1033	596.83	.0002		.11	150	67	65	264	252	49		3
1 4	35		597.73	.0002		.11	150	66	65	264	253	49		3
1 4	40		598.785	.0002		.11	150	66	65	264	252	47		3
1 5	45	1048	600.40	.0005	.28	.28	151	66	65	263	252	47		4
1 5	50	1053	602.152	.0007	.387	.39	151	66	65	262	251	46		5
11														
12														
13														
14														
15														
16														
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20														
21														
22														
23														
24														
25														

Notes:

Field Data Sheet

[redacted] orizon [redacted] ngineering

Date 12-15-98
Test Method 7
Concurrent Testing 25A
Run # 10 East cyc 1
Operator DRB Support —
Temperature, Amb (Ta) 40
Pressure, Bar (Pb) 30.9
Pressure, Static (Pstat) 0
Filters 98M-250 98S-52

Client/Plant/Location: OSU / East / cyc 1
Probe 3-1 Cp .79 Heat Set 250
Pilot Pretest in in/m
Leak Check Post in in/m
Nozzle .788
Sample Box 2 Heat Set 250
Meter Box 4 dH@ 1.77 Y .99
Meter Pretest 0.006 cfm 15 inH
Leak Check Post cfm inH
Moisture 18 Tdb Twb

Stack Diagram

Cyclonic Flow?

Traverse Point Number	Sampling Time min (θ)	Clock Time (24 hr)	Dry Gas Meter Reading cuft (Vm)	Velocity Head inH2O (dPs)	Orifice Pressure inH2O DESIRED	Orifice Pressure inH2O ACTUAL (dH)	STACK °F (Ts) Amb:	METER Inlet/Avg °F (Tm in) Amb:	METER Outlet °F (Tm out) Amb:	FRONT Filter °F (Tp) Amb:	OVEN Filter °F (To) Amb:	IMPINGER Outlet °F (Ti) Amb:	AUX °F (Ta)	Pump Vacuum inHg (Pv)
		1058	202.813											
South 6	5			.0003	.167	.17	143	61	61	247	253	44		8
6	10		Cal SUM											
5	15		206.225	.0005		.30	146	62	61	249	254	45		13
5	20		207.90	.0005		.30	146	62	61	249	254	45		13
4	25		209.51	.0006	.338	.34	146	63	61	248	253	44		12½
4	30		—	.0004	.238	.24	146	65	64	248	255	44		10
3	35		212.42	.0004		.24	147	69	65	248	255	44		10
3	40		214.000	.0005		.30	147	69	65	248	255	44		11
2	45		215.82	.0006		.34	148	72	66	248	252	43		12
2	50		216.695	.0002		.11	144	72	67	248	254	46		5
1	55		217.815	.0003		.17	141	73	68	248	254	46		6
1	60		218.97	.0003		.17	142	74	69	249	254	46		6
1	65	1158	220.18	.0003		.17	142	75	70	247	255	45		6
1	70		221.35	.0003		.17	140	76	71	248	253	44		6
2	75		222.49	.0003		.17	141	78	72	248	255	44		6
2	80		223.55	.0002	.114	.11	143	79	74	249	254	46		4
3	85		224.51	.0002		.11	145	79	75	243	254	47		4
3	90		225.29	.0002		.11	148	80	75	247	253	46		4
4	95		226.45	.0002		.11	148	80	75	246	252	46		4
4	100		227.81	.0004	.228	.27	148	81	77	248	253	45		5
5	105		229.05	.0004		.23	148	82	77	248	254	45		5
5	110		230.64	.0004		.23	148	83	78	247	255	46		5
6	115		232.34	.0006	.338	.34	149	83	79	247	252	46		6
6	120	1258	234.072	.0006		.34	149	83	79	247	254	46		6

Notes:

Field Data Sheet

Horizon Engineering

Client/Plant/Location: OSU / East / Cycl

Date 12-15-98

Test Method 7

Concurrent Testing 25A

Run # 10 cont East Cycl

Operator DRB Support

Temperature, Am (Ta) 45

Pressure, Bar (Pb) 30.9

Pressure, Static (Pstat) 0

Filters 98M-250 98S-52

Probe 3-1 Cp Heat Set 250 °F

Pitot	Pretest	in		in/min
Leak Check	Post	3 1/2 in	0	in/min

Nozzle .188

Sample Box 2 Heat Set 250 °F

Meter Box 4 dH@ 1.77 Y .99

Meter	Pretest	cfm		inHg
Leak Check	Post	0.013 cfm	14	inHg

Stack Diagram

Cyclonic Flow ?

Moisture 18 Tdb Twb

Traverse Point Number	Sampling Time min (dt)	Clock Time (24 hr)	Dry Gas Meter Reading cuft (Vm)	Velocity Head inH2O (dPs)	Orifice Pressure inH2O DESIRED	Orifice Pressure inH2O ACTUAL (dH)	STACK °F (Ts) Amb:	METER Inlet/Avg °F (Tm in) Amb:	METER Outlet °F (Tm out) Amb:	PROBE °F (Tp) Amb:	OVEN Filter °F (To) Amb:	IMPINGER Outlet °F (Ti) Amb:	AUX °F (Tx)	Pump Vacuum inHg (Pv)
		1302	234.072											
1	6	5	235.4	.0003	.17	.17	148	85	82	249	253	49		4
2	6	10	.	.0002	.11	.11	148	85	82	249	254	50		4
3	5	15	.											
4	5	20	238.025	.0002		.11	151	88	85	248	254	52		4
5	4	25	338.99	.0002		.11	151	88	85	248	254	53		4
6	4	30	1332 240.14	.0002		.11	151	88	85	249	254	53		4
7	3	35	241.25	.0003		.17	151	88	85	248	254	52		3
8	3	40	242.	.0004	229	.23	151	88	85	249	254	51		4
9	2	45	243.	.0004		.23	151	89	86	248	254	51		4
10	2	50	1352 245.212	.0004		.23	151	88	87	248	253	51		4
11			.											
12			.											
13			.											
14			.											
15			.											
16			.											
17			.											
18			.											
19			.											
20			.											
21			.											
22			.											
23			.											
24			.											
25			.											

Notes:

Field Data Sheet

[redacted] [redacted]

Date 12-15-98

Test Method 7

Concurrent Testing 25A

Run # 11 West Cycl

Operator OGS Support

Temperature, Amb (Ta) 58

Pressure, Bar (Pb) 30.9

Pressure, Static (Pstat) 0

Filters 98M-238 98M-51

Client/Plant/Location: OSU (West/Cycl)

Probe S-2 Cp .80 Heat Set 255

Pitot Pretest 3.0 in 0.0 in/m

Leak Check Post in in/m

Nozzle 988

Sample Box 3 Heat Set 250

Meter Box 7 dH@ 1.757 Y .977

Meter Pretest 0.003 cfm 13.0 in.

Leak Check Post cfm in/H

Moisture 18 Tdb Twb

Stack Diagram

Cyclonic Flow ?

Traverse Point Number	Sampling Time min (θ)	Clock Time (24 hr)	Dry Gas Meter Reading cuft (Vm)	Orifice Meter Setting (dH's)	Orifice Meter Setting DESIRED	Orifice Meter Setting ACTUAL (dH)	STACK °F (Ts) Amb:	AFTER Impinger °F (Tm in) Amb:	AFTER Impinger °F (Tm out) Amb:	PROBE °F (Tp) Amb:	OVEN Filter °F (To) Amb:	IMPINGER Outlet °F (Ti) Amb:	ABS °F (Ta)	Pump Vacuum inHg (Pv)
		1357	602.397											
6	5			.0003		.17	146	72	72	266	253	59		4½
6	10					.17								
5	15					.17								
5	20					.17								
4	25		609.25	.0002		.11	149	73	72	262	257	54		4
4	30		609.	.0002		.11	149	73	72	264	257	54		4
3	35		610.23	.0002		.11	149	74	73	266	253	53		4
3	40		611.25	.0002		.11	149	74	73	267	253	53		4
2	45		612.	.0002		.11	149	74	73	266	253	53		4
2	50		613.24	.0002		.11	150	74	73	266	254	53		4
1	55		614.38	.0003	.171	.17	148	74	73	266	254	54		4
1	60	1457	615.5	.0003		.17	147	74	73	266	254	54		4
1	65		617.00	.0003		.17	147	75	74	265	252	57		4
1	70		618.2	.0003		.17	147	75	74	265	252	57		4
2	75		619.47	.0003		.17	147	75	74	266	254	54		4
2	80		620.73	.0003		.17	147	75	74	266	254	54		4
3	85		622.03	.0003		.17	146	75	74	269	252	52		4
3	90		623.32	.0003		.17	147	75	74	266	254	54		4
4	95		624.75	.0002		.11	150	75	74	266	255	55		3
4	100		626.58	.0008	.455	.46	150	75	74	267	254	55		5
5	105			.0008		.46	151	75	74	264	254	55		5
5	110		632.78											
6	115	1553	635.09	.0011	.63	.63	153	75	72	264	255	57		5.0
6	120	1558	637.25	.0010	.57	.57	153	75	72	264	254	59		4.5

S Port

Cu Sum

Notes:

Field Data Sheet

Horizon Engineering

Client/Plant/Location: OSU West Cycle 1

Date 12-15-98

Test Method 7

Concurrent Testing 25A

Run # 11 West Cycle 1

Operator JDF Support

Temperature, Am (Ta) 50

Pressure, Bar (Pb) 30.9

Pressure, Static (Pstat) 0

Filters 98M-23B, 98S-51

Probe 3-2 Cp .80 Heat Set 250 °F

Pitot	Pretest	in	in/min
Leak Check	Post	in	in/min

Nozzle .988

Sample Box 3 Heat Set 250 °F

Meter Box 7 dH@ 1.757 Y .977

Meter	Pretest	cfm	inHg
Leak Check	Post .003	cfm 7	inHg

Stack Diagram

Cyclonic Flow? No

Moisture 18 Tdb NA Twb NA

Traverse Point Number	Sampling Time min (dt)	Clock Time (24 hr)	Dry Gas Meter Reading cuft (Vm)	Velocity Head inH2O (dPs)	Orifice Pressure inH2O DESIRED	Orifice Pressure inH2O ACTUAL (dH)	STACK °F (Ts) Amb:	METER Inlet/Avg. °F (Tm-in) Amb:	METER Outlet °F (Tm-out) Amb:	PROBE °F (Tp) Amb:	OVEN Filter °F (To) Amb:	IMPINGER Outlet °F (Ti) Amb:	AUX °F (Tx)	Pump Vacuum inHg (Pv)
1 6	125	1603	639.33	.0009	.51	.51	153	75	72	263	252	60		4.5
2 6	130	1608	642.17	.0016	.91	.91	153	75	72	259	254	62		6.0
3 5	135	1613	~~644.44~~	.0012	.68	.68	153	75	71	263	254	66		5.0
4 5	140	1618	644.44	.0004	.23	.23	152	74	71	262	252	60		3.5
5 4	145	1623	645.79	.0004	.23	.23	152	74	71	262	252	60		3.5
6 4	150	1628	647.14	.0004	.23	.23	152	72	71	264	254	55		3.5
7 3	155	1633	648.24	.0002	.11	.11	152	72	70	264	253	53		3.0
8 3	160	1638	649.87	.0005	.29	.29	151	71	69	264	255	51		3.5
9 2	165	1643	651.56	.0005	.29	.29	151	71	69	266	254	47		3.5
10 2	170	1648	653.66	.0009	.51	.51	150	71	69	260	254	45		4.5
11 1	175	1653	655.643	.0008	.46	.46	149	72	69	259	255	45		4.5
12														
13														
14														
15														
16														
17														
18														
19														
20														
21														
22														
23														
24														
25														

Notes:

Field Data Sheet

Horizon Engineering

Client/Plant/Location: OSU/R12/East/Cycle 1

Date 12-15-98

Test Method ODEQ 7

Concurrent Testing EPA 25A

Run # 12 East

Operator SDF Support

Temperature, Am (Ta) 45

Pressure, Bar (Pb) 30.9

Pressure, Static (Pstat) 0

Filters 98M-250, 98J-52

Probe 3-1 Cp Heat Set 250 °F

Pitot	Pretest	in	in/min
Leak Check	Post	in	in/min

Nozzle .988

Sample Box 2 Heat Set 250 °F

Meter Box 4 dH@ Y

Meter	Pretest	0.010 cfm	14	inHg
Leak Check	Post	cfm		inHg

Stack Diagram

Cyclonic Flow? NO

Moisture 18% Tdb Twb

	Traverse Point Number	Sampling Time min (dt)	Clock Time (24 hr)	Dry Gas Meter Reading cuft (Vm)	Velocity Head inH2O (dP's)	Orifice Pressure inH2O DESIRED	Orifice Pressure inH2O ACTUAL (dH)	STACK °F (Ts) Amb:	BEFFR Inlet/Avg °F (Tm in) Amb:	METER Outlet °F (Tm out) Amb:	PROBE °F (Tp) Amb:	OVEN Filter °F (To) Amb:	IMPINGER Outlet °F (Ti) Amb:	AUX °F (Tx)	Pump Vacuum inHg (Pv)
			1657	245.447											
1	1	5	1702	248.02	.0013	.74	.74	134	66	66	250	251	45		5.0
2	1	10	1707	.	.0006	.34	.34	143	67	66	248	251	42		3.0
3	2	15	1712	. .	JUM			BIAS	-			-	"		
4	2	20	1717	252.83											
5	3	25	1722	254.73	.0008	.46	.46	146	71	67	246	253	46		4.0
6	3	30	1727	256.42	.0006	.34	.34	146	73	68	245	253	46		3.5
7	4	35	1732	258.09	.0006	.34	.34	146	74	69	235	252	47		3.5
8	4	40	1737	260.03	.0008	.46	.46	146	75	70	241	253	48		4.0
9	5	45	1742	261.98	.0008	.46	.46	146	77	71	238	253	51		4.0
10	5	50	1747	263.93	.0008	.46	.46	146	77	72	245	251	53		4.0
11	6	55	1752	265.81	.0008	.46	.46	146	79	73	248	250	55		4.0
12	6	60	1557	266.65	.0002	.11	.11	147	80	73	244	251	54		2.0
13	6	65	1802	267.63	.0002	.11	.11	147	78	74	245	250	51		2.0
14	6	70	1807	268.77	.0003	.17	.17	147	79	74	249	252	52		2.5
15	5	75	1812	269.92	.0003	.17	.17	147	78	74	249	251	56		2.5
16	5	80	1817	271.06	.0003	.17	.17	148	78	74	249	251	54		2.5
17	4	85	1822	272.18	.0003	.17	.17	147	78	75	249	250	54		2.5
18	4	90	1827	273.26	.0002	.11	.11	147	78	75	249	252	54		2.0
19	3	95	1832	274.81	.0005	.29	.29	140	78	75	249	251	55		3.0
20	3	100	1837	276.31	.0005	.29	.29	139	79	75	249	250	57		3.0
21	2	105	1842	277.50	.0003	.17	.17	138	80	76	250	249	58		2.5
22	2	110	1847	279.08	.0005	.29	.29	139	80	76	249	251	59		3.0
23	1	115	1852	280.81	.0006	.34	.34	139	80	76	249	251	62		3.5
24	1	120	1857	282.77	.0008	.46	.46	138	80	76	244	254	63		4.0
25															

Notes:

Field Data Sheet

Horizon Engineering

Client/Plant/Location : 0050/R12/East/Cycl

Date 12-15-98

Test Method OOEQ 7

Concurrent Testing EPA 25A

Run # 12

Operator SDF Support

Temperature, Am (Ta) 40

Pressure, Bar (Pb) 30.9

Pressure, Static (Pstat) 0

Filters 98M-280, 985-52

Probe 3-1 Cp Heat Set 250 °F

Pitot	Pretest	in	in/min
Leak Check	Post	in	in/min

Nozzle .988

Sample Box 2 Heat Set 250 °F

Meter Box #7 dH@ Y

Meter	Pretest	cfm	inHg
Leak Check	Post .005	cfm 9	inHg

Stack Diagram

Cyclonic Flow? NO

Moisture 18 Tdb NA Twb NA

Traverse Point Number	Sampling Time min (dt)	Clock Time (24 hr)	Dry Gas Meter Reading cuft (Vm)	Velocity Head inH2O (dPs)	Orifice Pressure inH2O DESIRED	Orifice Pressure inH2O ACTUAL (dH)	STACK °F (Ts) Amb:	METER Inlet/Avg °F (Tm-in) Amb:	METER Outlet °F (Tm-out) Amb:	PROBE °F (Tp) Amb:	OVEN Filter °F (To) Amb:	IMPINGER Outlet °F (Ti) Amb:	AUX °F (Tx)	Pump Vacuum inHg (Pv)
1 6	125	1902	283.93	.0003	.17	.17	142	81	77	249	252	66		3.0
2 6	130	1907	285.27	.0004	.23	.23	141	81	78	250	253	67		3.0
3 5	135	1912	286.60	.0004	.23	.23	147	81	78	248	250	56		3.0
4 5	140	1917	287.97	.0004	.23	.23	148	81	78	248	250	53		3.0
5 4	145	1922	289.46	.0005	.29	.29	148	81	77	248	249	51		3.5
6 4	150	1927	290.40	.0002	.11	.11	148	81	77	247	249	51		2.5
7 3	155	1932	291.39	.0002	.11	.11	148	80	77	248	250	49		2.5
8 3	160	1937	292.90	.0005	.29	.29	136	80	77	248	249	51		3.5
9 2	165	1942	294.22	.0004	.23	.23	131	81	77	247	248	52		3.0
10 2	170	1947	295.56	.0004	.23	.23	130	81	78	247	252	52		3.0
11 1	175	1952	296.892	.0004	.23	.23	121	80	77	248	250	53		3.0
12														
13														
14														
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23														
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Notes:

Field Data Sheet

Horizon Engineering

Client/Plant/Location : OSU/cycle 1/R13/West

Date 12-15-98

Test Method ODEQ 7

Concurrent Testing EPA 25A

Run # 13

Operator JDF Support

Temperature, Am (Ta) 40

Pressure, Bar (Pb) 30.9

Pressure, Static (Pstat) 0

Filters 98M-283, 98S-51

Probe 3-2 Cp .80 Heat Set 250 °F

Pitot	Pretest	in	in/min
Leak Check	Post	in	in/min

Nozzle .988

Sample Box 3 Heat Set 250 °F

Meter Box 7 dH@ 1.757 Y .977

Meter	Pretest .007	cfm	8	inHg
Leak Check	Post	cfm		inHg

Stack Diagram

Cyclonic Flow? NO

Moisture 18 Tdb NA Twb NA

Traverse Point Number	Sampling Time min (dt)	Clock Time (24 hr)	Dry Gas Meter Reading cuft (Vm)	Velocity Head inH2O (dPs)	Orifice Pressure inH2O DESIRED	Orifice Pressure inH2O ACTUAL (dH)	STACK °F (Ts)	METER Inlet/Avg. °F (Tm-in)	METER Outlet °F (Tm-out)	PROBE °F (Tp)	OVEN Filter °F (To)	IMPINGER Outlet °F (Ti)	AUX °F (Tx)	Pump Vacuum inHg (Pv)
		1956	655.784				Amb:	Amb:	Amb:	Amb:	Amb:	Amb:		
1	1 5	2001	.	.0031	1.77	1.75	139	63	64	266	244	45		6.0
2	1 10	2006	.	SUM		BIAS								
3	2 15	2011	666.37											
4	2 20	2016	667.92	.0005	.29	.29	148	64	63	263	254	52		3.0
5	3 25	2021	669.61	.0006	.34	.34	147	65	63	264	254	51		3.0
6	3 30	2026	670.64	.0002	.11	.11	147	65	64	260	255	52		2.5
7	4 35	2031	672.09	.0004	.23	.23	147	66	64	266	255	51		3.0
8	4 40	2036	673.57	.0004	.23	.23	149	66	64	267	255	52		3.0
9	5 45	2041	675.23	.0005	.29	.29	148	66	65	267	255	52		3.5
10	5 50	2046	676.45	.0003	.17	.17	147	67	65	258	252	52		2.5
11	6 55	2051	677.66	.0003	.17	.17	148	68	65	267	255	54		2.5
12	6 60	2056	678.67	.0002	.11	.11	149	68	65	265	254	55		2.0
13	6 65	2101	679.90	.0003	.17	.17	149	68	66	266	255	54		2.5
14	6 70	2106	681.31	.0004	.23	.23	149	68	66	264	252	52		3.0
15	5 75	2111	683.22	.0007	.40	.40	149	68	66	265	254	54		3.5
16	5 80	2116	685.14	.0008	.46	.46	149	69	66	264	252	55		4.0
17	4 85	2121	687.15	.0008	.46	.46	149	69	66	263	253	58		4.0
18	4 90	2126	688.91	.0008	.46	.46	149	69	66	264	253	60		4.0
19	3 95	2131	689.74	.0002	.11	.11	150	69	66	264	254	61		2.0
20	3 100	2136	690.58	.0002	.11	.11	150	69	67	265	252	57		2.0
21	2 105	2141	691.78	.0003	.17	.17	146	69	67	265	252	58		2.5
22	2 110	2146	693.14	.0004	.23	.23	145	68	67	264	254	59		3.0
23	1 115	2151	694.56	.0004	.23	.23	146	68	66	264	253	60		3.0
24	1 120	2156	695.92	.0004	.23	.23	144	69	67	264	253	63		3.0
25			.											

Notes:

Field Data Sheet

Horizon Engineering

Client/Plant/Location: OSU/cycle 1/R13/West

Date 12-15-98

Test Method ODEQ7

Concurrent Testing EPA 25A

Run # 13

Operator JDF Support

Temperature, Am (Ta) 40

Pressure, Bar (Pb) 30.9

Pressure, Static (Pstal) 0

Filters 99M-283, 98J-51

Probe 3-2 Cp Heat Set 250 °F

Pitot	Pretest	in	in/min
Leak Check	Post	in	in/min

Nozzle .988

Sample Box 3 Heat Set 250 °F

Meter Box 7 dH@ Y

Meter	Pretest	cfm	inHg
Leak Check	Post .009	cfm 10	inHg

Stack Diagram

Cyclonic Flow? No

Moisture 18 Tdb NA Twb NA

Traverse Point Number	Sampling Time min (dt)	Clock Time (24 hr)	Dry Gas Meter Reading cuft (Vm)	Velocity Head inH2O (dPs)	Orifice Pressure inH2O DESIRED	Orifice Pressure inH2O ACTUAL (dH)	STACK °F (Ts) Amb:	METER Inlet/Avg. °F (Tm-in) Amb:	METER Outlet °F (Tm-out) Amb:	PROBE °F (Tp) Amb:	OVEN Filter °F (To) Amb:	IMPINGER Outlet °F (Ti) Amb:	AUX °F (Tx)	Pump Vacuum inHg (Pv)
1 6	125	2201	697.25	.0004	.23	.23	149	69	67	253	255	63		3.0
2 6	130	2206	698.22	.0002	.11	.11	149	69	67	265	253	63		2.0
3 5	135	2211	699.18	.0002	.11	.11	149	69	67	266	255	61		2.0
4 5	140	2216	700.15	.0002	.11	.11	149	68	67	266	255	60		2.0
5 4	145	2221	701.45	.0004	.23	.23	137	68	67	266	255	61		4.5
6 4	150	2226	702.81	.0004	.23	.23	137	68	67	264	253	63		5.0
7 3	155	2231	704.03	.0003	.17	.17	137	69	67	264	254	62		5.0
8 3	160	2236	705.26	.0003	.17	.17	138	69	67	267	254	62		5.0
9 2	165	2241	706.65	.0004	.23	.23	137	68	67	266	254	63		6.0
10 2	170	2246	707.89	.0003	.17	.17	133	69	67	264	254	65		5.0
11 1	175	2251	709.065	.0003	.17	.17	140	69	67	264	252	63		5.0
12														
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25														

Notes:

Field Data Sheet

Horizon Engineering

Client/Plant/Location: OSU/R14/East/cycle 1

Date 12-15-98

Test Method ODE Q 7

Concurrent Testing EPA 25A

Run # 14

Operator JDF Support CPB

Temperature, Am (Ta) 40

Pressure, Bar (Pb) 30.9

Pressure, Static (Pstat) 0

Filters 98M-280, 98S-52

Probe 3-1 Cp Heat Set 250 °F

Pitot	Pretest	in	in/min
Leak Check	Post	in	in/min

Nozzle 98E

Sample Box 2 Heat Set 250 °F

Meter Box 4 dH@ Y

Meter	Pretest	007 cfm	9	inHg
Leak Check	Post	.005 cfm	15	inHg

Stack Diagram

Cyclonic Flow ?

Moisture 18 Tdb NA Twb NA

Traverse Point Number	Sampling Time min (dt)	Clock Time (24 hr)	Dry Gas Meter Reading cuft (Vm)	Velocity Head inH2O (dPs)	Orifice Pressure inH2O DESIRED	Orifice Pressure inH2O ACTUAL (dH)	STACK °F (Ts) Amb:	METER Inlet/Avg. °F (Tm-in) Amb:	METER Outlet °F (Tm-out) Amb:	PROBE °F (Tp) Amb:	OVEN Filter °F (To) Amb:	IMPINGER Outlet °F (Ti) Amb:	AUX °F (Tx)	Pump Vacuum inHg (Pv)
		2258	297.062											
1	5	2303	.	.0010	.57	.57	114	67	67	248	248	49		11.0
1	10	2308	.	JUM			BIAS							
2	15	2313	304.08											
2	20	2318	305.71	.0007	.40	.40	139	68	65	247	250	54		7.5
3	25	2323	307.72	.0009	.51	.51	132	69	65	247	250	56		8.5
3	30	2328	308.66	.0002	.11	.11	147	70	66	245	251	57		3.5
4	35	2333	309.56	.0002	.11	.11	147	70	67	248	252	55		3.5
4	40	2338	310.46	.0002	.11	.11	147	70	67	249	250	54		3.5
5	45	2343	311.39	.0002	.11	.11	147	71	68	248	251	52		3.5
5	50	2348	312.56	.0003	.17	.17	147	71	68	248	251	52		4.5
6	55	2353	313.87	.0004	.23	.23	148	73	69	248	251	55		5.5
6	60	2358	315.17	.0004	.23	.23	147	73	69	248	253	59		5
6	65	2403	316.38	.0003	.17	.17	148	74	70	249	252	59		5
6	70	2408	317.57	.0003	.17	.17	147	74	70	248	252	59		5
5	75	2413	318.76	.0003	.17	.17	148	74	71	248	253	61		5
5	80	2418	319.94	.0003	.17	.17	148	75	71	249	252	61		5
4	85	2423	320.97	.0002	.11	.11	148	75	71	249	253	62		4
4	90	2428	322.17	.0003	.17	.17	148	75	71	248	253	58		5
3	95	2433	323.54	.0004	.23	.23	148	75	72	249	253	60		6
3	100	2438	324.91	.0004	.23	.23	147	75	72	248	253	60		6
2	105	2443	326.15	.0003	.17	.17	147	75	72	248	252	62		6
2	110	2448	327.36	.0003	.17	.17	148	75	72	248	252	62		6
1	115	2453	— . —	.0003	.17	.17	148	75	72	248	253	63		6
1	120	2458	329.929	.0004	.23	.23	148	75	72	248	254	62		6
			.											

Notes:

Field Data Sheet

Horizon Engineering

Client/Plant/Location : OSU/R14/East/Cycle

Date 12-16-98

Test Method OOEQ 7

Concurrent Testing EPA 25A

Run # 14

Operator CDB Support

Temperature, Am (Ta) 40

Pressure, Bar (Pb)

Pressure, Static (Pstat) 0

Filters 9RM - ~~283~~ 250, 985-52

Probe 3-1 Cp Heat Set 250 °F

Pitot	Pretest	in	in/min
Leak Check	Post	in	in/min

Nozzle .988

Sample Box 2 Heat Set 250 °F

Meter Box 4 dH@ Y

Meter	Pretest	cfm	inHg
Leak Check	Post	cfm	inHg

Stack Diagram

Cyclonic Flow? NO

Moisture 13 Tdb NA Twb NA

Traverse Point Number	Sampling Time min (dt)	Clock Time (24 hr)	Dry Gas Meter Reading cuft (Vm)	Velocity Head inH2O (dPs)	Orifice Pressure inH2O DESIRED	Orifice Pressure inH2O ACTUAL (dH)	STACK °F (Ts)	METER Inlet/Avg. °F (Tm-in)	METER Outlet °F (Tm-out)	PROBE °F (Tp)	OVEN Filter °F (To)	IMPINGER Outlet °F (Ti)	AUX °F (Tx)	Pump Vacuum inHg (Pv)
	.	101	329.929				Amb:	Amb:	Amb:	Amb:	Amb:	Amb:		
1 1	5		330.83	.0002	.11	.11	140	74	72	249	252	58		8
2 1	10		331.73	.0002	.11	.11	145	74	72	249	253	60		8
3 2	15		332.65	.0003	.17	.17	147	73	71	249	252	59		8
4 2	20		333.55	.0003	.17	.17	146	74	71	249	252	59		8
5 3	25		335.69	.0010	.5703	.57	144	74	71	248	252	59		11
6 3	30		337.92	.0010	.5703	.57	147	76	73	248	252	68		11
7 4	35		339.11	.0003	.17	.17	148	77	73	247	253	61		5
8 4	40		340.22	.0003	.17	.17	148	76	74	248	252	48		5
9 5	45		341.00	.0001	.06	.06	148	75	73	248	251	48		4
10 5	50	151	341.907	.0002	.11	.11	148	75	73	219	253	44		5
11 6	55		.											
12 6	60		.											
13			.											
14			.											
15			.											
16			.											
17			.											
18			.											
19			.											
20			.											
21			.											
22			.											
23			.											
24			.											
25			.											

Notes:

Field Data Sheet

Horizon Engineering

Date 12-16-98
Test Method OOEQ7
Concurrent Testing EPA 25A
Run # 15
Operator CDB Support
Temperature, Am (Ta) 40
Pressure, Bar (Pb)
Pressure, Static (Pstat) 0
Filters 98M- 99S-

Client/Plant/Location : OSU, West, Cycle 1, R15
Probe 3-2 Cp Heat Set 250 °F
Pilot Pretest 4 in 0 in/min
Leak Check Post in in/min
Nozzle .955
Sample Box 3 Heat Set 250 °F
Meter Box 7 dH@ Y
Meter Pretest .003 cfm 10 inHg
Leak Check Post cfm inHg

Stack Diagram

Cyclonic Flow ? ND
Moisture 15 Tdb NA Twb NA

	Traverse Point Number	Sampling Time min (dt)	Clock Time (24 hr)	Dry Gas Meter Reading cuft (Vm)	Velocity Head inH2O (dPs)	Orifice Pressure inH2O DESIRED	Orifice Pressure inH2O ACTUAL (dH)	STACK °F (Ts) Amb:	METER Inlet/Avg °F (Tm-in) Amb:	METER Outlet °F (Tm-out) Amb:	PROBE °F (Tp) Amb:	OVEN Filter °F (To) Amb:	IMPINGER Outlet °F (Ti) Amb:	AUX °F (Tx)	Pump Vacuum inHg (Pv)
			159	709.140											
1	1	5		711.77	.0009	.5183	.51	137	60	60	292	253	38		13
2	1	10		.	.003	.1711	.17	148	59	60	289	254	38		4
3	2	15		714.18		Bias	Check		J	vm					
4	2	20		715.37	.003	.17	.17	149	60	60	289	253	39		4
5	3	25		716.57	.003	.17	.17	149	60	60	290	254	39		4
6	3	30		717.65	.002	.11	.11	149	60	60	287	254	39		3
7	4	35		719.19	.005	.2852	.29	149	61	60	290	256	39		5
8	4	40		721.05	.007	.3992	.40	149	61	60	287	254	39		6
9	5	45		722.23	.003	.17	.17	150	62	60	288	255	41		4
10	5	50		723.78	.005	.29	.29	150	63	61	289	254	43		5
11	6	55		725.39	.005	.29	.29	150	63	61	289	254	43		5
12	6	60		727.15	.006	.34	.34	150	64	61	288	253	43		5
13	1	65		728.56	.0041	.2281	.23	150	64	61	287	254	42		4
14	1	70		730.30	.005	.29	.29	150	65	61	288	255	43		5
15	2	75		731.91	.0004	.2281	.23	151	65	61	288	254	43		5
16	2	80		733.66	.006	.34	.34	151	65	62	287	254	45		5
17	3	85		735.38	.006	.34	.34	152	65	63	288	254	45		5
18	3	90		737.10	.006	.34	.34	152	66	62	287	254	47		5
19	4	95		738.84	.006	.34	.34	152	66	63	286	253	47		5
20	4	100		740.53	.006	.34	.34	153	66	63	287	252	49		5
21	5	105		742.31	.005	.29	.29	152	66	63	288	254	52		5
22	5	110		743.94	.006	.34	.34	152	66	63	286	254	55		5
23	6	115		745.15	.003	.17	.17	152	66	63	288	255	55		4
24	6	120	359	746.753	.004	.23	.23	152	66	63	288	255	57		5
25				.											

Notes:

Field Data Sheet

Horizon Engineering

Client/Plant/Location: OSU Vest Cycle 1

Date 12/16/98

Test Method ODEQ 7

Concurrent Testing

Run # 15

Operator CDB Support

Temperature, Am (Ta) 4C

Pressure, Bar (Pb)

Pressure, Static (Pstat) 0

Probe 3-2 Cp — Heat Set 250 °F

Pitot	Pretest	in	in/min
Leak Check	Post	in	in/min

Nozzle 928

Sample Box — Heat Set 250 °F

Meter Box dH@ Y

Meter	Pretest	cfm	inHg
Leak Check	Post .004 cfm	13	inHg

Stack Diagram

Filters — Cyclonic Flow ? — Moisture — Tdb — Twb

Traverse Point Number	Sampling Time min (dt)	Clock Time (24 hr)	Dry Gas Meter Reading cuft (Vm)	Velocity Head inH2O (dPs)	Orifice Pressure inH2O DESIRED	Orifice Pressure inH2O ACTUAL (dH)	STACK °F (Ts)	METER Inlet/Avg. °F (Tm-in)	METER Outlet °F (Tm-out)	PROBE °F (Tp)	OVEN Filter °F (To)	IMPINGER Outlet °F (Ti)	AUX °F (Tx)	Pump Vacuum inHg (Pv)
		402	746.753				Amb:	Amb:	Amb:	Amb:	Amb:	Amb:		
1	5		748.60	.0007	.40	.40	149	66	63	289	253	53		6
2	10		750.43	.0007	.40	.40	150	66	63	285	254	56		6
3	15		752.98	.0014	.80	.80	149	66	64	287	251	56		8
4	20		755.56	.0014	.80	.80	149	67	64	286	254	60		8
5	25		758.08	.0015	.86	.86	150	68	64	286	255	62		8
6	30		760.54	.0013	.74	.74	152	69	64	287	255	63		9
7	35		762.90	.0013	.74	.74	152	69	64	287	255	63		9
8	40		765.57	.0015	.86	.86	152	69	65	287	254	67		11
9	45		768.26	.0013	.74	.74	153	69	65	285	253	68		11
10	50	452	770.848	.0014	.80	.80	152	70	65	286	254	67		11
11	55		.											
12	60		.											
13			.											
14			.											
15			.											
16			.											
17			.											
18			.											
19			.											
20			.											
21			.											
22			.											
23			.											
24			.											
25			.											

Notes:

Field Data Sheet

Horizon Engineering

Date 12/16/98
Test Method 7
Concurrent Testing
Run # 16
Operator CDB Support
Temperature, Am (Ta) 35
Pressure, Bar (Pb)
Pressure, Static (Pstat) 0

Client/Plant/Location : OSU East Cycle 1
Probe Cp Heat Set 250 °F
Pitot Pretest 4 in 0 in/min
Leak Check Post in in/min
Nozzle .988
Sample Box Heat Set 250 °F
Meter Box dH@ 1.76899 Y .98968
Meter Pretest 0.01 cfm 15. inHg
Leak Check Post cfm inHg

Stack Diagram

Filters Cyclonic Flow? Moisture Tdb Twb

Traverse Point Number	Sampling Time min (dt)	Clock Time (24 hr)	Dry Gas Meter Reading cuft (Vm)	Velocity Head inH2O (dPs)	Orifice Pressure inH2O DESIRED	Orifice Pressure inH2O ACTUAL (dH)	STACK °F (Ts) Amb:	METER Inlet/Avg. °F (Tm-in) Amb:	METER Outlet °F (Tm-out) Amb:	PROBE °F (Tp) Amb:	OVEN Filter °F (To) Amb:	IMPINGER Outlet °F (Ti) Amb:	AUX °F (Tx)	Pump Vacuum inHg (Pv)
		459	342.004											
1 1	5		343.35	.0004	.2281	.23	129	63	62	259	262	37		8
2 1	10		.	.0005	.29	.29	141	63	62	258	262	38		8
3 2	15		346.07		JUM Bias									
4 2	20		347.42	.0003	.17	.17	147	64	62	257	263	37		8
5 3	25		348.78	.0004	.23	.23	146	65	62	257	264	37		8
6 3	30		350.13	.0004	.23	.23	147	66	63	257	263	37		8
7 4	35		— . —	.0003	.17	.17	146	67	63	256	263	36		7
8 4	40		352.50	.0003	.17	.17	146	68	64	257	264	37		7
9 5	45		353.67	.0003	.17	.17	146	69	65	257	262	36		7
10 5	50		354.85	.0003	.17	.17	146	69	66	256	263	36		7
11 6	55		356.03	.0003	.17	.17	147	71	66	257	263	36		7
12 6	60		357.39	.0004	.23	.23	146	71	67	256	263	36		8
13 1	65		358.59	.0003	.17	.17	147	72	67	257	263	37		7
14 1	70		359.80	.0003	.17	.17	147	73	68	257	263	38		7
15 2	75		— . —	.0002	.11	.11	147	73	69	258	263	39		6
16 2	80		361.82	.0002	.11	.11	147	73	69	257	263	39		6
17 3	85		363.01	.0003	.17	.17	147	74	70	256	263	38		7
18 3	90		364.02	.0002	.11	.11	148	75	71	256	262	40		6
19 4	95		365.03	.0002	.11	.11	148	75	71	257	262	39		6
20 4	100		366.03	.0002	.11	.11	149	76	72	257	263	40		6
21 5	105		367.22	.0003	.17	.17	149	76	72	256	263	40		7
22 5	110		368.23	.0002	.11	.11	146	77	73	256	263	40		6
23 6	115		369.22	.0002	.11	.11	145	77	73	257	263	40		6
24 6	120	659	370.224	.0002	.11	.11	145	78	74	256	260	40		
25			.											

South East

Notes:

Field Data Sheet

Horizon Engineering

Client/Plant/Location: OSU East Cycle 1

Date 12/16/98

Test Method 7

Concurrent Testing 25A

Run # 16

Operator CDB Support

Temperature, Am (Ta) 35

Pressure, Bar (Pb)

Pressure, Static (Pstat) 0

Stack Diagram

Probe Cp Heat Set °F

Pitot Pretest in in/min

Leak Check Post in in/min

Nozzle

Sample Box Heat Set °F

Meter Box dH@ Y

Meter Pretest cfm inHg

Leak Check Post 0.016 cfm 14 inHg

Filters Cyclonic Flow? Moisture Tdb Twb

Traverse Point Number	Sampling Time min (dt)	Clock Time (24 hr)	Dry Gas Meter Reading cuft (Vm)	Velocity Head inH2O (dPs)	Orifice Pressure inH2O DESIRED	Orifice Pressure inH2O ACTUAL (dH)	STACK °F (Ts)	METER Inlet/Avg °F (Tm-in)	METER Outlet °F (Tm-out)	PROBE °F (Tp)	OVEN Filter °F (To)	IMPINGER Outlet °F (Ti)	AUX °F (Tx)	Pump Vacuum inHg (Pv)
		702	370.224				Amb:	Amb:	Amb:	Amb:	Amb:	Amb:		
1	5		371.19	.0002	.11	.11	148	78	75	258	263	43		7
2	10		372.76	.0004	.23	.23	148	78	75	258	263	44		11
3	15		374.01	.0003	.17	.17	147	79	76	257	263	48		8
4	20		375.20	.0003	.17	.17	148	79	76	258	263	47		8
5	25		376.53	.0004	.23	.23	147	79	76	258	263	48		8
6	30		378.12	.0005	.29	.29	147	80	76	257	262	47		10
7	35		379.35	.0003	.17	.17	147	81	76	257	262	49		8
8	40		380.55	.0003	.17	.17	148	80	77	257	263	53		8
9	45		381.72	.0003	.17	.17	150	81	77	257	263	54		8
10	50		382.91	.0003	.17	.17	150	81	77	258	263	54		8
11	55	757	384.104	.0003	.17	.17	150	81	78	258	263	54		8
~~12~~	~~60~~													
13														
14														
15														
16														
17														
18														
19														
20														
21														
22														
23														
24														
25														

Notes:

Field Data Sheet

Horizon Engineering

Client/Plant/Location: OSU West Cyclo 1

Date 12/16/98
Test Method 7
Concurrent Testing 25A
Run # 17 west
Operator DRB Support
Temperature, Am (Ta) 33
Pressure, Bar (Pb) 30.6
Pressure, Static (Pstat) 0
Filters 98M 283 185-51

Probe S-L Cp Heat Set 250 °F
Pitot Pretest in in/min
Leak Check Post in in/min
Nozzle 988
Sample Box 3 Heat Set 250 °F
Meter Box 7 dH@ Y
Meter Pretest .003 cfm 16 inHg
Leak Check Post cfm inHg

Stack Diagram

Cyclonic Flow?

Moisture ~~18~~ 23 Tdb Twb

Traverse Point Number	Sampling Time min (dt)	Clock Time (24 hr)	Dry Gas Meter Reading cuft (Vm)	Velocity Head inH2O (dPs)	Orifice Pressure inH2O DESIRED	Orifice Pressure inH2O ACTUAL (dH)	STACK °F (Ts) Amb:	METER Inlet/Avg. °F (Tm-in) Amb:	METER Outlet °F (Tm-out) Amb:	PROBE °F (Tp) Amb:	OVEN Filter °F (To) Amb:	IMPINGER Outlet °F (Ti) Amb:	AUX °F (Tx)	Pump Vacuum inHg (Pv)
		817	771.119											
1 1	5		772.62	.0004	.22	.22	141	66	73	288	284	55		6
2 1	10		773.721	.0002	.115	.12	134	65	65	285	252	52		5
3 2	15		774.52	.0002		.12	149	65	65	280	252	49		5
4 2	20		775.31	.0002		.12	150	65	64	280	252	50		5
5 3	25		776.000	.0002		.12	150	65	64	280	252	51		5
6 3	30		777.70	.0010	.557	.56	153	65	64	280	252	52		12
7 4	35		780.12	.0015	.753	.75	153	65	64	275	252	60		13
8 4	40		782.55	.0015		.75	153	65	64	274	250	53		13
9 5	45		784.999	.0015		.75	153	65	63	274	251	46		13
10 5	50		787.61	.0015		.75	153	65	63	274	251	42		13
11 6	55		789.82	.0015		.75	153	65	63	275	255	44		13
12 6	60		792.37	.0015		.75	153	65	63	275	254	44		13
13 6	65		794.86	.0015		.75	153	65	63	275	253	44		13
14 6	70		796.	.0015		.75	153	65	62	275	254	44		13
15 5	75		799.69	.0013	.653	.65	153	66	62	276	252	47		12
16 5	80		801.99	.0013		.65	153	66	62	276	255	45		12
17 4	85		804.29	.0013		.65	153	66	62	275	253	46		12
18 4	90		806.	.0013		.65	154	66	62	275	254	46		12
19 3	95		807.17	.0003	.153	.15	154	66	62	275	253	46		8
20 3	100		808.42	.0003		.15	153	65	62	277	253	43		8
21 2	105		810.32	.0007	.351	.35	152	65	62	269	254	44		13
22 2	110		811.91	.0007		.35	153	65	62	269	254	45		13
23 1	115		813.65	.0007		.35	153	65	62	269	254	45		13
24 1	120	1017	815.389	.0007		.35	153	65	62	270	254	45		13
25														

Notes: 7:59am → 8:17am Hot check wood % H_2O
(kiln off)

Field Data Sheet

Horizon Engineering

Client/Plant/Location: OSU/west/cyc 1

Date 12-16

Test Method 7

Concurrent Testing 25A

Run # 17 cont west cyc 1

Operator DRB Support

Temperature, Am (Ta) 35

Pressure, Bar (Pb) 30.6

Pressure, Static (Pstat) 0

Filters 98M 283 985-51

Probe 3-2 Cp .8 Heat Set 250 °F

Pitot	Pretest	in		in/min
Leak Check	Post	in	0.0	in/min

Nozzle .188

Sample Box 3 Heat Set 250 °F

Meter Box 7 dH@ 1.76 Y 1

Meter	Pretest	cfm		inHg
Leak Check	Post	0.010	cfm	16 inHg

Stack Diagram

Cyclonic Flow?

Moisture 26 Tdb Twb

Traverse Point Number	Sampling Time min (dt)	Clock Time (24 hr)	Dry Gas Meter Reading cuft (Vm)	Velocity Head inH2O (dPs)	Orifice Pressure inH2O DESIRED	Orifice Pressure inH2O ACTUAL (dH)	STACK °F (Ts)	METER Inlet/Avg. °F (Tm-in)	METER Outlet °F (Tm-out)	PROBE °F (Tp)	OVEN Filter °F (To)	IMPINGER Outlet °F (Ti)	AUX °F (Tx)	Pump Vacuum inHg (Pv)
	.	1022	815.389				Amb:	Amb:	Amb:	Amb:	Amb:	Amb:		
1	6	5	818.055	.0018	.904	.90	156	64	62	280	253	47		15
2	6	10	820.82	.0018		.90	156	64	62	276	253	48		15
3	5	15	822.89	.0011	.548	.55	159	64	62	276	253	49		12
4	5	20	824.74	.0009	.417	.42	160	65	61	276	253	47		10
5	4	25	826.65	.0009		.42	160	65	62	276	253	47		11
6	4	30	1052 827.78	.0002	.099	.10	161	65	62	278	252	47		6
7	3	35	828.73	.0002		.10	161	65	62	278	252	47		7
8	3	40	829.93	.0004	.185	.19	157	65	62	276	253	47		10
9	2	45	1107 831.212	.0004		.19	151	65	63	278	254	49		10
10			.											
11			.											
12			.											
13			.											
14			.											
15			.											
16			.											
17			.											
18			.											
19			.											
20			.											
21			.											
22			.											
23			.											
24			.											
25			.											

Notes:

Field Data Sheet

Horizon Engineering

Date	12-16-98
Test Method	7
Concurrent Testing	25A
Run #	18 East
Operator	DRB Support
Temperature, Am (Ta)	38
Pressure, Bar (Pb)	30.6
Pressure, Static (Pstat)	0
Filters	98M-250 98S-52

Stack Diagram

Cyclonic Flow ?

Client/Plant/Location :	OSU/East/cycl				
Probe	3-1	Cp		Heat Set	250 °F
Pitot	Pretest	in			in/min
Leak Check	Post	in			in/min
Nozzle	988				
Sample Box	24			Heat Set	°F
Meter Box	4	dH@	1.768	Y .987	
Meter	Pretest	0.013	cfm	15	inHg
Leak Check	Post		cfm		inHg
Moisture	23	Tdb		Twb	

Traverse Point Number	Sampling Time min (dt)	Clock Time (24 hr)	Dry Gas Meter Reading cuft (Vm)	Velocity Head inH2O (dPs)	Orifice Pressure inH2O DESIRED	Orifice Pressure inH2O ACTUAL (dH)	STACK °F (Ts)	METER Inlet/Avg. °F (Tm-in)	METER Outlet °F (Tm-out)	PROBE °F (Tp)	OVEN Filter °F (To)	IMPINGER Outlet °F (Ti)	AUX °F (Tx)	Pump Vacuum inHg (Pv)
		1115	384.419				Amb:	Amb:	Amb:	Amb:	Amb:	Amb:		
1 6	5			.0009		.4	150	58	59	257	263	51		10
2 6	10		Cal	JUN										
3 5	15		389.	.0005										
4 5	20		391.36	.0004	.184	.18	161	61	59	257	263	45		5
5 4	25		392.65	.0005	.232	.23	161	62	59	258	263	46		5½
6 4	30		394.0	.0005		.23	162	62	60	257	262	47		5½
7 3	35		395.21	.0006	.279	.28	162	62	60	257	262	47		7
8 3	40		396.72	.0006	.279	.28	162	62	60	257	262	47		7
9 2	45		397.93	.0004		.18	163	63	60	257	263	47		5
10 2	50		.	.0004		.18	163	64	61	257	263	45		5
11 1	55		.											
12 1	60	1216	401.42	.0005		.18	163	67	64	258	262	52		5
13 1	65		402	.0004		.18	163	67	64	258	262	52		5
14 1	70		403.821	.0003		.14	163	69	66	257	262	49		4
15 2	75		404.89	.0003		.14	163	69	66	257	262	47		4
16 2	80		405.72	.0003		.14	163	69	66	257	262	50		4
17 3	85		406.81	.0003		.14	163	71	68	240	263	51		5
18 3	90		407.99	.0003		.14	162	72	68	256	263	52		5
19 4	95		408.808	.0002	.099	.10	162	72	69	256	263	52		4
20 4	100		409.68	.0002		.10	161	72	68	257	263	52		4
21 5	105		410.23				162	73	70	256	263	53		4
22 5	110		411.42	.0003			163	73	70	256	263	53		4
23 6	115		412.38	.0002		.10	163	73	70	256	263	53		4
24 6	120	1316	413.075	.0005		.10	163	73						
25			.											

Notes:

Field Data Sheet

Horizon Engineering

Client/Plant/Location : OSU/East/cyc 1

Date 12-16-98

Test Method 7

Concurrent Testing 25A

Run # B Cent East

Operator DRS Support —

Temperature, Am (Ta) 40

Pressure, Bar (Pb) 30.6

Pressure, Static (Pstat) 0

Filters 98m2850 78552

Probe 3-1 Cp Heat Set 250 °F

Pitot	Pretest	in	in/min
Leak Check	Post	3½ in 0	in/min

Nozzle .188'

Sample Box 2 Heat Set 250 °F

Meter Box 4 dH@ 1.768 Y .989

Meter	Pretest	cfm	inHg
Leak Check	Post 0.008	cfm 13	inHg

Stack Diagram

Cyclonic Flow? ____

Moisture 25 Tdb Twb

Traverse Point Number	Sampling Time min (dt)	Clock Time (24 hr)	Dry Gas Meter Reading cuft (Vm)	Velocity Head inH2O (dPs)	Orifice Pressure inH2O DESIRED	Orifice Pressure inH2O ACTUAL (dH)	STACK °F (Ts)	METER Inlet/Avg. °F (Tm-in)	METER Outlet °F (Tm-out)	PROBE °F (Tp)	OVEN Filter °F (To)	IMPINGER Outlet °F (Ti)	AUX °F (Tx)	Pump Vacuum inHg (Pv)
		1319	413.075				Amb:	Amb:	Amb:	Amb:	Amb:	Amb:		
1 6	5		414.01	.0002		.10	163	71	71	258	263	46		4
2 6	10		414.92	.0003		.14	163	72	71	257	263	44		5
3 5	15		415.84	.0003		.14	163	72	71	257	263	45		5
4 5	20		416.79	.0002		.10	162	71	69	257	262	44		4
5 4	25		417.68	.0002		.10	163	71	69	258	263	45		4
6 4	30		418.54	.0002		.10	164	72	69	258	263	44		4
7 3	35		419.	.0004	.186	.19	144	69	71	258	263	45		4
8 3	40		420.95	.0003		.19	144	72	69	258	263	46		4
9 2	45		421.97	.0003		.14	144	72	69	258	263	49		4
10 2	50	1404	423.209	.0004		.19	142	72	70	258	263	49		5
11			.											
12			.											
13			.											
14			.											
15			.											
16			.											
17			.											
18			.											
19			.											
20			.											
21			.											
22			.											
23			.											
24			.											
25			.											

Notes:

Field Data Sheet

Horizon Engineering

Client/Plant/Location: OJU/West/cyl

Date 12-16-98

Test Method 7

Concurrent Testing 25A

Run # 19 West

Operator DRD Support

Temperature, Am (Ta) 45

Pressure, Bar (Pb) 30.6

Pressure, Static (Pstat) 0

Stack Diagram

Filters 98M-238 98S-51 Cyclonic Flow?

Probe 3-2 Cp Heat Set 350 °F

Pitot	Pretest	in	in/min
Leak Check	Post	in	in/min

Nozzle .988

Sample Box 3 Heat Set °F

Meter Box 7 dH@ Y

Meter	Pretest	0.010 cfm	15. inHg
Leak Check	Post	cfm	inHg

Moisture 25 Tdb Twb

Traverse Point Number	Sampling Time min (dt)	Clock Time (24 hr)	Dry Gas Meter Reading cuft (Vm)	Velocity Head inH2O (dPs)	Orifice Pressure inH2O DESIRED	Orifice Pressure inH2O ACTUAL (dH)	STACK °F (Ts) Amb:	METER Inlet/Avg. °F (Tm-in) Amb:	METER Outlet °F (Tm-out) Amb:	PROBE °F (Tp) Amb:	OVEN Filter °F (To) Amb:	IMPINGER Outlet °F (Ti) Amb:	AUX °F (Tx)	Pump Vacuum inHg (Pv)
		1415	831.434											
1 6	5			.0016		.43	164	62	62	275	255	60		10
2 6	10		Cal	Sum										
3 5	15		837.39	.0019	.885	.89	164	62	62	278	254	60		16
4 5	20		840.13	.0019		.89	164	62	62	278	254	60		16
5 4	25		84 —	.0002		.10	165	63	62	277	254	58		4
6 4	30		84 —	.0002		.10	165	63	63	275	255	56		4
7 3	35		842.89	.0002		.10	165	63	63	275	255	55		4
8 3	40		843.900	.0002		.10	165	63	63	275	255	55		4
9 2	45		845.035	.0003	.1299	.13	165	64	63	205	255	57		7
10 2	50		846.	.0004	.172	.17	166	65	63	272	253	53		7
11 1	55		.	.0006	.251	.25	166	65	63	268	255	56		10
12 1	60	1515	849.	.0005	.21	.25	166	66	64	270	258	54		10
13 1	65		850.45	.0005	.21	.21	166	66	64	272	256	51		9
14 1	70		851.825	.0005		.21	165	66	64	270	254	48		9
15 2	75		853.63	.0009	.377	.38	165	66	64	270	255	48		13
16 2	80		855.92	.0009		.38	166	66	64	270	253	49		12
17 3	85		856.71	.0002		.10	165	66	65	274	254	48		6
18 3	90		857.53	.0001	0.04	.04	164	65	65	276	254	48		5
19 4	95		859.	.0001		.04	164	66	65	274	254	47		5
20 4	100		858.84	.0001		.04	165	66	65	275	254	47		5
21 5	105	1601	859.50	.0006	.25	.25	166	66	65	275	255	45		10.5
22 5	110	1606	860.91	.0008	.34	.34	166	66	65	272	254	44		12.0
23 6	115	1611	862.22	.0008	.34	.34	166	66	65	273	255	44		12.0
24 6	120	1616	863.91	.0004	.17	.17	167	66	65	273	254	46		8.0
25														

Notes:

Field Data Sheet

Horizon Engineering

Client/Plant/Location: OSU/West/Cycle/R19

Date 12-16-98

Test Method ODEQ 7

Concurrent Testing EPA ESA

Run # 19 West

Operator SDF Support

Temperature, Am (Ta) 45

Pressure, Bar (Pb) 30.6

Pressure, Static (Pstat) 0

Filters 98M-283, 985-51

Probe 3-2 Cp Heat Set 250 °F

Pitot	Pretest	in	in/min
Leak Check	Post	in	in/min

Nozzle .998

Sample Box 3 Heat Set 250 °F

Meter Box 7 dH@ 1.75783 Y .97729

Meter	Pretest	cfm	inHg
Leak Check	Post .007	cfm 14	inHg

Stack Diagram

Cyclonic Flow? _____

Moisture 25 Tdb NA Twb NA

Traverse Point Number	Sampling Time min (dt)	Clock Time (24 hr)	Dry Gas Meter Reading cuft (Vm)	Velocity Head inH2O (dPs)	Orifice Pressure inH2O DESIRED	Orifice Pressure inH2O ACTUAL (dH)	STACK °F (Ts) Amb:	METER Inlet/Avg. °F (Tm-in) Amb:	METER Outlet °F (Tm-out) Amb:	PROBE °F (Tp) Amb:	OVEN Filter °F (To) Amb:	IMPINGER Outlet °F (Ti) Amb:	AUX °F (Tx)	Pump Vacuum inHg (Pv)
1 1	125	1622	865.25	.0005	.21	.21	167	66	65	274	254	46		8.5
2 1	130	1646	866.47	.0004	.17	.17	164	66	65	274	253	48		8.0
* 3 2	135	1651	867.74	.0004	.17	.17	138	64	64	273	251	50		8.0
4 2	140	1656	868.90	.0004	.17	.17	144	63	63	272	252	48		8.0
5 3	145	1701	870.07	.0004	.17	.17	160	63	63	272	252	41		8.0
6 3	150	1706	871.01	.0002	.10	.10	166	63	63	252	251	42		6.0
7 4	155	1711	872.67	.0008	.34	.34	166	64	63	274	254	44		12.0
8 4	160	1716	874.02	.0005	.21	.21	166	65	63	266	254	53		9.0
9 5	165	1721	875.38	.0005	.21	.21	166	65	63	274	254	56		9.0
10 5	170	1726	876.97	.0007	.29	.29	166	66	64	274	254	58		11.5
11 6	175	1731	878.486	.0006	.25	.25	166	67	64	272	253	60		10.0
12														
13														
14														
15														
16														
17														
18														
19														
20														
21														
22														
23														
24														
25														

Notes: * Kiln down for hot check

Field Data Sheet

Horizon Engineering

Client/Plant/Location: OSW/East/R20/Cycle 1

Date 12-16-99

Test Method OPE Q7

Concurrent Testing EPA 25A

Run # 20

Operator SDF Support

Temperature, Am (Ta) 40

Pressure, Bar (Pb) 30.6

Pressure, Static (Pstat) 0

Filters 98M-250, 98S-52

Probe 3-1 Cp Heat Set 250 °F

Pitot	Pretest	in	in/min
Leak Check	Post	in	in/min

Nozzle .988

Sample Box Z Heat Set 250 °F

Meter Box 4 dH@ Y

Meter	Pretest 0.011	cfm 14	inHg
Leak Check	Post	cfm	inHg

Stack Diagram

Cyclonic Flow? NO

Moisture 28 Tdb NA Twb NA

	Traverse Point Number	Sampling Time min (dt)	Clock Time (24 hr)	Dry Gas Meter Reading cuft (Vm)	Velocity Head inH2O (dPs)	Orifice Pressure inH2O DESIRED	Orifice Pressure inH2O ACTUAL (dH)	STACK °F (Ts) Amb:	METER Inlet/Avg °F (Tm-in) Amb:	METER Outlet °F (Tm-out) Amb:	PROBE °F (Tp) Amb:	OVEN Filter °F (To) Amb:	IMPINGER Outlet °F (Ti) Amb:	AUX °F (Tx)	Pump Vacuum inHg (Pv)
			1735	423.442											
1	1	5	1740	.	.0007	.29	.29	148	62	61	258	262	45		7.0
2	1	10	1745	.											
3	2	15	1750	.	JUM	BIAS			+						
4	2	20	1755	.											
5	3	25	1800	.	RECAL										
6	3	30	1805	432.42											
7	4	35	1810	433.74	.0006	.25	.25	158	69	64	255	262	55		6.5
8	4	40	1815	434.69	.0003	.13	.13	159	73	68	255	262	53		4.5
9	5	45	1820	435.85	.0004	.17	.17	160	71	67	255	261	52		5.0
10	5	50	1825	437.10	.0005	.21	.21	160	73	68	255	261	56		5.5
11	6	55	1830	438.51	.0005	.21	.21	161	73	68	254	261	56		5.5
12	6	60	1835	439.29	.0003	.13	.13	162	74	69	255	261	58		4.5
13	6	65	1840	440.51	.0005	.21	.21	162	75	70	255	261	56		5.5
14	6	70	1845	441.62	.0004	.17	.17	163	77	72	255	261	60		5.0
15	5	75	1850	442.99	.0006	.25	.25	163	77	72	256	262	61		6.0
16	5	80	1855	444.22	.0005	.21	.21	163	79	73	255	262	64		6.0
17	4	85	1900	445.22	.0003	.13	.13	163	80	74	257	262	64		4.5
18	4	90	1905	446.37	.0004	.17	.17	163	81	75	256	261	61		5.0
19	3	95	1910	447.62	.0005	.21	.21	164	81	76	256	262	66		5.5
20	3	100	1915	448.50	.0002	.08	.08	162	83	77	256	262	58		4.0
21	2	105	1920	449.72	.0005	.22	.22	162	83	77	255	261	53		5.5
22	2	110	1925	450.62	.0002	.08	.08	162	84	79	253	261	53		4.0
23	1	115	1930	452.14	.0007	.31	.31	162	84	79	255	260	54		7.0
24	1	120	1935	452.97	.0002	.08	.08	161	86	80	253	261	54		3.5
25				.											

Notes:

Field Data Sheet

Horizon Engineering

Client/Plant/Location: OSU/East/R20/Cycle 1

Date 12-16-98

Test Method ODEQ 7

Concurrent Testing EPA 25A

Run # 20

Operator JDF Support

Temperature, Am (Ta) 35

Pressure, Bar (Pb) 30.6

Pressure, Static (Pstat) 0

Filters 98M-250, 985-52

Probe 3-1 Cp Heat Set 250 °F

Pitot	Pretest	in	in/min
Leak Check	Post	in	in/min

Nozzle .988

Sample Box 2 Heat Set 250 °F

Meter Box 4 dH@ Y

Meter	Pretest	cfm	inHg
Leak Check	Post .016	cfm 14.5	inHg

Stack Diagram

Cyclonic Flow? No

Moisture 28 Tdb NA Twb NA

	Traverse Point Number	Sampling Time min (dt)	Clock Time (24 hr)	Dry Gas Meter Reading cuft (Vm)	Velocity Head inH2O (dPs)	Orifice Pressure inH2O DESIRED	Orifice Pressure inH2O ACTUAL (dH)	STACK °F (Ts) Amb:	METER Inlet/Avg. °F (Tm-in) Amb:	METER Outlet °F (Tm-out) Amb:	PROBE °F (Tp) Amb:	OVEN Filter °F (To) Amb:	IMPINGER Outlet °F (Ti) Amb:	AUX °F (Tx)	Pump Vacuum inHg (Pv)
1	1	125	1940	453.97	.0003	.13	.13	162	85	80	255	260	52		4.0
2	1	130	1945	454.94	.0003	.13	.13	162	86	81	253	258	51		4.0
3	2	135	1950	455.77	.0002	.09	.09	163	86	82	254	260	52		3.5
4	2	140	1955	456.62	.0002	.09	.09	161	84	80	254	262	54		3.5
5	3	145	2000	457.67	.0003	.13	.13	162	84	80	255	262	55		4.0
6	3	150	2005	458.72	.0003	.13	.13	163	84	80	255	261	55		4.0
7	4	155	2010	460.02	.0005	.22	.22	163	86	81	252	262	58		6.0
8	4	160	2015	461.19	.0004	.17	.17	163	86	82	253	260	62		5.5
9	5	165	2020	462.51	.0005	.22	.22	163	86	82	253	261	61		6.0
10	5	170	2025	463.80	.0005	.22	.22	164	86	82	253	259	60		6.0
11	6	175	2030	464.967	.0004	.17	.17	163	87	83	248	260	60		5.5
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13															
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Notes:

Field Data Sheet

Horizon Engineering

Client/Plant/Location: OSU/West/R21/Cycle1

Date 12-16-98

Test Method ODEQ 7

Concurrent Testing EPA 25A

Run # 21

Operator JDF Support

Temperature, Am (Ta) 35

Pressure, Bar (Pb) 30.6

Pressure, Static (Pstat) 0

Filters 98M-283, 985-51

Probe 3-2 Cp Heat Set 250 °F

Pitot	Pretest	in	in/min
Leak Check	Post	in	in/min

Nozzle .988

Sample Box 3 Heat Set 250 °F

Meter Box 7 dH@ Y

Meter	Pretest	.011	cfm	15	inHg
Leak Check	Post	.005	cfm	15	inHg

Stack Diagram

Cyclonic Flow? NO

Moisture 25 Tdb NA Twb NA

Traverse Point Number	Sampling Time min (dt)	Clock Time (24 hr)	Dry Gas Meter Reading cuft (Vm)	Velocity Head inH2O (dPs)	Orifice Pressure inH2O DESIRED	Orifice Pressure inH2O ACTUAL (dH)	STACK °F (Ts)	METER Inlet/Avg. °F (Tm-in)	METER Outlet °F (Tm-out)	PROBE °F (Tp)	OVEN Filter °F (To)	IMPINGER Outlet °F (Ti)	AUX °F (Tx)	Pump Vacuum inHg (Pv)
		2036	878.655				Amb:	Amb:	Amb:	Amb:	Amb:	Amb:		
1 1	5	2041	.	.0002	.09	.09	148	69	68	277	252	48		10.5
2 1	10	2046	880.54	JUM		BIAS								
3 2	15	2051	881.57	.0003	.13	.13	146	68	68	276	249	57		10.5
4 2	20	2056	882.66	.0003	.13	.13	139	68	68	264	252	46		10.5
5 3	25	2101	883.78	.0003	.13	.13	155	69	68	276	254	47		10.5
6 3	30	2106	884.49	.0001	.04	.04	155	69	68	268	253	51		6.5
7 4	35	2111	885.36	.0002	.09	.09	160	69	68	264	253	51		9.0
8 4	40	2116	886.04	.0001	.04	.04	165	69	69	258	253	52		7.0
9 5	45	2121	886.76	.0001	.04	.04	165	69	69	274	251	52		7.0
10 5	50	2126	888.67	.0011	.48	.48	166	69	69	264	252	54		12.5
11 6	55	2131	890.78	.0012	.52	.52	163	70	69	273	251	57		13.0
12 6	60	2136	892.51	.0012	.52	.52	160	71	69	272	253	61		13.0
13 1	65	2142	894.35	.0006	.26	.26	158	72	69	273	253	68		9.0
14 2	70	2147	896.28	.0010	.44	.44	156	72	69	274	253	68		11.0
15 3	75	2152	898.158	.0009	.39	.39	156	72	69	273	252	66		10.0
16			.											
17			.											
18			.											
19			.											
20			.											
21			.											
22			.											
23			.											
24			.											
25			.											

Notes:

Field Data Sheet

Horizon Engineering

Client/Plant/Location : OSU/West/cycle 2/R1

Date 12-16-98

Test Method ODE Q 7

Concurrent Testing EPA 25A

Run # 1

Operator JDF Support COB end

Temperature, Am (Ta) 35

Pressure, Bar (Pb) 30.6

Pressure, Static (Pstat) 0

Filters 98M-206, 98S-15

Probe 3-1 Cp Heat Set °F

Pitot	Pretest	in	in/min
Leak Check	Post	in	in/min

Nozzle .988

Sample Box 6 Heat Set °F

Meter Box 4 dH@ Y

Meter	Pretest .013	cfm	14	inHg
Leak Check	Post .017	cfm	12	inHg

Stack Diagram

Cyclonic Flow ?

Moisture Tdb Twb

Traverse Point Number	Sampling Time min (dt)	Clock Time (24 hr)	Dry Gas Meter Reading cuft (Vm)	Velocity Head inH2O (dPs)	Orifice Pressure inH2O DESIRED	Orifice Pressure inH2O ACTUAL (dH)	STACK °F (Ts)	METER Inlet/Avg. °F (Tm-in)	METER Outlet °F (Tm-out)	PROBE °F (Tp)	OVEN Filter °F (To)	IMPINGER Outlet °F (Ti)	AUX °F (Tx)	Pump Vacuum inHg (Pv)
		1107	465.275				Amb:	Amb:	Amb:	Amb:	Amb:	Amb:		
1	5	1112	469.65	.0390	19	1.7	108	72	71	251	258	39		10.0
2	10	1117	473.89	.0408	19.5	1.8	103	73	70	251	259	40		10.5
3	15	1122	476.80	.037	18	1.8	101	76	71	251	258	42		10.5
4	20	1127	480.67	.0363	17.5	1.8	97	79	72	252	261	49		10.5
5	25	1132	484.81	.0337	18.9	1.8	92	83	73	260	260	55		10.5
6	30	1137	487.18	.0019	.93	.93	93	84	74	254	260	55		7.0
7	35	1142	489.44	.0013	.63	.63	94	84	75	255	260	54		5.5
8	40	1147	491.48	.0010	.49	.49	95	83	75	255	259	54		4.5
9	45	1152	493.55	.0011	.54	.54	97	83	76	256	261	55		4.5
10	50	1157	494.80	.0004	.20	.20	98	83	76	255	259	53		3
11	55	1202	496.05	.0004	.20	.20	101	82	76	254	262	52		3
12	60	1207	496.95	.0002	.10	.10	103	82	77	256	262	53		2
13	65	1212	—	.0002	.10	.10	106	81	77	257	262	54		2
14	70	1217	498.96	.0004	.20	.20	111	81	77	256	262	49		3
15	75	1222	500.25	.0004	.20	.20	112	81	77	256	262	49		3
16	80	1227	501.43	.0003	.1464	.15	116	82	78	255	262	46		3
17	85	1232	502.707	.0004	.20	.20	119	82	78	255	261	46		2
18														
19														
20														
21														
22														
23														
24														
25														

Notes: Did not take H_2O sample from Run 1

Field Data Sheet

Horizon Engineering

Client/Plant/Location: OSU/East/Cycle 2/R2

Date 12/17/98

Test Method ODEQ 7

Concurrent Testing 25A

Run # 2

Operator CDB/Support

Temperature, Am (Ta) 35

Pressure, Bar (Pb) 30.6

Pressure, Static (Pstat) 0

Probe 3-2 Cp Heat Set 250 °F

Pitot	Pretest	in	in/min
Leak Check	Post	in	in/min

Nozzle .988

Sample Box 1 Heat Set 250 °F

Meter Box 7 dH@ Y

Meter	Pretest	.005 cfm	1.5	inHg
Leak Check	Post	cfm		inHg

Stack Diagram

Filters Cyclonic Flow? Moisture Tdb Twb

Traverse Point Number	Sampling Time min (dt)	Clock Time (24 hr)	Dry Gas Meter Reading cuft (Vm)	Velocity Head inH2O (dPs)	Orifice Pressure inH2O DESIRED	Orifice Pressure inH2O ACTUAL (dH)	STACK °F (Ts)	METER Inlet/Avg. °F (Tm-in)	METER Outlet °F (Tm-out)	PROBE °F (Tp)	OVEN Filter °F (To)	IMPINGER Outlet °F (Ti)	AUX °F (Tx)	Pump Vacuum inHg (Pv)
	.	1237	898.394				Amb:	Amb:	Amb:	Amb:	Amb:	Amb:		
1	1 5		899.91	.0005	.24	.24	112	63	64	277	252	40		3
2	1 10		901.44	.0003	.15	.15	117	63	63	273	253	41		2
3	2 15		902.54	.0002	.10	.10	127	63	63	275	255	41		2
4	2 20		903.61	.0002	.10	.10	126	63	63	275	255	43		2
5	3 25		.	.0002	.10	.10	134	64	63	274	256	43		2
6	3 30		905.76	Bias Check JUM										
7	4 35		906.77	.0002	.10	.10	134	65	64	273	256	45		2
8	4 40		907.81	.0002	.10	.10	133	66	65	273	255	46		2
9	5 45		909.03	.0003	.15	.15	128	66	65	272	255	46		3
10	5 50		910.20	.0003	.15	.15	132	66	65	274	255	49		3
11	6 55		911.40	.0003	.15	.15	137	67	65	273	255	50		3
12	6 60		912.40	.0002	.10	.10	136	68	66	265	255	52		2
13	1 65		913.39	.0002	.10	.10	130	68	66	274	254	47		2
14	1 70		914.37	.0002	.10	.10	130	68	66	273	255	44		2
15	2 75		915.35	.0002	.10	.10	128	68	67	273	256	42		2
16	2 80		— . —	.0002	.10	.10	136	69	67	273	255	41		2
17	3 85		917.54	.0003	.15	.15	144	69	67	275	255	43		3
18	3 90		918.82	.0003	.15	.15	144	69	68	275	252	42		3
19	4 95		920.11	.0003	.15	.15	145	70	68	273	255	41		3
20	4 100		921.38	.0003	.15	.15	144	70	68	272	253	41		3
21	5 105		922.74	.0004	.20	.20	145	70	68	271	252	41		3
22	5 110		924.97	.0003	.15	.15	145	70	68	270	255	41		3
23	6 115		925.02	.0002	.10	.10	145	71	69	272	254	41		3
24	6 120	237	926.050	.0003	.15	.15	144	71	69	272	254	41		3
25			.											

Notes:

Field Data Sheet

Horizon Engineering

Client/Plant/Location : OSU East Cycle 2

Date 12/17/98

Test Method ODEQ7

Concurrent Testing

Run # 2

Operator CDB Support

Temperature, Am (Ta) 35

Pressure, Bar (Pb) 30.6

Pressure, Static (Pstat) 0

Probe 3-2 Cp Heat Set °F

Pitot	Pretest	in	in/min
Leak Check	Post	in	in/min

Nozzle .988

Sample Box 1 Heat Set °F

Meter Box 7 dH@ Y

Meter	Pretest	cfm	inHg
Leak Check	Post .001	cfm 5	inHg

Stack Diagram

Filters Cyclonic Flow ? Moisture Tdb Twb

Traverse Point Number	Sampling Time min (dt)	Clock Time (24 hr)	Dry Gas Meter Reading cuft (Vm)	Velocity Head inH2O (dPs)	Orifice Pressure inH2O DESIRED	Orifice Pressure inH2O ACTUAL (dH)	STACK °F (Ts)	METER Inlet/Avg. °F (Tm-in)	METER Outlet °F (Tm-out)	PROBE °F (Tp)	OVEN Filter °F (To)	IMPINGER Outlet °F (Ti)	AUX °F (Tx)	Pump Vacuum inHg (Pv)
		239	926.050				Amb:	Amb:	Amb:	Amb:	Amb:	Amb:		
1	5		927.27	.0003	.15	.15	145	71	69	276	254	41		3
1	10		928.50	.0003	.15	.15	145	71	69	274	254	41		3
2	15		929.51	.0002	.10	.10	145	71	69	274	255	42		3
2	20		930.51	.0002	.10	.10	145	71	69	275	255	41		3
3	25		931.51	.0002	.10	.10	145	71	69	273	255	41		3
3	30		932.50	.0002	.10	.10	145	71	69	275	254	43		3
4	35		933.77	.0003	.15	.15	145	71	70	274	255	41		3
4	40		934.75	.0002	.10	.10	145	71	70	275	256	43		3
5	45		935.70	.0002	.10	.10	145	71	70	275	255	43		3
5	50		936.66	.0002	.10	.10	145	71	70	275	255	43		3
6	55	334	937.638	.0002	.10	.10	145	71	70	275	255	43		3
6	60		.											
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Notes:

Field Data Sheet

Horizon Engineering

Date 12/17/98
Test Method ODEQ 7
Concurrent Testing 25A
Run # 3
Operator CDP Support
Temperature, Am (Ta) 35
Pressure, Bar (Pb) 30.6
Pressure, Static (Pstat) 0

Client/Plant/Location: OSU West Cycle 2
Probe 3-1 Cp Heat Set 250 °F
Pilot Pretest in in/min
Leak Check Post in in/min
Nozzle .988
Sample Box 6 Heat Set 250 °F
Meter Box 4 dH@ Y
Meter Pretest .015 cfm 15 inHg
Leak Check Post cfm inHg

Stack Diagram

Filters Cyclonic Flow? ____ Moisture Tdb Twb

	Traverse Point Number	Sampling Time min (dt)	Clock Time (24 hr)	Dry Gas Meter Reading cuft (Vm)	Velocity Head inH2O (dPs)	Orifice Pressure inH2O DESIRED	Orifice Pressure inH2O ACTUAL (dH)	STACK °F (Ts)	METER Inlet/Avg °F (Tm-in)	METER Outlet °F (Tm-out)	PROBE °F (Tp)	OVEN Filter °F (To)	IMPINGER Outlet °F (Ti)	AUX °F (Tx)	Pump Vacuum inHg (Pv)
			337	502.932				Amb:	Amb:	Amb:	Amb:	Amb:	Amb:		
1	1	5		503.95	.0003	.15	.15	132	71	70	258	262	39		3
2	1	10		.	.0004	.20	.20	142	71	70	258	262	39		
3	2	15		—.—											
4	2	20		507.25	.0005	.24	.24	141	72	70	257	262	37		5
5	3	25		508.75	.0006	.29	.29	142	72	70	257	261	37		5
6	3	30		510.15	.0005	.24	.24	142	73	70	256	262	36		5
7	4	35		511.34	.0004	.20	.20	142	73	71	257	262	37		4
8	4	40		512.59	.0004	.20	.20	142	74	71	257	262	39		4
9	5	45		513.97	.0005	.24	.24	142	74	71	257	262	37		5
10	5	50		515.34	.0005	.24	.24	142	76	72	256	262	37		5
11	6	55		—.—	.0004	.20	.20	142	76	72	257	261	37		4
12	6	60		518.06	.0006	.29	.29	142	78	73	257	262	38		5
13	1	65		519.44	.0005	.24	.24	142	78	74	256	261	37		5
14	1	70		520.70	.0004	.20	.20	142	79	74	255	262	37		4
15	2	75		521.97	.0004	.20	.20	142	79	74	256	261	37		4
16	2	80		523.23	.0004	.20	.20	142	79	75	256	262	37		4
17	3	85		524.49	.0004	.20	.20	142	80	75	256	262	37		4
18	3	90		525.80	.0004	.20	.20	142	80	76	255	261	37		4
19	4	95		526.70	.0002	.10	.10	142	80	76	256	262	37		3
20	4	100		528.10	.0005	.24	.24	143	80	76	256	262	37		5
21	5	105		529.23	.0003	.15	.15	143	81	77	256	262	37		3
22	5	110		530.68	.0005	.24	.24	143	81	77	255	261	37		5
23	6	115		532.09	.0004	.20	.20	143	82	77	255	261	37		4
24	6	120	537	533.545	.0005	.24	.24	143	81	77	255	261	38		5
25				.											

Notes:

Field Data Sheet

Horizon Engineering

Date 12/17/98
Test Method ODEQ 7
Concurrent Testing 25A
Run # 3
Operator CDB Support
Temperature, Am (Ta) 35
Pressure, Bar (Pb) 30.6
Pressure, Static (Pstat) 0

Client/Plant/Location: OSU West Cycle 2
Probe 3-1 Cp Heat Set 250 °F
Pitot Pretest in in/min
Leak Check Post in in/min
Nozzle .988
Sample Box 6 Heat Set 250 °F
Meter Box 4 dH@ Y
Meter Pretest cfm inHg
Leak Check Post .008 cfm 6 inHg

Stack Diagram

Filters Cyclonic Flow? Moisture Tdb Twb

Traverse Point Number	Sampling Time min (dt)	Clock Time (24 hr)	Dry Gas Meter Reading cuft (Vm)	Velocity Head inH2O (dPs)	Orifice Pressure inH2O DESIRED	Orifice Pressure inH2O ACTUAL (dH)	STACK °F (Ts)	METER Inlet/Avg °F (Tm-in)	METER Outlet °F (Tm-out)	PROBE °F (Tp)	OVEN Filter °F (To)	IMPINGER Outlet °F (Ti)	AUX °F (Tx)	Pump Vacuum inHg (Pv)
		539	533.545				Amb:	Amb:	Amb:	Amb:	Amb:	Amb:		
1	1 5		534.52	.0002	.10	.10	142	80	78	256	262	40		3
2	1 10		535.63	.0003	.15	.15	142	80	77	256	261	42		4
3	2 15		536.77	.0003	.15	.15	142	80	77	256	261	42		4
4	2 20		537.91	.0003	.15	.15	143	80	77	255	262	42		4
5	3 25		538.90	.0002	.10	.10	142	81	77	255	262	43		3
6	3 30		540.03	.0003	.15	.15	143	80	77	255	260	42		4
7	4 35		541.17	.0003	.15	.15	143	80	77	255	260	42		4
8	4 40		542.63	.0005	.24	.24	143	80	77	255	260	44		5
9	5 45		543.77	.0003	.15	.15	143	80	77	254	262	44		4
10	5 50	629	544.908	.0003	.15	.15	143	80	77	256	262	44		4
11	6 55		.											
12	6 60		.											
13			.											
14			.											
15			.											
16			.											
17			.											
18			.											
19			.											
20			.											
21			.											
22			.											
23			.											
24			.											
25			.											

Notes:

Field Data Sheet

Horizon Engineering

Date 12/17/98
Test Method OD EQ 7
Concurrent Testing 25A
Run # 4
Operator CDB Support
Temperature, Am (Ta) 35
Pressure, Bar (Pb) 30.6
Pressure, Static (Pstat) 0

Client/Plant/Location: OSU East Cycle 2
Probe 3-2 Cp Heat Set 250 °F
Pitot Pretest in in/min
Leak Check Post in in/min
Nozzle .988
Sample Box 1 Heat Set 250 °F
Meter Box 7 dH@ Y
Meter Pretest .01 cfm 15 inHg
Leak Check Post cfm inHg

Stack Diagram

Filters Cyclonic Flow? Moisture 18 Tdb Twb

Traverse Point Number	Sampling Time min (dt)	Clock Time (24 hr)	Dry Gas Meter Reading cuft (Vm)	Velocity Head inH2O (dPs)	Orifice Pressure inH2O DESIRED	Orifice Pressure inH2O ACTUAL (dH)	STACK °F (Ts) Amb:	METER Inlet/Avg. °F (Tm-in) Amb:	METER Outlet °F (Tm-out) Amb:	PROBE °F (Tp) Amb:	OVEN Filter °F (To) Amb:	IMPINGER Outlet °F (Ti) Amb:	AUX °F (Tx)	Pump Vacuum inHg (Pv)
		637	937.817											
1 1	5		939.31	.0005	.24	.24	128	65	65	274	255	44		3
2 1	10		.	.0002	.10	.10	143	65	65	272	255	47		2
3 2	15		941.28		Bias	Check	JVM							
4 2	20		942.26	.0002	.10	.10	142	64	65	276	255	52		2
5 3	25		943.23	.0002	.10	.10	143	65	65	273	257	52		2
6 3	30		944.45	.0003	.15	.15	143	65	64	273	255	48		3
7 4	35		945.68	.0003	.15	.15	144	65	65	272	255	45		3
8 4	40		946.91	.0003	.15	.15	144	66	65	273	255	46		3
9 5	45		948.16	.0003	.15	.15	144	66	65	273	256	45		3
10 5	50		949.16	.0002	.10	.10	143	67	65	274	255	45		2
11 6	55		950.17	.0002	.10	.10	142	68	66	275	255	45		2
12 6	60	737	951.19	.0002	.10	.10	143	69	66	275	257	44		2
13 1	65		952.41	.0003	.15	.15	143	69	66	276	257	46		3
14 1	70		953.63	.0003	.15	.15	143	69	67	275	255	46		3
15 2	75		954.83	.0003	.15	.15	143	69	68	274	257	46		3
16 2	80		957.17	.0013	.63	.63	143	69	68	274	255	45		6
17 3	85		959.49	.0013	.63	.63	143	71	68	276	255	47		6
18 3	90		.	.0013	.63	.63	143	72	68	273	255	47		6
19 4	95		.											
20 4	100		966.54	.0007	.34	.34	144	74	69	272	253	45		6
21 5	105		968.888	.0008	.46	.46	144	74	69	272	253	43		5
22 5	110		970.34	.0007		.40	145	74	70	274	256	44		4
23 6	115		972.10	.0007		.40	145	74	70	274	255	44		4
24 6	120	837	973.968	.0007		.40	144	75	70	270	256	44		4
25			.											

Notes:

Field Data Sheet

Horizon Engineering

Client/Plant/Location : OSU / East / cyc 2

Date 12-17-98

Test Method 7

Concurrent Testing 25A

Run # 4

Operator DRS Support

Temperature, Am (Ta) 35

Pressure, Bar (Pb) 30.58

Pressure, Static (Pstat) 0

Filters 98M-200 98S-14

Probe 3-2 Cp Heat Set 250 °F

Pilot	Pretest	in	in/min
Leak Check	Post	3 in 0	in/min

Nozzle 988

Sample Box 1 Heat Set 250 °F

Meter Box 7 dH@ 1.76 Y 1

Meter	Pretest	cfm	inHg
Leak Check	Post 0.015	cfm 9	inHg

Stack Diagram

Cyclonic Flow ?

Moisture 18 Tdb Twb

Traverse Point Number	Sampling Time min (dt)	Clock Time (24 hr)	Dry Gas Meter Reading cuft (Vm)	Velocity Head inH2O (dPs)	Orifice Pressure inH2O DESIRED	Orifice Pressure inH2O ACTUAL (dH)	STACK °F (Ts)	METER Inlet/Avg. °F (Tm-in)	METER Outlet °F (Tm-out)	PROBE °F (Tp)	OVEN Filter °F (To)	IMPINGER Outlet °F (Ti)	AUX °F (Tx)	Pump Vacuum inHg (Pv)
		838	973.968				Amb:	Amb:	Amb:	Amb:	Amb:	Amb:		
1 6	5		.	.0005	.287	.29	144	73	71	273	255	41		4
2 6	10		. Dry		Silica	Gel								
3 5	15		978.79	.0005		.30	144	72	71	273	256	44		4
4 5	20		980.46	.0005		.30	144	72	71	272	255	45		4
5 4	25		982.13	.0006	.344	.34	145	72	71	270	255	44		4
6 4	30	908	983.67	.0004		.26	145	72	71	273	253	44		4
7 3	35		985.32	.0006		.34	145	72	71	272	255	46		4
8 3	40		987.12	.0006		.34	145	72	70	273	250	47		4
9 2	45		988.75	.0005		.30	145	72	70	273	254	48		4
10 2	50	928	990.334	.0005		.30	145	72	70	273	255	49		4
11 1			.											
12 1			.											
13			.											
14			.											
15			.											
16			.											
17			.											
18			.											
19			.											
20			.											
21			.											
22			.											
23			.											
24			.											
25			.											

Notes:

Field Data Sheet

Horizon Engineering

Client/Plant/Location: OSU/west/cyc 2

Date 12-17-98

Test Method 7

Concurrent Testing 25A

Run # 5 west cyc 2

Operator DRD Support

Temperature, Am (Ta) 40

Pressure, Bar (Pb) 30.7

Pressure, Static (Pstat) 0

Filters 98m-206 98s-15

Probe 3-1 Cp Heat Set 250 °F

Pitot Pretest in in/min

Leak Check Post in in/min

Nozzle 988

Sample Box 6 Heat Set °F

Meter Box 4 dH@ Y

Meter Pretest 0.005 cfm 10 inHg

Leak Check Post cfm inHg

Stack Diagram

Cyclonic Flow?

Moisture 18 Tdb Twb

Traverse Point Number	Sampling Time min (dt)	Clock Time (24 hr)	Dry Gas Meter Reading cuft (Vm)	Velocity Head inH2O (dPs)	Orifice Pressure inH2O DESIRED	Orifice Pressure inH2O ACTUAL (dH)	STACK °F (Ts)	METER Inlet/Avg. °F (Tm-in)	METER Outlet °F (Tm-out)	PROBE °F (Tp)	OVEN Filter °F (To)	IMPINGER Outlet °F (Ti)	AUX °F (Tx)	Pump Vacuum inHg (Pv)
		936	544.971				Amb:	Amb:	Amb:	Amb:	Amb:	Amb:		
1	6	5	Cal Sum	.0004		.25	141	66	66	256	261	40		7
2	6	10	.	.0006	.336	.34	141	66	66	256	261	40		8
3	5	15	549.50	.0006		.34	141	67	66	256	261	40		8
4	5	20	551.64	.0010	.559	.56	141	68	66	256	262	40		10
5	4	25	553.00	.0004	.224	.22	142	69	66	255	261	40		5
6	4	30	554.250	.0004		.22	142	70	67	255	261	41		5
7	3	35	555.5555	.0012	.679	.68	142	71	67	255	261	41		5
8	3	40	558.88	.0012		.68	142	74	68	245	261	43		9
9	2	45	561.325	.0013		.68	142	76	69	245	261	44		9
10	2	50	.	.0014	.779	.78	142	77	70	256	261	46		9½
11	1	55	566.46	.0018	1.0	.86	142	79	71	255	261	46		9½
12	1	60	569.48	.0018		1.0	140	80	72	253	261	46		10
13	1	65	572.62	.0018		1.0	141	81	73	256	262	45		10
14	1	70	575.27	.0017		.95	141	82	74	251	261	46		9
15	2	75	.	.0018		1.0	141	83	74	257	262	48		10
16	2	80	.			1.1								
17	3	85	584.000	.0017		.95	141	84	76	258	262	53		8
18	3	90	587.17	.0018		1.0	141	84	76	258	262	55		8
19	4	95	5 .	.0017		.95	140	84	77	255	262	56		8
20	4	100	592.002	.0002	.115	.12	143	84	78	258	262	56		3
21	5	105	593.02	.0002		.12	143	83	78	258	262	56		3
22	5	110	590.92	.0002		.12	143	82	78	257	263	54		3
23	6	115	594.91	.0002		.12	143	82	78	256	262	53		3
24	6	120	1136 595.86	.0002		.12	144	81	78	256	262	53		3
25			.											

Notes:

Field Data Sheet

Horizon Engineering

Client/Plant/Location : OSU/west Kyle 2

Date 12-17-98

Test Method 7

Concurrent Testing 25A

Run # 5 cont

Operator DRB Support

Temperature, Am (Ta) 40

Pressure, Bar (Pb) 30.7

Pressure, Static (Pstat) 0

Filters 98M-206 985-15

Probe 3-1 Cp 0.8 Heat Set 250 °F

Pitot	Pretest	in	in/min
Leak Check	Post	in	in/min

Nozzle 988

Sample Box 6 Heat Set 250 °F

Meter Box 4 dH@ Y

Meter	Pretest	cfm		inHg
Leak Check	Post 0.012	cfm	11	inHg

Stack Diagram

Cyclonic Flow ?

Moisture 18 Tdb Twb

Traverse Point Number	Sampling Time min (dt)	Clock Time (24 hr)	Dry Gas Meter Reading cuft (Vm)	Velocity Head inH2O (dPs)	Orifice Pressure inH2O DESIRED	Orifice Pressure inH2O ACTUAL (dH)	STACK °F (Ts)	METER Inlet/Avg °F (Tm-in)	METER Outlet °F (Tm-out)	PROBE °F (Tp)	OVEN Filter °F (To)	IMPINGER Outlet °F (Ti)	AUX °F (Tx)	Pump Vacuum inHg (Pv)
	.	1156	595.860				Amb:	Amb:	Amb:	Amb:	Amb:	Amb:		
1 6	5		5 .	.0003	.172	.17	145	79	78	257	262	46		3
2 6	10		598.30	.0003		.17	145	80	79	257	262	46		3
3 5	15		.	.0003		.17	145	80	78	257	263	46		3
4 5	20		.			.17								
5 4	25		.			.17								
6 4	30	1226	603.08	.0003		.17	147	82	80	257	263	47		3
7 3	35	1231	604.19	.0003		.17	147	82	80	257	262	47		3
8 3			.											
9			.											
10			.											
11			.											
12			.											
13			.											
14			.											
15			.											
16			.											
17			.											
18			.											
19			.											
20			.											
21			.											
22			.											
23			.											
24			.											
25			.											

Notes:

Field Data Sheet

Horizon Engineering

Client/Plant/Location: OSU / East / cyc 2

Date 12-17-98

Test Method 7

Concurrent Testing 25A

Run # 6 east cyc 2

Operator DRS Support

Temperature, Am (Ta) 42

Pressure, Bar (Pb) 30.7

Pressure, Static (Pstat) 0

Filters M-200 S-14

Probe 3-2 Cp 0.8 Heat Set 250 °F

Pitot	Pretest	in	in/min
Leak Check	Post	in	in/min

Nozzle .188

Sample Box 1 Heat Set 250 °F

Meter Box 7 dH@ 1.758 Y .977

Meter	Pretest	0.003 cfm	14 inHg
Leak Check	Post	cfm	inHg

Stack Diagram

Cyclonic Flow? _____

Moisture 18 Tdb Twb

Traverse Point Number	Sampling Time min (dt)	Clock Time (24hr)	Dry Gas Meter Reading cuft (Vm)	Velocity Head inH2O (dPs)	Orifice Pressure inH2O DESIRED	Orifice Pressure inH2O ACTUAL (dH)	STACK °F (Ts)	METER Inlet/Avg. °F (Tm-in)	METER Outlet °F (Tm-out)	PROBE °F (Tp)	OVEN Filter °F (To)	IMPINGER Outlet °F (Tl)	AUX °F (Tx)	Pump Vacuum inHg (Pv)
		1236	990.603				Amb:	Amb:	Amb:	Amb:	Amb:	Amb:		
1 6	5		.	.0002	.115	.12	137	71	71	272	255	42		3
2 6	10		99 .	.0002		.12								3
3 5	15		993.8	.0002		.12	146	70	70	274	255	55		3
4 5	20		995.00	.0002		.12	146	70	70	274	255	53		3
5 4	25		996.91	.0004		0.23	148	71	71	275	251	51		3
6 4	30		997.89	.0005		.28	149	71	71	274	255	50		4
7 3	35		999.55	.0005		.29	149	72	71	275	254	50		4
8 3	40		.	.0001	.06	.06	149	73	71	275	253	50		4
9 2	45		.			.06								
10 2	50		1001.	.0002		.06								
11 1	55		2.91	.0006	.346	.35	150	74	72	270	260	50		4
12 1	60	1336	4.71	.0006		.35	150	74	72	272	255	49		4
13 1	65		6.33	.0005		.29	149	74	72	273	250	47		4
14 1	70		8.21	.0006		.35	150	74	72	272	255	48		5
15 2	75		9.57	.0005		.29	150	75	72	272	254	48		4
16 2	80		11.34	.0006		.35	150	75	72	272	254	47		4
17 3	85		.	.0005		.29	150	75	73	272	254	49		4
18 3	90		14.61	.0005		.29	150	75	73	272	252	49		4
19 4	95		.	.0005		.29	150	75	73	272	252	49		4
20 4	100		.	.0005										
21 5	105		.											
22 5	110		20.99	.0006		.35	150	75	73	272	255	51		5
23 6	115		22.91	.0006		.35	150	75	73	272	255	51		5
24 6	120	1436	24.738	.0006		.35	150	75	73	271	251	52		5
25			.											

Notes:

Field Data Sheet

Horizon Engineering

Client/Plant/Location : OSU/ [illegible] /C2

Date 12-17-98

Test Method 7

Concurrent Testing 25A

Run # 6 cont Cycle 2

Operator DEQ Support

Temperature, Am (Ta) 42

Pressure, Bar (Pb) 30.7

Pressure, Static (Pstat) 0

Filters 99m200 3-14

Probe 3-2 Cp Heat Set °F

Pitot Pretest in in/min

Leak Check Post in in/min

Nozzle .988

Sample Box 1 Heat Set °F

Meter Box 7 dH@ Y

Meter Pretest cfm inHg

Leak Check Post 0.003 cfm 6 inHg

Stack Diagram

Cyclonic Flow ?

Moisture 18 Tdb Twb

Traverse Point Number	Sampling Time min (dt)	Clock Time (24 hr)	Dry Gas Meter Reading cuft (Vm)	Velocity Head inH2O (dPs)	Orifice Pressure inH2O DESIRED	Orifice Pressure inH2O ACTUAL (dH)	STACK °F (Ts)	METER Inlet/Avg °F (Tm-in)	METER Outlet °F (Tm-out)	PROBE °F (Tp)	OVEN Filter °F (To)	IMPINGER Outlet °F (Ti)	AUX °F (Tx)	Pump Vacuum inHg (Pv)
	.	1438	24.738				Amb:	Amb:	Amb:	Amb:	Amb:	Amb:		
1	6	5	26.21	.0004		.23	149	74	72	273	253	53		3
2	6	10	27.61	.0004		.23	151	74	72	272	253	55		3
3	5	15	29.03	.0004		.23	151	74	72	272	253	55		3½
4	5	20	30.43	.0004		.23	151	74	72	272	254	54		3½
5	4	25	31.82	.0004		.23	152	74	72	272	251	53		3½
6	4	30	33.1	.0004		.23	153	73	72	273	254	54		3½
7	3	35	34.41	.0002	.116	.12	150	72	71	273	252	52		3
8	3	40	35.40	.0002		.12	149	72	71	272	253	52		3
9	2	45	.	.0004		.23	148	71	71	270	251	54		3
10	2	50	38.24	.0002		.12	147	71	70	271	251	54		3
11	1	55	1533 39.300	.0002		.12	147	71	70	271	251	53		3
12	1		.											
13			.											
14			.											
15			.											
16			.											
17			.											
18			.											
19			.											
20			.											
21			.											
22			.											
23			.											
24			.											
25			.											

Notes:

Field Data Sheet

Horizon Engineering

Client/Plant/Location: OSU / West / Cyc 2

Date 12-17-98

Test Method 7

Concurrent Testing 25A

Run # 7 cyc 2 west

Operator RRB Support JDF

Temperature, Am (Ta) 45

Pressure, Bar (Pb) 30.7

Pressure, Static (Pstat) 0

Filters 98m 206 5-15

Probe 3-1 Cp Heat Set 250 °F

Pitot Pretest in in/min

Leak Check Post in in/min

Nozzle 988

Sample Box 6 Heat Set °F

Meter Box 4 dH@ Y

Meter Pretest 0.011 cfm 12 inHg

Leak Check Post cfm inHg

Stack Diagram

Cyclonic Flow?

Moisture 18 Tdb Twb

Traverse Point Number	Sampling Time min (dt)	Clock Time (24 hr)	Dry Gas Meter Reading cu ft (Vm)	Velocity Head inH2O (dPs)	Orifice Pressure inH2O DESIRED	Orifice Pressure inH2O ACTUAL (dH)	STACK °F (Ts)	METER Inlet/Avg. °F (Tm-in)	METER Outlet °F (Tm-out)	PROBE °F (Tp)	OVEN Filter °F (To)	IMPINGER Outlet °F (Ti)	AUX °F (Tx)	Pump Vacuum inHg (Pv)
		1537	604.609				Amb:	Amb:	Amb:	Amb:	Amb:	Amb:		
1 6	5		Cal	.0003		.17	145	65	65	254	261	45		2½
2 6	10		Cal	JUM		.								
3 5	15		608.58	.0011	.612	.61	146	65	65	254	261	46		~~2½~~ 5
4 5	20		610.875	.0011		.61	146	66	65	252	261	46		5
5 4	25		613.18	.0011		.61	146	67	65	254	261	48		5
6 4	30		615.44	.0011		.61	147	69	65	253	261	52		5
7 3	35		617.66	.0011		.61	147	70	65	254	262	53		5
8 3	40	1612	619.85	.0010	.56	.56	147	71	66	254	262	56		5.0
9 2	45	1617	622.30	.0013	.72	.72	147	72	67	254	263	58		6.0
10 2	50	1627	624.82	.0014	.78	.78	148	74	67	255	261	62		6.5
11 1	55	1632	627.08	.0011	.61	.61	147	77	70	255	261	64		5.5
12 1	60	1637	629.73	.0015	.84	.84	148	78	70	257	261	67		6.5
13 1	65	1642	632.42	.0016	.89	.89	148	80	72	256	262	62		7.0
14 1	70	1647	634.70	.0011	.61	.61	147	81	72	256	262	58		5.5
15 2	75	1652	637.19	.0013	.72	.72	149	82	73	258	262	55		6.0
16 2	80	1657	639.87	.0014	.78	.78	149	83	74	258	262	53		6.0
17 3	85	1702	642.74	.0020	1.1	1.1	149	84	75	257	262	54		7.5
18 3	90	1707	645.26	.0013	.72	.72	150	87	76	258	262	56		6.0
19 4	95	1712	648.03	.0017	.95	.95	150	86	77	257	262	57		7.0
20 4	100	1717	650.32	.0012	.67	.67	149	88	78	257	262	59		6.0
21 5	105	1722	652.16	.0007	.39	.39	150	89	80	257	261	58		4.5
22 5	110	1727	654.08	.0008	.45	.45	150	88	80	257	261	57		4.5
23 6	115	1732	655.95	.0007	.39	.39	150	89	81	256	261	59		4.5
24 6	120	1737	658.13	.0010	.56	.56	150	90	82	256	261	59		5.0
25														

Notes:

Field Data Sheet

Horizon Engineering

Client/Plant/Location: OSU/West/Cyc 2

Date 12-17-98

Test Method OPE Q 7

Concurrent Testing EPA 25A

Run # 7 Cyc 2 West

Operator SDF Support

Temperature, Am (Ta) 40

Pressure, Bar (Pb) 30.7

Pressure, Static (Pstat) 0

Filters 98M-206, 98S-15

Probe 3-1 Cp Heat Set 250 °F

Pitot	Pretest	in	in/min
Leak Check	Post	in	in/min

Nozzle .988

Sample Box 6 Heat Set 250 °F

Meter Box 4 dH@ Y

Meter	Pretest	cfm		inHg
Leak Check	Post .012	cfm	15	inHg

Stack Diagram

Cyclonic Flow? No

Moisture 18 Tdb NA Twb NA

Traverse Point Number	Sampling Time min (dt)	Clock Time (24 hr)	Dry Gas Meter Reading cuft (Vm)	Velocity Head inH2O (dPs)	Orifice Pressure inH2O DESIRED	Orifice Pressure inH2O ACTUAL (dH)	STACK °F (Ts) Amb:	METER Inlet/Avg. °F (Tm-in) Amb:	METER Outlet °F (Tm-out) Amb:	PROBE °F (Tp) Amb:	OVEN Filter °F (To) Amb:	IMPINGER Outlet °F (Ti) Amb:	AUX °F (Tx)	Pump Vacuum inHg (Pv)
1 1	125	1745	660.46	.0011	.61	.61	150	91	83	256	261	61		5.5
2 1	130	1750	662.98	.0013	.72	.72	150	93	84	256	251	65		6.0
3 2	135	1755	665.91	.0017	.95	.95	150	93	86	253	261	70		7.5
4 2	140	1800	667.99	.0009	.50	.50	150	94	86	256	261	60		5.0
5 3	145	1805	669.96	.0008	.45	.45	150	94	87	255	261	54		5.0
6 3	150	1810	671.62	.0006	.33	.33	150	94	87	256	260	50		4.0
7 4	155	1815	.	.0007	.39	.39	150			255				
8 4	160	1820	.	.0013	.72	.72								
9 5	165	1825	.											
10 5	170	1830	.											
11 6	175	1835	683.352											
12			.											
13			.											
14			.											
15			.											
16			.											
17			.											
18			.											
19			.											
20			.											
21			.											
22			.											
23			.											
24			.											
25			.											

Notes:

Field Data Sheet

Horizon Engineering

Client/Plant/Location: OSU/Cycle 2/East

Date 12-17-98

Test Method ODE Q7

Concurrent Testing EPA 25A

Run # 8

Operator SDF Support

Temperature, Am (Ta) 40

Pressure, Bar (Pb) 30.7

Pressure, Static (Pstat) 0

Filters 98M-200, 935-14

Probe 3-2 Cp Heat Set 250 °F

Pitot	Pretest	in	in/min
Leak Check	Post	in	in/min

Nozzle

Sample Box 1 Heat Set 250 °F

Meter Box 7 dH@ Y

Meter	Pretest .012	cfm	14	inHg
Leak Check	Post	cfm		inHg

Stack Diagram

Cyclonic Flow?

Moisture 18 Tdb NA Twb NA

Traverse Point Number	Sampling Time min (dt)	Clock Time (24 hr)	Dry Gas Meter Reading cuft (Vm)	Velocity Head inH2O (dPs)	Orifice Pressure inH2O DESIRED	Orifice Pressure inH2O ACTUAL (dH)	STACK °F (Ts)	METER Inlet/Avg °F (Tm-in)	METER Outlet °F (Tm-out)	PROBE °F (Tp)	OVEN Filter °F (To)	IMPINGER Outlet °F (Ti)	AUX °F (Tx)	Pump Vacuum inHg (Pv)
		1837	039.514				Amb:	Amb:	Amb:	Amb:	Amb:	Amb:		
1 1	5	1842	.	.0005	.28	.28	136	71	72	272	253	55		3.0
2 1	10	1847	.											
3 2	15	1852	.											
4 2	20	1857	.											
5 3	25	1902	.											
6 3	30	1907	.											
7 4	35	1912	.											
8 4	40	1917	.											
9 5	45	1922	.											
10 5	50	1927	054.86											
11 6	55	1932	056.55	.0007	.39	.39	149	73	71	272	256	69		3.5
12 6	60	1937	058.16	.0005	.28	.28	150	73	71	275	255	72		3.0
13 6	65	1942	059.83	.0005	.28	.28	149	73	71	274	255	61		3.0
14 6	70	1947	061.45	.0006	.33	.33	149	73	71	275	254	57		3.0
15 5	75	1952	062.99	.0005	.28	.28	149	74	71	273	255	53		3.0
16 5	80	1957	064.52	.0005	.28	.28	150	73	71	273	254	51		3.0
17 4	85	2002	066.04	.0005	.28	.28	150	72	71	274	254	51		3.0
18 4	90	2007	067.55	.0005	.28	.28	150	72	71	273	255	48		3.0
19 3	95	2012	069.06	.0006	.33	.33	150	72	71	275	254	48		3.0
20 3	100	2017	070.56	.0006	.33	.33	150	72	71	274	254	51		3.0
21 2	105	2022	072.04	.0006	.33	.33	150	72	71	274	255	51		3.0
22 2	110	2027	073.53	.0006	.33	.33	150	72	71	273	256	53		3.0
23 1	115	2032	075.20	.0005	.28	.28	151	72	71	274	256	52		3.0
24 1	120	2037	076.90	.0005	.28	.28	151	72	71	274	255	53		3.0
25			.											

JUM BIAS

Notes:

Field Data Sheet

Horizon Engineering

Date 12-17-98
Test Method ODEQ M7
Concurrent Testing EPA M25A
Run # 8
Operator SDF Support
Temperature, Am (Ta) 35
Pressure, Bar (Pb) 30.7
Pressure, Static (Pstat) 0
Filters 98M-200, 98S-14

Client/Plant/Location : OSU 1[illegible] 2/East
Probe 3-2 Cp Heat Set 250 °F

Pitot	Pretest	in		in/min
Leak Check	Post	in		in/min

Nozzle .988
Sample Box 1 Heat Set 250 °F
Meter Box 7 dH@ Y

Meter	Pretest	cfm	6	inHg
Leak Check	Post .002	cfm	6	inHg

Stack Diagram
Cyclonic Flow ? NO
Moisture 18 Tdb NA Twb NA

Traverse Point Number	Sampling Time min (dt)	Clock Time (24 hr)	Dry Gas Meter Reading cuft (Vm)	Velocity Head inH2O (dPs)	Orifice Pressure inH2O DESIRED	Orifice Pressure inH2O ACTUAL (dH)	STACK °F (Ts) Amb:	METER Inlet/Avg. °F (Tm-in) Amb:	METER Outlet °F (Tm-out) Amb:	PROBE °F (Tp) Amb:	OVEN Filter °F (To) Amb:	IMPINGER Outlet °F (Ti) Amb:	AUX °F (Tx)	Pump Vacuum inHg (Pv)
1	1	125	2045	078.88	.0007	.39	.39	151	72	71	275	254	56		4.0
2	1	130	2050	080.53	.0006	.33	.33	151	73	71	273	255	57		3.0
3	2	135	2055	082.08	.0005	.28	.28	152	73	71	273	255	59		3.0
4	2	140	2100	083.53	.0004	.23	.23	151	73	71	273	255	60		3.0
5	3	145	2105	085.31	.0006	.33	.33	151	73	71	274	255	61		3.5
6	3	150	2110	086.68	.0005	.28	.28	151	73	71	274	256	64		3.0
7	4	155	2115	088.11	.0005	.28	.28	151	73	71	275	254	64		3.0
8	4	160	2120	089.51	.0004	.23	.23	151	73	71	275	256	64		3.0
9	5	165	2125	091.27	.0006	.33	.33	152	73	71	272	254	63		4.0
10	5	170	2130	092.71	.0004	.23	.23	152	74	71	272	255	63		3.0
11	6	175	2135	094.232	.0005	.28	.28	152	74	71	272	254	61		3.5
12															
13															
14															
15															
16															
17															
18															
19															
20															
21															
22															
23															
24															
25															

Notes:

Field Data Sheet

Horizon Engineering

Client/Plant/Location: OSU/Cycle 2/West

Date 12-17-98

Test Method 00EQ7

Concurrent Testing EPA 25A

Run # 9

Operator SDF Support CDB

Temperature, Am (Ta) 35

Pressure, Bar (Pb) 30.7

Pressure, Static (Pstat) 0

Filters 98M-206 98S-15

Probe 3-1 Cp Heat Set °F

Pitot	Pretest	in	in/min
Leak Check	Post	in	in/min

Nozzle .988

Sample Box 6 Heat Set °F

Meter Box 4 dH@ Y

Meter	Pretest .008	cfm	15	inHg
Leak Check	Post .017	cfm	14	inHg

Stack Diagram

Cyclonic Flow?

Moisture 18 Tdb Twb

Traverse Point Number	Sampling Time min (dt)	Clock Time (24 hr)	Dry Gas Meter Reading cuft (Vm)	Velocity Head inH2O (dPs)	Orifice Pressure inH2O DESIRED	Orifice Pressure inH2O ACTUAL (dH)	STACK °F (Ts) Amb:	METER Inlet/Avg. °F (Tm-in) Amb:	METER Outlet °F (Tm-out) Amb:	PROBE °F (Tp) Amb:	OVEN Filter °F (To) Amb:	IMPINGER Outlet °F (Ti) Amb:	AUX °F (Tx)	Pump Vacuum inHg (Pv)
		2137	683.505											
1 1	5	2142	.	.0024	1.33	1.35	135	75	75	258	262	52		11.0
2 1	10	2147	.	SUM		BIAS								
3 2	15	2152	.											
4 2	20	2157	698.73											
5 3	25	2202	701.71	.0018	1.0	1.0	147	79	74	253	261	52		9.0
6 3	30	2207	704.53	.0016	.89	.89	147	80	74	256	263	64		7.5
7 4	35	2212	707.30	.0016	.89	.89	148	80	74	254	262	54		7.0
8 4	40	2217	709.89	.0017	.95	.95	147	82	75	245	262	48		7.0
9 5	45	2222	712.99	.0018	1.0	1.0	148	82	75	257	263	46		7.0
10 5	50	2227	714.49	.0005	.28	.28	147	82	76	255	262	47		3.5
11 6	55	2232	715.98	.0005	.28	.28	147	81	76	258	262	46		3.5
12 6	60	2237	717.72	.0004	.22	.22	147	80	76	257	261	46		3.0
13 6	65	2242	719.08	.0004	.22	.22	148	80	76	257	261	46		3.0
14 6	70	2247	720.77	.0007	.39	.39	148	80	76	257	262	47		4.0
15 5	75	2252	722.08	.0004	.22	.22	148	80	76	257	261	46		3.0
16 5	80	2257	723.56	.0005	.28	.28	148	81	77	258	262	49		3.5
17 4	85	2302	724.81	.0004	.22	.22	149	81	77	256	262	47		3.0
18 4	90	2307	726.36	.0005	.28	.28	149	81	77	256	262	46		3.5
19 3	95	2312	727.87	.0005	.28	.28	149	81	77	257	262	48		3.5
20 3	100	2317	729.47	.0006	.33	.33	149	82	78	257	262	52		4.0
21 2	105	2322	731.05	.0005	.28	.28	150	82	78	258	262	53		4.0
22 2	110	2327	732.82	.0007	.39	.39	150	82	78	256	262	52		4.5
23 1	115	2332	734.22	.0005	.28	.28	150	82	78	256	262	52		4.0
24 1	120	2337	735.805	.0005	.28	.28	150	82	78	257	262	55		4.0
25			.											

Notes:

Field Data Sheet

Horizon Engineering

Client/Plant/Location : OSU / Cycle 2 / West

Date 12-17-98

Test Method ODEQ 7

Concurrent Testing EIA 2SA

Run # 9

Operator CDB Support

Temperature, Am (Ta) 35

Pressure, Bar (Pb) 30.7

Pressure, Static (Pstat) 0

Filters 98M-206, 98S-15

Probe 3-1 Cp Heat Set 250 °F

Pitot	Pretest	in	in/min
Leak Check	Post	in	in/min

Nozzle .988

Sample Box 6 Heat Set 250 °F

Meter Box 4 dH@ Y

Meter	Pretest	cfm	inHg
Leak Check	Post	cfm	inHg

Stack Diagram

Cyclonic Flow? NO

Moisture 18 Tdb NA Twb NA

Traverse Point Number	Sampling Time min (dt)	Clock Time (24 hr)	Dry Gas Meter Reading cuft (Vm)	Velocity Head inH2O (dPs)	Orifice Pressure inH2O DESIRED	Orifice Pressure inH2O ACTUAL (dH)	STACK °F (Ts) Amb:	METER Inlet/Avg °F (Tm-in) Amb:	METER Outlet °F (Tm-out) Amb:	PROBE °F (Tp) Amb:	OVEN Filter °F (To) Amb:	IMPINGER Outlet °F (Ti) Amb:	AUX °F (Tx)	Pump Vacuum inHg (Pv)
1 1	125	2345	737.35	.0005	.28	.28	138	81	78	258	261	55		4.0
2 1	130	2350	739.38	.0009	.50	.50	138	82	78	257	262	65		5.0
3 2	135	2355	741.33	.0008	.45	.45	137	82	78	257	261	62		4.5
4 2	140	2400	743.30	.0008	.45	.45	139	83	78	257	262	59		5
5 3	145	0005	745.25	.0008	.45	.45	139	83	78	257	262	59		5
6 3	150	0010	747.23	.0009	.50	.50	139	83	78	251	262	62		5
7 4	155	0015	749.29	.0009	.50	.50	138	83	78	257	262	53		5
8 4	160	0020	751.26	.0008	.45	.45	139	83	79	252	262	59		4
9 5	165	0025	753.75	.0013	.72	.72	140	83	79	257	261	61		6
10 5	170	0030	755.783	.0008	.45	.45	137	84	79	252	261	61		5
11														
12														
13														
14														
15														
16														
17														
18														
19														
20														
21														
22														
23														
24														
25														

Notes:

Field Data Sheet

Horizon Engineering

Date 12-18-98
Test Method ODEQ 7
Concurrent Testing 25A
Run # 10
Operator CDB Support
Temperature, Am (Ta) 35
Pressure, Bar (Pb) 30.7
Pressure, Static (Pstat) 0

Client/Plant/Location: OSU East Cycle 2
Probe 3-2 Cp Heat Set 250 °F
Pitot Pretest in in/min
Leak Check Post in in/min
Nozzle .988
Sample Box Heat Set 250 °F
Meter Box 7 dH@ Y
Meter Pretest .010 cfm 10 inHg
Leak Check Post cfm inHg

Stack Diagram

Filters Cyclonic Flow ? Moisture Tdb Twb

Traverse Point Number	Sampling Time min (dt)	Clock Time (24 hr)	Dry Gas Meter Reading cuft (Vm)	Velocity Head inH2O (dPs)	Orifice Pressure inH2O DESIRED	Orifice Pressure inH2O ACTUAL (dH)	STACK °F (Ts) Amb:	METER Inlet/Avg. °F (Tm-in) Amb:	METER Outlet °F (Tm-out) Amb:	PROBE °F (Tp) Amb:	OVEN Filter °F (To) Amb:	IMPINGER Outlet °F (Ti) Amb:	AUX °F (Tx)	Pump Vacuum inHg (Pv)
		1239	94.800											
1 1	5		97.22	.0012	.67	.67	137	66	66	273	255	50		6
2 1	10		.	.0005	.28	.28	146	66	66	272	254	56		
3 2	15		.	Bias Check JUM										
4 2	20		101.58											
5 3	25		102.78	.0003	.17	.17	149	65	65	273	255	60		4
6 3	30		103.86	.0002	.11	.11	149	66	65	273	255	50		3
7 4	35		104.94	.0002	.11	.11	149	66	65	274	255	46		3
8 4	40		106.02	.0002	.11	.11	149	66	65	273	255	45		3
9 5	45		107.10	.0002	.11	.11	149	66	65	273	255	43		3
10 5	50		108.18	.0002	.11	.11	149	66	65	273	255	43		3
11 6	55		109.31	.0002	.11	.11	148	67	66	273	254	42		3
12 6	60		110.41	.0002	.11	.11	149	67	66	272	254	41		3
13 6	65		111.68	.0003	.17	.17	149	68	66	274	255	44		4
14 6	70		113.01	.0003	.17	.17	149	68	66	272	255	47		4
15 5	75		114.25	.0003	.17	.17	149	68	66	272	255	49		4
16 5	80		115.26	.0002	.11	.11	150	68	66	272	254	50		3
17 4	85		116.77	.0004	.22	.22	149	69	67	273	254	49		4
18 4	90		117.99	.0003	.17	.17	149	69	67	275	256	51		4
19 3	95		119.24	.0003	.17	.17	150	69	67	273	255	50		4
20 3	100		— . —	.0002	.11	.11	149	69	67	275	255	51		3
21 2	105		121.44	.0002	.11	.11	150	70	68	275	255	51		3
22 2	110		122.72	.0003	.17	.17	149	69	68	275	255	52		4
23 1	115		124.00	.0003	.17	.17	149	69	68	273	254	54		4
24 1	120	239	125.121	.0002	.11	.11	150	69	68	273	254	51		3
25			.											

Notes:

Field Data Sheet

Horizon Engineering

Date 12/18/98
Test Method ODEQ 7
Concurrent Testing 25A
Run # 10
Operator CDB Support
Temperature, Am (Ta) 35
Pressure, Bar (Pb) 30.7
Pressure, Static (Pstat) 0

Client/Plant/Location: OSU Gas Cycle 2
Probe 3-2 Cp Heat Set 250 °F
Pilot Pretest in in/min
Leak Check Post in in/min
Nozzle .988
Sample Box Heat Set 250 °F
Meter Box 7 dH@ Y
Meter Pretest cfm inHg
Leak Check Post 0.1 cfm 15 inHg

Stack Diagram

Filters Cyclonic Flow ? Moisture Tdb Twb

Traverse Point Number	Sampling Time min (dt)	Clock Time (24 hr)	Dry Gas Meter Reading cuft (Vm)	Velocity Head inH2O (dPs)	Orifice Pressure inH2O DESIRED	Orifice Pressure inH2O ACTUAL (dH)	STACK °F (Ts) Amb:	METER Inlet/Avg. °F (Tm-in) Amb:	METER Outlet °F (Tm-out) Amb:	PROBE °F (Tp) Amb:	OVEN Filter °F (To) Amb:	IMPINGER Outlet °F (Ti) Amb:	AUX °F (Tx)	Pump Vacuum inHg (Pv)
		242	125.121											
1	1	5	126.16	.0002	.11	.11	149	69	67	273	255	50		3
2	1	10	127.19	.0002	.11	.11	149	68	67	274	254	47		3
3	2	15	128.17	.0002	.11	.11	150	68	67	274	254	49		3
4	2	20	129.03	.0002	.11	.11	150	68	67	275	255	46		3
5	3	25	130.36	.0004	.22	.22	150	68	67	273	255	52		11
6	3	30	131.32	.0002	.11	.11	150	68	67	274	256	52		7
7	4	35	132.27	.0002	.11	.11	150	68	66	273	255	50		7
8	4	40	133.24	.0002	.11	.11	150	68	66	274	254	51		7
9	5	45	134.12	.0002	.11	.11	151	67	66	275	255	50		7
10	5	50	332 135.059	.0002	.11	.11	152	67	66	273	254	5		7
11	6	55												
12	6	60												
13														
14														
15														
16														
17														
18														
19														
20														
21														
22														
23														
24														
25														

Notes:

Field Data Sheet

Horizon Engineering

Date 12/18/98
Test Method ODEQ 7
Concurrent Testing 25A
Run # 11
Operator CDB Support
Temperature, Am (Ta) 35
Pressure, Bar (Pb) 30.7
Pressure, Static (Pstat) 0

Client/Plant/Location: OSU West Cycle 2
Probe 3-1 Cp Heat Set 250 °F
Pitot Pretest in in/min
Leak Check Post in in/min
Nozzle .988
Sample Box 6 Heat Set 250 °F
Meter Box 4 dH@ Y
Meter Pretest .008 cfm 15 inHg
Leak Check Post cfm inHg

Stack Diagram

Filters Cyclonic Flow? Moisture Tdb Twb

Traverse Point Number	Sampling Time min (dt)	Clock Time (24 hr)	Dry Gas Meter Reading cuft (Vm)	Velocity Head inH2O (dPs)	Orifice Pressure inH2O DESIRED	Orifice Pressure inH2O ACTUAL (dH)	STACK °F (Ts)	METER Inlet/Avg. °F (Tm-in)	METER Outlet °F (Tm-out)	PROBE °F (Tp)	OVEN Filter °F (To)	IMPINGER Outlet °F (Ti)	AUX °F (Tx)	Pump Vacuum inHg (Pv)
		340	755.942				Amb:	Amb:	Amb:	Amb:	Amb:	Amb:		
1 1	5		758.72	.0015	.84	.84	140	65	64	257	262	44		14
2 1	10		.	.0010	.56	.56	145	65	64	255	261	48		11
3 2	15		763.18	Bias check			JUM							
4 2	20	419	765.58	.0012	.67	.67	147	65	64	256	230	40		11
5 3	25		767.90	.0012	.67	.67	148	66	64	255	264	47		11
6 3	30		769.93	.0009	.50	.50	148	67	64	254	260	48		8
7 4	35		772.11	.0010	.55	.55	150	68	64	256	262	54		10
8 4	40		774.30	.0010	.55	.55	151	69	64	256	261	55		10
9 5	45		776.98	.0015	.84	.84	151	71	65	256	261	63		13
10 5	50		779.22	.0010	.55	.55	151	73	66	255	261	68		10
11 6	55		781.35	.0010	.55	.55	151	74	67	257	262	64		9
12 6	60		783.60	.0011	.61	.61	151	74	68	257	262	65		10
13 6	65		785.90	.0011	.61	.61	151	76	69	257	262	68		10
14 6	70		788.01	.0009	.50	.50	152	76	69	257	262	67		9
15 5	75		790.29	.0011	.61	.61	151	77	70	257	262	60		9
16 5	80		792.70	.0012	.67	.67	152	77	70	257	262	57		9
17 4	85		795.17	.0012	.67	.67	152	78	71	257	263	60		9
18 4	90		797.55	.0012	.67	.67	152	78	71	256	262	61		8
19 3	95		799.93	.0012	.67	.67	152	78	72	257	262	64		8
20 3	100		802.03	.0009	.50	.50	152	78	72	256	262	59		7
21 2	105		803.67	.0005	.28	.28	152	79	73	257	263	64		6
22 2	110		805.68	.0010	.55	.55	152	78	73	257	263	66		7
23 1	115		807.98	.0011	.61	.61	152	78	73	257	262	66		8
24 1	120	559	810.421	.0012	.67	.67	152	78	73	257	263	59		8
25														

Notes: Filter Heat failed @ 358 stopped Test to Repair
Restarted @ 417

Field Data Sheet

Horizon Engineering

Client/Plant/Location: OSU West Cycle 2

Date 12/18/98

Test Method ODEQ 7

Concurrent Testing 25A

Run # 11

Operator CDB Support

Temperature, Am (Ta) 35

Pressure, Bar (Pb) 30.7

Pressure, Static (Pstat) 0

Probe 3-1 Cp Heat Set °F

Pitot	Pretest	in	in/min
Leak Check	Post	in	in/min

Nozzle

Sample Box 6 Heat Set °F

Meter Box 4 dH@ Y

Meter	Pretest	cfm	inHg
Leak Check	Post .008	cfm 15	inHg

Stack Diagram

Filters Cyclonic Flow? Moisture Tdb Twb

Traverse Point Number	Sampling Time min (dt)	Clock Time (24 hr)	Dry Gas Meter Reading cuft (Vm)	Velocity Head inH2O (dPs)	Orifice Pressure inH2O DESIRED	Orifice Pressure inH2O ACTUAL (dH)	STACK °F (Ts)	METER Inlet/Avg. °F (Tm-in)	METER Outlet °F (Tm-out)	PROBE °F (Tp)	OVEN Filter °F (To)	IMPINGER Outlet °F (Tl)	AUX °F (Tx)	Pump Vacuum inHg (Pv)
		601	810.421				Amb:	Amb:	Amb:	Amb:	Amb:	Amb:		
1 1	5		811.53	.0003	.17	.17	148	77	74	259	263	51		5
2 1	10		—	.0005	.28	.28	148	77	74	257	262	49		8
3 2	15		814.76	.0006	.33	.33	149	77	74	256	262	46		9
4 2	20		815.98	.0003	.17	.17	151	77	74	256	262	45		7
5 3	25		817.34	.0004	.22	.22	151	77	74	256	262	47		7
6 3	30	631	819.191	.0007	.39	.39	151	77	74	256	261	45		10
7 4	35		.											
8 4	40		.											
9 5	45		.											
10 5	50		.											
11 6	55		.											
12 6	60		.											
13			.											
14			.											
15			.											
16			.											
17			.											
18			.											
19			.											
20			.											
21			.											
22			.											
23			.											
24			.											
25			.											

Notes:

Field Data Sheet

Horizon Engineering

Date 12/18/98
Test Method ODEQ 7
Concurrent Testing 25A
Run # 12/east/cycle 2
Operator CDB Support DRB
Temperature, Am (Ta) 35
Pressure, Bar (Pb) 30.4
Pressure, Static (Pstat) 0

Client/Plant/Location: OSU East Cycle 2

Probe	Cp		Heat Set	°F
Pitot	Pretest	in		in/min
Leak Check	Post	in		in/min
Nozzle				
Sample Box			Heat Set	°F
Meter Box	dH@		Y	
Meter	Pretest	.01 cfm	15	inHg
Leak Check	Post	cfm		inHg

Stack Diagram

Filters Cyclonic Flow? Moisture Tdb Twb

Traverse Point Number	Sampling Time min (dt)	Clock Time (24 hr)	Dry Gas Meter Reading cuft (Vm)	Velocity Head inH2O (dPs)	Orifice Pressure inH2O DESIRED	Orifice Pressure inH2O ACTUAL (dH)	STACK °F (Ts)	METER Inlet/Avg °F (Tm-in)	METER Outlet °F (Tm-out)	PROBE °F (Tp)	OVEN Filter °F (To)	IMPINGER Outlet °F (Ti)	AUX °F (Tx)	Pump Vacuum inHg (Pv)
		640	135.204				Amb:	Amb:	Amb:	Amb:	Amb:	Amb:		
1	1	5		137.41	.0010	.55	.55	144	64	64	270	252	48		9
2	1	10		.	.0003	.17	.17	146	64	64	270	252	49		5
3	2	15		139.66	.	Bias	Check	JUM						
4	2	20		140.71	.0002	.11	.11	147	64	63	273	254	49		4
5	3	25		141.75	.0002	.11	.11	147	65	64	273	253	50		4
6	3	30		142.78	.0002	.11	.11	148	65	64	272	252	49		4
7	4	35		143.84	.0002	.11	.11	149	65	64	272	254	47		5
8	4	40		145.32	.0004	.22	.22	150	65	64	272	254	44		6
9	5	45		— . —	.0003	.17	.17	149	66	65	272	254	41		5
10	5	50		147.98	.0004	.22	.22	150	66	65	273	253	39		6
11	6	55		149.16	.0003	.17	.17	150	66	65	270	253	39		5
12	6	60		150.87	.0005	.28	.28	150	67	65	273	255	39		6
13	6	65		152.22	.0004	.22	.22	150	67	65	271	254	39		5
14	6	70		153.58	.0004	.22	.22	149	68	66	274	252	43		5
15	5	75		155.21	.0005	.28	.28	150	68	66	273	252	44		6
16	5	80		156.52	.0003	.17	.17	151	68	66	272	255	44		4
17	4	85		.	.0003	.17	.17	151	68	66	254	255	44		4
18	4	90		.										
19	3	95		160.24	.0004		.17	150	68	66	270	250	42		4
20	3	100		161.55	.0003		.17	149	68	66	270	250	41		4
21	2	105		162.77	.0003		.17	140	67	66	257	251	42		4
22	2	110		163.755	.0002		.11	130	67	66	257	251	42		4
23	1	115		164.68	.0002		.11	121	67	66	270	255	43		3
24	1	120		165.748	.0002		.11	122	67	66	272	255	43		3
25			.											

Notes:

Field Data Sheet

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Date 12-18-98
Test Method 7
Concurrent Testing 25A
Run # 12 cont E Cyc 2
Operator DRB Support
Temperature, Amb (Ta) 38
Pressure, Bar (Pb) 30.4
Pressure, Static (Pstat) 0
Filters 98m-200 99s-14

Client/Plant/Location: OSU/East/Cyc 2
Probe 3-2 Cp Heat Set 750
Pitot Pretest in in/min
Leak Check Post in in/min
Nozzle 9.88
Sample Box 1 Heat Set
Meter Box 7 dH@ Y
Meter Pretest cfm in/Hg
Leak Check Post 0.015 cfm 10 in/Hg
Moisture 18 Tdb Twb

Stack Diagram

Cyclonic Flow ?

Traverse Point Number	Sampling Time min (dt)	Clock Time (24 hr)	Dry Gas Meter Reading cuft (Vm)	Orifice Pressure Drop (dH)	Orifice Pressure Drop Desired	Orifice Pressure Drop Actual (dH)	STACK °F (Ts) Amb	REFRIG Inlet/Avg °F (Tm in) Amb	REFRIG Outlet °F (Tm out) Amb	FILTER °F (Tp) Amb	HOT Filter °F (To) Amb	IMPINGER Outlet °F (Tf) Amb	AUX °F (Ta)	Pump Vacuum inHg (Pv)
		844	165.748											
1 6	5		166.	.0003	.17	.17	150	66	65	273	253	43		4
1 6	10		168.19	.0003		.17	149	66	65	270	255	43		4
1 5	15		169.59	.0003		.17	149	66	65	270	250	43		4
1 5	20		170.95	.0004		.23	150	66	65	270	250	44		5
1 4	25		173.32	.0003		.17	150	66	65	270	250	44		5
1 4	30	914	175.57	.0003		.17	154	67	65	272	253	47		5
1 3	35		[illegible]	.0004		.23	153	67	66	272	252	49		5
1 3	40	924	178.07	.0004		.23	153	67	66	272	257	49		5
1 2	45	929	177.545	.0004		.23	153	67	66	272	253	49		5
10 2														
11														
12														
13														
14														
15														
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23														
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25														

Notes:

Field Data Sheet

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Date 12-18

Test Method 7

Concurrent Testing 25A

Run # 13 cyc 2 West

Operator RRB Support

Temperature, Am (Ta) 40

Pressure, Bar (Pb) 30.4

Pressure, Static (Pstat) 0

Filters 98 206 - 5-15

Client/Plant/Location: OSU/west/C2

Probe 3-1 Cp Heat Set 250

Pitot Pretest in in/min

Leak Check Post in in/min

Nozzle 9 88

Sample Box 6 Heat Set 250

Meter Box 4 dH@ Y

Meter Pretest 0.013 cfm 16 inHg

Leak Check Post cfm inHg

Moisture 18

Stack Diagram

Cyclonic Flow?

Traverse Point Number	Sampling Time min (θ)	Check Time (Pstat)	Dry Gas Meter Reading cu ft (Vm)	Velocity Head (inH2O) (dPs)	Orifice Pressure (inH2O) DESIRED	Orifice Pressure (inH2O) ACTUAL (dH)	STACK °F (Ts) Amb:	SILICA Gel/Aug °F (Tm in) Amb:	SILICA Gel Outlet °F (Tm out) Amb:	FRONT °F (Tp) Amb:	OVEN Filter °F (Tc) Amb:	IMPINGER Outlet °F (Tf) Amb:	ABS °F (Ta)	Pump Vacuum inHg (Pv)
		938	819.396											
1 6	5		821.000	.0006	.33	.33	140	67	65	257	250	45		12
1 6	10		CAL	.0006		.33	145	67	66	256	247	47		12
1 5	15			SUM										
1 5	20		826.53	.0010	.559	.56	141	72	67	255	247	45		11
1 4	25		828.86	.0010		.56	141	72	67	255	247	45		11
1 4	30			.0010		.56	144	74	68	255	247	48		10
1 3	35		Dry	Bilin		Gel								
1 3	40		835.85	.0010		.56	144	80	72	255	247	48		7
1 2	45		838.17	.0010		.56	144	80	72	256	247	48		7
10 2	50		8	.0010		.56	144	80	74	255	247	51		7
11 1	55		842.46	.0011		.56	144	81	74	256	247	51		6
11 1	60	1038												
11 1	65		847.1	.0011		.56	145	81	75	256	247	55		5
11 1	70		849.065	.0011		.56	145	81	75	256	247	55		5
11 2	75			.0005		.28	145	81	75	257	247	55		5
11 2	80		852.	.0006		.28	145	81	76	257	247	57		3
11 3	85			.0005		.28	145	81	76	256	248	54		3
11 3	90													
11 4	95		857.66	.0003		.28	145	83	78	256	247	50		3
10 4	100		859.00	.0003		.23	145	83	78	256	247	50		3
11 5	105			.0002		.11	145	82	79	258	248	50		3
11 5	110													
11 6	115													
11 6	120	1138	862.838			.11	145							
11														

Notes:

Field Data Sheet

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Date 12-18

Test Method 7

Concurrent Testing 25

Run # 13 cont

Operator DRB Support

Temperature, Amb (Ta) 42

Pressure, Bar (Pb) 30.4

Pressure, Static (Pstat) 0

Filters 98M-206 98S-15

Stack Diagram

Cyclonic Flow ?

Client/Plant/Location: OSU/wast/cyc

Probe 3-1 Cp Heat Set 250

Pitot	Pretest	in	in/min
Leak Check	Post	in	in/min

Nozzle 988

Sample Box 6 Heat Set

Meter Box 4 dH@ Y

Meter	Pretest	cfm		inHg
Leak Check	Post 0.005	cfm	14	inHg

Moisture (8 Tdb Twb

Traverse Point Number	Sampling Time min (dt)	Check Time (Time)	Gas Meter Reading cuft (Vm)	Orifice Meter (dH)	Orifice Pressure (dH@) or Vacuum	Volume Pressure (dH) or Vacuum (dH)	Stack T °F (Ts) Avg	Probe T °F (Tm in) Avg	Probe T °F (Tm out) Avg	Filter T °F (Tp) Avg	Impinger T °F (Tc) Avg	Impinger Outlet T °F (Tf) Avg	Aux T °F (Ta)	Pump Vacuum inHg (Pv)
		1145	862.838											
6	5		864.83	.0008	.449	.45	144	77	77	255	255	44		5
6	10		866.83	.0009		.45	144	77	77	255	255	44		5
5	15			.0010		.56	144	77	77	256	250	44		5
5	20		871.17	.0010		.56	144	76	76	256	250			5
4	25		873.33	.0010		.56	144	76	75	256	250	50		5
4	30		875.52	.0010		.56	144	76	75	255	250	51		5
3	35		877.64	.0010		.56	144	75	74	256	250	54		5
3	40		879.84	.0009		.45	144	76	74	256	250	58		5
2	45	1330	881.759	.0010		.56	144	76	74	256	250	58		5
10														
11														
12														
13														
14														
15														
16														
17														
18														
19														
20														
21														
22														
23														
24														
25														

Notes:

Field Data Sheet

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Date 12-18-98

Test Method 7

Concurrent Testing 25A

Run # 14 cycl East

Operator DRB Support

Temperature, Amb (Ta) 40

Pressure, Bar (Pb) 30.4

Pressure, Static (Pstat) 0

Filters 98m-200983-14

Client/Plant/Location: OSU/East/cycl 2

Probe 3-2 Cp Heat Set 250

Pitot Pretest in in/mk

Leak Check Post in in/mk

Nozzle .988"

Sample Box 1 Heat Set 250

Meter Box 7 dH@ Y

Meter Pretest 0.005 cfm 16 inHg

Leak Check Post cfm inHg

Moisture 18 Tdb Twb

Stack Diagram

Cyclonic Flow ?

Traverse Point Number	Sampling Time (min)	Clock Time (24 hr)	Dry Gas Meter Reading (Vm)	Orifice Head (delH)	Orifice Pressure (delP)	Probe Pressure (delP)	STACK °F (Ts) Amb:	SIFTER Inlet/Avg °F (Tsi In) Amb:	SIFTER Outlet °F (Tsi out) Amb:	THOMAS °F (Tp) Amb:	OVEN Filter °F (To) Amb:	IMPINGER Outlet °F (Ti) Amb:	AUX °F (Ta)	Pump Vacuum inHg (Pv)
		1238	177.777											
6	5			.0003		.17		62	62	270	255	55		4
6	10		Cal	Run										
5	15		181.66	.0005	28	.28	137	62	62	270	255	51		5
5	20		183.82	.0006	.334	.33	138	61	62	270	255	50		5
4	25		185.53	.0007	.389	.39	138	61	61	272	253	50		6
4	30		187.27	.0006		.39	139	64	62	270	250	49		6
3	35		189.12	.0006		.39	140	66	63	270	250			6
3	40		191.03	.0007		.39	142	67	63	272	250			6
2	45		192.46	.0006		.33	144	68	64	272	252	51		4
2	50		194.21	.0005		.28	144	69	65	270	250			4
1	55		195.62	.0005		.28	145	69	66	270	250	50		4
1	60	1338	197.0	.0006		.33	145	71	66	272	255	54		4
1	65		198.9	.0006		.33	145	71	68	272	250	51		4
1	70		200.95	.0006		.33	145	71	68	272	250	51		4
2	75		202	.0002		.11	138	72	68	270	250	50		3
2	80		202.99	.0002		.11	138	71	69	273	251	49		3
3	85			.0002		.11	137	71	69	273	251	49		3
3	90													
4	95													
4	100		206.77	.0003										
5	105		207.75	.0002		.11	138	71	69	272	251	49		3
5	110		208.95	.0003		.17	139	71	69	270	250	49		3
6	115		210.28	.0003		.17	140	71	69	255	250	48		3
6	120	1438	211.650	.0003		.17	140	71	69	250	250	48		3

Notes:

Field Data Sheet

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Date 12-18-98

Test Method 7

Concurrent Testing 25A

Run # 14 cont

Operator DBS Support

Temperature, Amb (Ta) 40

Pressure, Bar (Pb) 30.4

Pressure, Static (Pstat) 0

Filters 98-200 S-14

Client/Plant/Location: OSU/E Lugs 2

Probe 3-2 Cp Heat Set 250

Pilot	Pretest	in	in/min
Leak Check	Post	in	in/min

Nozzle .988

Sample Box 1 Heat Set

Meter Box 7 dH@ Y

Meter	Pretest	cfm	in Hg
Leak Check	Post .006	cfm 11	in Hg

Moisture 18 Tdb Twb

Stack Diagram

Cyclonic Flow ?

Traverse Point Number	Sampling Time (min)	Clock Time (24 hr)	Dry Gas Meter Reading (Vm)	Orifice Head (inH2O)	Orifice Pressure (inHg)	Orifice Pressure (Actual) (inH)	STACK °F (Ts) Avg:	BOTTOM Probe/Avg °F (Tm-In)	BOTTOM Probe °F (Tm out)	FILTER °F (Tp) Avg:	OVEN Filter °F (To) Avg:	IMPINGER Outlet °F (Ti) Avg:	AUX °F (Ta)	Pump Vacuum inHg (Pv)
		1441	211.650											
1 6	5		.	.0003		.17								3
1 6	10		.											
1 5	15		.											
1 5	20		216.20	.0003		.17	146	69	69	270	250	50		3
1 4	25		217.49	.0003		.17	146	69	69	270	250	49		3
1 4	30		218.86	.0003		.17	146	70	69	270	250	50		3
1 3	35		.	.0002		.11	140	70	69	270	250	51		3
1 3	40		.											
1 2	45		.											
1 2	50	1531	222.770											
11			.											
12			.											
13			.											
14			.											
15			.											
16			.											
17			.											
18			.											
19			.											
20			.											
21			.											
22			.											
23			.											
24			.											

Notes:

Field Data Sheet

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Date 12-18-98

Test Method 7

Concurrent Testing 25A

Run # 15 west cyc 2

Operator DRS Support

Temperature, Amb (Ta) 42

Pressure, Bar (Pb) 30.4

Pressure, Static (Pstat) 0

Filters 98M-206, 983-15

Client/Plant/Location: OSU/west/cyc 2

Probe 3-1 Cp Heat Set 250

Pilot Pretest in in

Leak Check Post in in

Nozzle .988

Sample Box 6 Heat Set 250

Meter Box 4 dH@ Y

Meter Pretest 0.002 cfm 14 in

Leak Check Post cfm in

Moisture 18 Tdb NA Twb NA

Stack Diagram

Cyclonic Flow?

Traverse Point Number	Sampling Time (min)	Clock Time	Dry Gas Meter Reading (cu ft)	Orifice Pressure Drop (in H2O)	Orifice Pressure Drop (dH)	Orifice Pressure Drop Average (dH)	Stack Temp (Ts)	Probe Temp Average (Tp)	Filter Temp (Tf)	Impinger Outlet Temp (Ti)	Abs (Ts)	Vacuum
		1539	882.069									
6	5	1544	884	.0008	.471	.47	132	66	66	255	249	57	5
6	10	1549	885.97	.0008		.47	134	66	66	254	250	57	5
5	15	1554	887.78	.0007	.41	.41	134	66	66	254	249	55	4.0
5	20	1559	890.32	.0007	.41	.41	137	67	66	255	249	51	4.0
4	25	1604	892.12	.0008	.47	.47	138	70	66	255	250	50	4.0
4	30	1609	893.94	.0011	.65	.65	139	71	66	254	250	47	5.0
3	35	1614	895.86	.0008	.47	.47	142	71	66	256	250	47	4.0
3	40	1619	897.56	.0006	.35	.35	143	71	67	256	250	47	3.5
2	45	1624	899.79	.0010	.59	.59	143	72	67	256	257	46	5.0
2	50	1629	902.02	.0010	.59	.59	143	74	68	254	249	47	5.0
1	55	1634	904.28	.0010	.59	.59	143	75	69	254	249	47	5.0
1	60	1639	906.69	.0012	.71	.71	144	76	70	256	251	48	5.5
1	65	1644	909.06	.0011	.65	.65	144	77	70	255	250	50	5.5
1	70	1649	911.58	.0013	.77	.77	144	79	71	253	249	52	5.5
2	75	1654	913.96	.0011	.65	.65	144	80	72	254	249	54	5.5
2	80	1659	916.51	.0013	.77	.77	144	81	73	255	249	55	5.5
3	85	1704	919.06	.0013	.77	.77	144	82	75	256	249	58	5.5
3	90	1709	921.60	.0013	.77	.77	144	83	76	256	249	61	5.5
4	95	1714	923.95	.0011	.65	.65	145	84	77	256	250	62	5.0
4	100	1719	926.27	.0011	.65	.65	144	84	77	254	249	62	5.5
5	105	1724	928.55	.0010	.59	.59	144	84	77	254	250	63	5.0
5	110	1729	931.03	.0012	.71	.71	144	86	78	256	250	66	5.5
6	115	1734	933.52	.0012	.71	.71	145	85	80	255	250	67	5.5
6	120	1739	936.03	.0012	.71	.71	144	86	79	256	250	59	5.5

Notes:

Field Data Sheet

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Date 12-18-98

Test Method ODEQ 7

Concurrent Testing EPA 25A

Run # 15

Operator JDF Support

Temperature, Am (Ta) 35

Pressure, Bar (Pb) 30.4

Pressure, Static (Pstat) 0

Filters 98M-206, 985-15

Stack Diagram

Cyclonic Flow? No

Client/Plant/Location: OSU/West/Cycle 2

Probe 3-1 Cp Heat Set 250

Pitot Pretest in in/m

Leak Check Post in in/m

Nozzle .988

Sample Box 6 Heat Set 250

Meter Box 4 dH@ Y

Meter Pretest cfm Inll

Leak Check Post .013 cfm 9 Inll

Moisture 18 Tdb NA Twb NA

Traverse Point Number	Sampling Time min (dt)	Clock Time (24hr)	Dry Gas Meter Reading cuft (Vm)	Orifice Head (dH@) (dPs)	Orifice Pressure (dH@) (dPstd)	Orifice Pressure (dH@) (dH)	STACK °F (Ts) Amb:	METER Inlet/Avg °F (Tm in) Amb:	METER Outlet °F (Tm out) Amb:	PROBE °F (Tp) Amb:	OVEN Filter °F (To) Amb:	IMPINGER Outlet °F (Ti) Amb:	AUX °F (Ta)	Fan Vacuum Inll (Pv)
1 1	125	1745	938.68	.0014	.83	.83	145	84	77	256	251	50		6.0
1 1	130	1750	941.05	.0011	.65	.65	145	84	78	254	250	49		5.0
1 2	135	1755	943.53	.0012	.71	.71	145	84	78	255	249	48		5.5
1 2	140	1800	946.09	.0013	.77	.77	145	84	78	255	249	47		5.5
1 3	145	1805	948.71	.0014	.83	.83	144	84	78	255	249	46		6.0
1 3	150	1810	951.34	.0014	.83	.83	144	84	78	256	249	47		6.0
1 4	155	1815	953.95	.0014	.83	.83	144	84	78	255	249	47		6.0
1 4	160	1820	956.09	.0009	.53	.53	144	84	79	254	249	47		4.5
1 5	165	1825	958.40	.0011	.65	.65	144	83	78	255	249	47		5.0
10 5	170	1830	960.61	.0009	.53	.53	145	83	78	254	250	46		4.5
11 6	175	1835	963.578	.0018	1.06	1.05	145	82	78	254	249	46		6.5
12														
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Notes:

Field Data Sheet

[redacted] orizon [redacted] ngineering

Date 12-18-98

Test Method 7 ODEQ

Concurrent Testing 25A EPA

Run # 16 East Cycle 2

Operator JDF Support

Temperature, Amb (Ta) 35

Pressure, Bar (Pb) 30.4

Pressure, Static (Pstat)

Filters 98M-200, 98S-14

Client/Plant/Location : OSU/East/Cycle 2/R16

Probe 3-2 Cp Heat Set 250

Pitot Pretest in in/m

Leak Check Post in in/m

Nozzle .988

Sample Box 1 Heat Set 250

Meter Box 7 dH@ Y

Meter Pretest .005 cfm 10 inH

Leak Check Post cfm inH

Moisture 18 Tdb NA Twb NA

Stack Diagram

Cyclonic Flow? NO

Point Pitot Number	Sampling Time (min)	Clock Time (24hr)	Dry Gas Meter Reading (cf) (Vm)	Velocity Head (inH2O) (dPs)	Orifice Pressure (inH2O) DESIRED	Orifice Pressure (inH2O) ACTUAL (dH)	STACK °F (Ts) Amb:	AFTER Probe/Avg °F (Tm in) Amb:	AFTER Outlet °F (Tm out) Amb:	FURNACE °F (Tp) Amb:	OVEN Filter °F (To) Amb:	IMPINGER Outlet °F (Ti) Amb:	AUX °F (Ta)	Fan Vacuum (inH2O) (Pv)
		1840	224.673											
1 1	5	1845	.	.0013	.77	.77	117	66	66	273	254	50		5.5
1 1	10	1850	.											
1 2	15	1855	.		JUMP BIAS									
1 2	20	1900	234.74											
1 3	25	1905	236.48	.0007	.41	.41	108	66	64	270	254	46		4.0
1 3	30	1910	237.48	.0002	.12	.12	138	66	64	272	254	46		2.5
1 4	35	1915	238.78	.0003	.18	.18	139	66	64	271	254	45		3.0
1 4	40	1920	240.08	.0003	.18	.18	140	66	64	270	252	46		3.0
1 5	45	1925	241.36	.0003	.18	.18	140	66	64	270	252	45		3.0
10 5	50	1930	242.31	.0002	.12	.12	140	66	64	272	254	46		2.5
11 6	55	1935	243.04	.0001	.06	.06	141	65	64	272	254	45		2.0
11 6	60	1940	244.48	.0004	.24	.24	142	65	64	272	254	46		3.5
11 6	65	1945	245.90	.0004	.24	.24	143	66	64	270	252	44		3.5
11 6	70	1950	247.15	.0003	.18	.18	144	66	64	270	254	44		3.0
11 5	75	1955	248.43	.0003	.18	.18	145	66	64	272	254	44		3.0
11 5	80	2000	249.88	.0004	.24	.24	145	66	64	272	251	44		3.0
11 4	85	2005	251.16	.0003	.18	.18	145	66	64	270	255	45		3.0
11 4	90	2010	252.67	.0004	.24	.24	145	66	65	273	252	44		3.0
11 3	95	2015	254.42	.0007	.41	.41	145	66	65	270	252	44		4.0
10 3	100	2020	255.45	.0002	.12	.12	144	66	65	270	252	46		2.5
11 2	105	2025	256.68	.0003	.18	.18	145	66	65	272	254	45		3.0
11 2	110	2030	257.67	.0002	.12	.12	145	66	65	272	251	44		2.5
11 1	115	2035	259.14	.0004	.24	.24	144	66	65	272	254	44		3.0
11 1	120	2040	258.31	.0002	.12	.12	144	66	65	270	254	45		2.5
11			.											

Notes:

Field Data Sheet

[redacted] orizon [redacted] ngineering

Date 12-18-98
Test Method OEQ 7
Concurrent Testing EPA 25A
Run # 16
Operator SOF Support
Temperature, Amb (Ta) 35
Pressure, Bar (Pb) 30.4
Pressure, Static (Pstat) 0
Filters 98M-200, 985-14

Client/Plant/Location : OSU/East/Cycle 2
Probe 3-2 Cp Heat Set 250
Pitot Pretest in in/m
Leak Check Post in in/m
Nozzle .938
Sample Box / Heat Set
Meter Box 7 dH@ Y
Meter Pretest cfm inH
Leak Check Post .009 cfm 11.5 inH
Moisture 18 Tdb NA Twb NA

Stack Diagram

Cyclonic Flow? No

Traverse Point Number	Sampling Time min (θt)	Clock Time (Ta)	Dry Gas Meter Reading cuft (Vm)	Velocity Head inH2O (dPs)	Orifice Pressure inH2O (dH)	Orifice Pressure inH2O Actual (dH)	STACK °F (Ts) Amb:	BEFORE Probe °F (Tm in) Amb:	BEFORE Orifice °F (Tm out) Amb:	Filter °F (Tp) Amb:	OVEN Filter °F (To) Amb:	IMPINGER Outlet °F (Ti) Amb:	AUX °F (Tx)	Turn Vlve Inlet (Pt)
1	125	2047	261.41	.0004	.24	.24	145	66	65	271	252	44		3.0
1	130	2052	262.54	.0003	.18	.18	146	66	65	270	252	44		3.0
2	135	2057	263.54	.0002	.12	.12	146	66	65	272	251	45		2.5
2	140	2102	264.84	.0003	.18	.18	146	66	65	272	254	44		3.0
3	145	2107	266.18	.0003	.18	.18	146	66	65	272	253	45		3.0
* 3	150	2127	267.76	.0006	.35	.35	145	66	65	270	253	45		4.0
4	155	2132	268.53	.0001	.06	.06	138	64	63	270	254	45		2.0
4	160	2137	269.62	.0002	.12	.12	138	63	63	272	254	44		2.5
5	165	2142	270.85	.0003	.18	.18	144	63	63	270	251	45		3.0
5	170	2147	271.910	.0002	.12	.12	145	63	63	271	253	44		2.5
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25														

Notes: Stop for hot check. Switch @ 2153

Field Data Sheet

[redacted] orison [redacted] ngineering

Date 12-18-98
Test Method OOEQ7
Concurrent Testing EPA 25A
Run # 17
Operator SDF Support
Temperature, Amb (Ta) 35
Pressure, Bar (Pb) 30.4
Pressure, Static (Pstat) 0
Filters 98M-2016 / 985-15

Client/Plant/Location: OSU/West/Cycle 2
Probe 3-1 Cp Heat Set 250
Pilot Pretest in In/h
Leak Check Post in In/h
Nozzle . 988
Sample Box 6 Heat Set 250
Meter Box 4 dH@ Y
Meter Pretest .008 cfm 13 In
Leak Check Post cfm In
Moisture 18 Tdb NA Twb NA

Stack Diagram
Cyclonic Flow? NO

Traverse Point Number	Sampling Time min (dt)	Clock Time (24hr)	Dry Gas Meter Reading cuft (Vm)	Velocity Head (dP) (dPv)	Orifice Pressure Drop (dH) (dH@)	Orifice Pressure Drop (Actual) (dH)	STACK °F (Ts) Amb	BOTTOM Probe °F (Tm bot) Amb	BOTTOM Probe °F (Tm mid) Amb	TRIMBOX °F (Tp) Amb	OVEN Filter °F (To) Amb	IMPINGER Outlet °F (Ti) Amb	AMB °F (Ta)	Fo Vo In (F
		2155	963.817											
1 1	5	2200	968.11	.0033	1.95	1.95	119	58	57	257	251	43		16.0
1 1	10	2205	.	.0019	1.12	1.1	132	59	57	251	250	42		9.0
1 2	15	2210	974.10	JUM		BIAS.								
1 2	20	2215	977.01	.0017	1.0	1.0	136	64	58	249	251	47		8.0
1 3	25	2220	979.84	.0016	.94	.94	137	66	59	255	250	48		7.5
1 3	30	2225	982.69	.0016	.94	.94	137	68	60	256	250	49		7.5
1 4	35	2230	986.84	.0015	.88	.88	138	68	60	254	249	51		6.5
1 4	40	2235	988.25	.00017	1.0	1.0	141	70	62	254	250	55		7.5
1 5	45	2240	991.07	.0004	.24	.24	141	70	62	257	260	56		3.0
10 5	50	2245	992.80	.0008	.47	.47	141	69	62	256	250	56		4.5
11 6	55	2250	994.15	.0004	.24	.24	142	69	63	254	250	55		3.5
11 6	60	2255	995.87	.0006	.35	.35	142	67	63	255	250	54		4.0
11 6	65	2300	997.56	.0006	.35	.35	142	67	63	255	250	55		4.0
11 6	70	2305	999.01	.0005	.29	.29	142	68	63	255	251	56		3.5
11 5	75	2310	1000.43	.0004	.24	.24	143	68	63	256	250	55		3.0
11 5	80	2315	1002.35	.0005	.29	.29	143	68	64	254	250	53		3.5
11 4	85	2320	1005.18	.0016	.94	.94	142	69	64	255	249	53		6.0
11 4	90	2325	1008.09	.0017	1.0	1.0	140	71	65	252	250	57		7.0
11 3	95	2330	1011.01	.0017	1.0	1.0	139	72	65	254	250	61		7.0
10 3	100	2335	1013.63	.0014	.83	.83	140	73	66	254	248	63		6.0
11 2	105	2340	1016.27	.0014	.83	.83	140	73	66	255	250	63		6.5
11 2	110	2345	1018.93	.0015	.88	.88	139	73	66	244	250	65		7.0
11 1	115	2350	1021.40	.0012	.71	.71	139	72	66	244	249	64		6.5
11 1	120	2355	1023.029	.0014	.83	.83	139	72	66	255	250	63		7.0
11														

Notes: Switched 25A probe over late: 2207 - missed ~ 13 minutes

Field Data Sheet

[redacted] arison [redacted] ngineering

Date 12-18-98
Test Method ODEQ 7
Concurrent Testing EPA 25A
Run # 17
Operator JC Support LDB
Temperature, Am (Ta) 30
Pressure, Bar (Pb) 30.4
Pressure, Static (Pstat) 0
Filters 98M-206 / 985-15

Client/Plant/Location: OSU / West / Cycle 2
Probe 3-1 Cp Heat Set 250
Pilot Pretest in in/in
Leak Check Post in in/in
Nozzle .988
Sample Box 6 Heat Set 250
Meter Box 4 dH@ Y
Meter Pretest cfm inH
Leak Check Post .013 cfm 10 inH
Moisture 18 Tdb NA Twb NA

Stack Diagram
Cyclonic Flow / NO

Traverse Point Number	Sampling Time (min)	Clock Time (HHm)	Dry Gas Meter Reading (Vm)	Velocity Head (inH2O) (dPs)	Orifice Pressure (inH2O) (dH)	Orifice Pressure (inH2O) Actual (dH)	STACK °F (Ts) Amb:	PROBE Inlet/Avg °F (Tm in) Amb:	PROBE Outlet °F (Tm out) Amb:	FILTER °F (Tp) Amb:	OVEN Filter °F (To) Amb:	IMPINGER Outlet °F (Ti) Amb:	AUX °F (Ta)	Fan Vacuum inH (Pv)
		1158	1023.089											
1 1	125		1026.62	.0013	.77	.77	136	70	66	254	248	61		.7
1 1	130		— . —	.0013	.77	.77	136	71	66	251	249	62		7
1 2	135		1031.75	.0013	.77	.77	138	70	65	253	249	62		7
1 2	140		1033.95	.0010	.59	.59	138	70	65	253	249	62		6
1 3	145		1036.31	.0011	.65	.65	137	69	65	253	248	64		7
1 3	150		1038.80	.0012	.71	.71	138	69	64	257	249	58		7
1 4	155		1041.00	.0010	.59	.59	138	69	65	254	248	59		6
1 4	160		1043.55	.0013	.77	.77	138	68	64	253	249	59		7
1 5	165		1045.89	.0011	.65	.65	137	68	64	241	249	59		7
10 5	170	1248	1048.403	.0013	.77	.77	138	68	64	253	248	58		7
11 6	175													
12														
13														
14														
15														
16														
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18														
19														
20														
21														
22														
23														
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25														

Notes:

Field Data Sheet

[redacted]arison [redacted]ngineering

Date 12-19-98
Test Method ODE a 7
Concurrent Testing EPA 25A
Run # 18
Operator CDB Support
Temperature, Amb (Ta) 30
Pressure, Bar (Pb) 30.4
Pressure, Static (Pstat) 0
Filters 98M-200, 98J-14

Client/Plant/Location: OSU/East/Cycle 2
Probe 3-2 Cp Heat Set 250
Pitot Pretest in in/mi
Leak Check: Post in in/mi
Nozzle .988
Sample Box 1 Heat Set 250
Meter Box 7 dH@ Y
Meter Pretest .007 cfm 12 inHg
Leak Check: Post cfm inHg
Moisture 18 Tdb NA Twb NA

Stack Diagram
Cyclonic Flow? NO

Traverse Point Number	Sampling Time (min)	Clock Time (24 hr)	Dry Gas Meter Reading (cuft) (Vm)	Velocity Head (inH2O) (dPs)	Orifice Pressure (inH2O) DESIRED	Orifice Pressure (inH2O) ACTUAL (dH)	STACK °F (Ts) Amb:	PROBE Inlet/Avg °F (Tm in) Amb:	PROBE Outlet °F (Tm out) Amb:	FILTER °F (Tp) Amb:	OVEN Filter °F (To) Amb:	IMPINGER Outlet °F (Tf) Amb:	AIR °F (Ta)	Vacuum inHg (Pv)
		1257	272.100											
1 1	5		274.06	.0008	.47	.47	124	54	54	270	250	45		4
1 1	10		.	.0005	.29	.29	136	54	54	269	252	46		3
1 2	15		277.26	JU	MM	6 ics								
1 2	20		278.53	.0003	.18	.18	138	54	54	269	252	49		3
1 3	25		279.79	.0003	.18	.18	139	55	54	269	251	49		3
1 3	30		281.06	.0003	.18	.18	139	55	54	270	254	48		3
1 4	35		282.64	.0005	.29	.29	139	56	54	270	255	49		4
1 4	40		284.07	.0004	.24	.24	143	57	54	270	250	50		3
1 5	45		285.52	.0004	.24	.24	145	57	55	269	254	51		3
11 5	50		286.64	.0002	.12	.12	145	57	55	270	255	51		2
11 6	55		287.76	.0002	.12	.12	145	57	55	270	252	51		2
11 6	60		288.87	.0002	.12	.12	145	58	55	270	252	51		2
11 6	65		290.17	.0003	.18	.18	144	58	55	270	252	51		3
11 6	70		292.36	.0009	.53	.53	145	58	56	269	252	54		4
11 5	75		293.89	.0005	.29	.29	145	58	56	269	252	55		3
11 5	80		294.99	.0002	.12	.12	146	58	56	269	251	52		2
11 4	85		296.42	.0004	.24	.24	145	58	56	270	253	52		3
11 4	90		297.70	.0003	.18	.18	146	58	56	269	253	53		3
11 3	95		298.77	.0002	.12	.12	146	58	56	271	252	54		2
11 3	100		300.05	.0003	.18	.18	146	58	56	270	253	54		3
11 2	105		301.11	.0002	.12	.12	146	58	56	270	254	54		2
11 2	110		302.15	.0002	.12	.12	146	58	56	271	252	52		2
11 1	115		303.18	.0002	.12	.12	146	58	57	271	254	52		2
11 1	120	257	304.267	.0002	.12	.12	146	58	57	271	254	52		2
11														

Notes:

Field Data Sheet

[redacted] orizon [redacted] ngineering

Date 12-19-98

Test Method ODE 9 7

Concurrent Testing EPA 25A

Run # 1B

Operator COB Support

Temperature, Am (Ta) 30

Pressure, Bar (Pb)

Pressure, Static (Pstat) 0

Filters 98M-200, 985-14

Client/Plant/Location : OSU/East/Cycle 2

Probe 3-2 Cp Heat Set 250

Pitot	Pretest	in	in/min
Leak Check	Post	in	in/min

Nozzle .988

Sample Box 1 Heat Set 250

Meter Box 7 dH@ Y

Meter	Pretest	cfm	inHg
Leak Check	Post .005	cfm 6	inHg

Moisture 18 Tdb NA Twb NA

Stack Diagram

Cyclonic Flow? NO

Traverse Point Number	Sampling Time min (dt)	Clock Time (24 hr)	Dry Gas Meter Reading cuft (Vm)	Velocity Head inH2O (dPs)	Orifice Pressure inH2O (dH)	Orifice Pressure inH2O (dH@)	STACK °F (Ts) Amb:	BETWEEN Stack/Avg °F (Tm in) Amb:	BETWEEN Outlet °F (Tm out) Amb:	OVEN Filter °F (Tp) Amb:	OVEN Filter °F (Tn) Amb:	IMPINGER Outlet °F (Tf) Amb:	AUX °F (Ta)	Pump Vacuum inHg (Pv)
		300	304.267											
1	125		305.65	.0003	.18	.18	139	58	57	270	251	44		4
1	130		307.03	.0003	.18	.18	139	58	57	269	251	49		4
2	135		308.25	.0003	.18	.18	146	58	57	269	252	49		4
2	140		309.29	.0002	.12	.12	146	58	57	270	251	47		3
3	145		310.35	.0002	.12	.12	147	58	57	270	251	45		3
3	150		—	.0002	.12	.12	147	58	57	270	252	44		3
4	155		312.44	.0002	.12	.12	149	58	57	270	249	45		3
4	160		313.75	.0003	.18	.18	149	59	57	270	252	45		3
5	165		315.05	.0003	.18	.18	150	58	57	270	251	46		3
5	170	350	316.357	.0003	.18	.18	150	58	57	270	252	47		3
6	175													

Notes:

Field Data Sheet

Horizon Engineering

Client/Plant/Location: OSU West Cycle 2

Date 12/19/98

Test Method ODEQ 7

Concurrent Testing 25 A

Run # 19

Operator CDB Support

Temperature, Am (Ta) 20

Pressure, Bar (Pb) 30.44

Pressure, Static (Pstat) 0

Probe 3-7 Cp Heat Set 250 °F

Pitot Pretest in in/min

Leak Check Post in in/min

Nozzle .988

Sample Box Heat Set 250 °F

Meter Box dH@ Y

Meter Pretest .01 cfm 15 inHg

Leak Check Post cfm inHg

Stack Diagram

Filters Cyclonic Flow ? Moisture Tdb Twb

Traverse Point Number	Sampling Time min (dt)	Clock Time (24 hr)	Dry Gas Meter Reading cuft (Vm)	Velocity Head inH2O (dPs)	Orifice Pressure inH2O DESIRED	Orifice Pressure inH2O ACTUAL (dH)	STACK °F (Ts)	METER Inlet/Avg °F (Tm-in)	METER Outlet °F (Tm-out)	PROBE °F (Tp)	OVEN Filter °F (To)	IMPINGER Outlet °F (Ti)	AUX °F (Tx)	Pump Vacuum inHg (Pv)
		359	48.562				Amb:	Amb:	Amb:	Amb:	Amb:	Amb:		
1	1	5	51.52	.0010	.59	.59	131	50	50	254	249	44		12
2	1	10	— . —	.0010	.59	.59	142	51	50	253	249	47		11
3	2	15	56.05		JUM	Bias								
4	2	20	58.43	.0012	.71	.71	148	54	50	254	248	52		11
5	3	25	60.78	.0011	.65	.65	149	55	50	253	248	54		9
6	3	30	63.11	.0011	.65	.65	150	57	51	252	248	54		9
7	4	35	65.48	.0011	.65	.65	152	58	52	252	248	60		9
8	4	40	67.68	.0010	.59	.59	154	59	52	253	249	61		8
9	5	45	69.99	.0011	.65	.65	156	59	53	252	248	63		9
10	5	50	72.20	.0010	.59	.59	158	60	54	254	247	65		8
11	6	55	74.35	.0010	.59	.59	159	60	54	253	249	66		8
12	6	60	76.47	.0010	.59	.59	160	61	56	253	248	65		8
13	6	65	78.75	.0011	.65	.65	161	63	56	253	248	66		9
14	6	70	81.06	.0010	.59	.59	162	64	57	244	248	68		9
15	5	75	83.40	.0011	.65	.65	163	64	58	253	248	60		8
16	5	80	85.75	.0011	.65	.65	164	65	58	254	248	53		8
17	4	85	88.19	.0012	.71	.71	165	65	59	246	249	46		9
18	4	90	90.05	.0007	.41	.41	166	64	57	253	249	43		6
19	3	95	92.44	.0012	.71	.71	166	63	57	255	249	42		9
20	3	100	94.54	.0009	.53	.53	166	64	58	255	249	44		7
21	2	105	— . —	.0010	.59	.5	166	64	58	255	249	45		8
22	2	110	99.07	.0011	.65	.65	166	65	59	255	248	47		9
23	1	115	101.37	.0011	.65	.65	166	65	59	255	249	46		9
24	1	120	559	103.88	.0013	.77	.77	166	65	59	254	249	49		10
25														

South

Notes:

Field Data Sheet

Horizon Engineering

Date 12/19/98
Test Method ODEQ 7
Concurrent Testing 25A
Run # 19
Operator CDR Support
Temperature, Am (Ta) 30
Pressure, Bar (Pb) 30.44
Pressure, Static (Pstat) 0

Stack Diagram

Client/Plant/Location OSU west Cycle 8
Probe 3-1 Cp Heat Set °F
Pitot Pretest in in/min
Leak Check Post in in/min
Nozzle .938
Sample Box Heat Set °F
Meter Box dH@ Y
Meter Pretest cfm inHg
Leak Check Post .01 cfm 14 inHg

Filters Cyclonic Flow ? Moisture Tdb Twb

Traverse Point Number	Sampling Time min (dt)	Clock Time (24 hr)	Dry Gas Meter Reading cuft (Vm)	Velocity Head inH2O (dPs)	Orifice Pressure inH2O DESIRED	Orifice Pressure inH2O ACTUAL (dH)	STACK °F (Ts) Amb:	METER Inlet/Avg. °F (Tm-in) Amb:	METER Outlet °F (Tm-out) Amb:	PROBE °F (Tp) Amb:	OVEN Filter °F (To) Amb:	IMPINGER Outlet °F (Ti) Amb:	AUX °F (Tx)	Pump Vacuum inHg (Pv)
		602	103.860											
1 1	5		105.41	.0005	.29	.29	162	63	60	257	250	48		11
2 1	10		106.65	.0003	.18	.18	162	64	60	256	249	52		9
3 2	15		108.03	.0004	.24	.24	163	63	60	256	249	53		9
4 2	20		109.44	.0004	.24	.24	163	64	60	256	249	51		9
5 3	25		110.84	.0004	.24	.24	163	64	60	257	250	55		9
6 3	30		112.25	.0004	.24	.24	164	64	61	257	249	57		9
7 4	35		113.67	.0004	.24	.24	165	64	61	256	25	55		9
8 4	40		114.87	.0003	.18	.18	166	65	61	256	249	57		8
9 5	45		116.07	.0003	.18	.18	166	64	61	256	250	59		8
10 5	50	652	117.047	.0002	.12	.12	166	64	62	257	250	59		7
11 6	55													
12 6	60													
13														
14														
15														
16														
17														
18														
19														
20														
21														
22														
23														
24														
25														

Last Not

Notes:

Field Data Sheet

Horizon Engineering

Client/Plant/Location : OSU East Cycle 2

Date 12/19/98

Test Method CDEQ 7

Concurrent Testing 254

Run # 20 cyc 2

Operator CDB Support

Temperature, Amb (Ta) 30

Pressure, Bar (Pb) 30.44

Pressure, Static (Pstat) 0

Filters 98M-200 98S-14

Probe 3-2 Cp Heat Set 250 °F

Pitot Pretest in in/min

Leak Check Post in in/min

Nozzle .988

Sample Box 1 Heat Set 250 °F

Meter Box 7 dH@ Y

Meter Pretest .015 cfm 15 inHg

Leak Check Post cfm inHg

Stack Diagram

Cyclonic Flow ?

Moisture 30 Tdb Twb

Traverse Point Number	Sampling Time min (dt)	Clock Time (24 hr)	Dry Gas Meter Reading cuft (Vm)	Velocity Head inH2O (dPs)	Orifice Pressure inH2O DESIRED	Orifice Pressure inH2O ACTUAL (dH)	STACK °F (Ts)	METER Inlet/Avg. °F (Tm-in)	METER Outlet °F (Tm-out)	PROBE °F (Tp)	OVEN Filter °F (To)	IMPINGER Outlet °F (Ti)	AUX °F (Tx)	Pump Vacuum inHg (Pv)
	.	657	316.532				Amb:	Amb:	Amb:	Amb:	Amb:	Amb:		
1 1	5		318.87	.0012	.71	.71	156	52	52	270	254	47		6
2 1	10		.	.0005	.29	.29	161	52	52	268	254	48		4
3 2	15		— . —											
4 2	20		322.67	.0003	.18	.18	165	53	52	271	256	55		6
5 3	25		323.73	.0002	.12	.12	155	53	52	272	254	52		5
6 3	30		324.75	.0002	.12	.12	153	54	52	272	254	46		5
7 4	35		326.01	.0003	.18	.18	148	54	52	272	255	45		6
8 4	40		327.05	.0002	.12	.12	153	54	53	270	254	46		5
9 5	45		328.07	.0002	.12	.12	146	55	54	272	255	51		5
10 5	50		329.06	.0002	.12	.12	150	55	54	270	254	49		5
11 6	55		330.36	.0002	.12	.12	147	55	54	272	255	46		5
12 6	60	757	331.65	.0003	.18	.18	144	55	54	267	254	46		7
13 6	65		332.82	.0003	.18	.18	144	56	54	271	255	48		7
14 6	70		.	.0002		.12	146	57	55	257	255	41		5
15 5	75		.											
16 5	80		.											
17 4	85		336.00	.0002		.12	145	61	58	273	255	46		5
18 4	90		337.27	.0002		.12	145	61	58	270	255	46		5
19 3	95		338.0	.0002		.12	150	61	58	272	254	45		5
20 3	100		338.9	.0002	.09	.10	164	63	60	269	254	43		5
21 2	105		340.04	.0003		.13	165	64	61	268	254	41		6
22 2	110		340.99	.0002	.09	.09	164	65	61	269	254	42		5
23 1	115		341.96	.0004		.17	165	66	63	68	254	41		7
24 1	120	857	343.29	.0004		.17	165	66	63	267	255	41		7
25			.											

Notes:

Field Data Sheet

Horizon Engineering

Client/Plant/Location: OSU/East/Cage 2

Date 12-19-98

Test Method 7

Concurrent Testing 25A

Run # 20C017

Operator DRB Support

Temperature, Am (Ta) 30

Pressure, Bar (Pb) 30.3

Pressure, Static (Pstat) 0

Filters 98M-200 5-14

Probe 3-2 Cp Heat Set 250 °

Pitot Pretest in in/min

Leak Check Post 3.75 in 0.0 in/min

Nozzle .188

Sample Box 1 Heat Set °

Meter Box 7 dH@ Y

Meter Pretest cfm inHg

Leak Check Post 0.007 cfm 12 inHg

Stack Diagram

Cyclonic Flow?

Moisture 30 Tdb Twb

Traverse Point Number	Sampling Time min (dt)	Clock Time (24 hr)	Dry Gas Meter Reading cuft (Vm)	Velocity Head inH2O (dPs)	Orifice Pressure inH2O DESIRED	Orifice Pressure inH2O ACTUAL (dH)	STACK °F (Ts)	METER Inlet/Avg °F (Tm-in)	METER Outlet °F (Tm-out)	PROBE °F (Tp)	OVEN Filter °F (To)	IMPINGER Outlet °F (Ti)	AUX °F (Tx)	Pump Vacuum inHg (Pv)
		859	343.214				Amb:	Amb:	Amb:	Amb:	Amb:	Amb:		
1 6	5		344.5	.0004		.18	164	69	66	267	256	46		7
2 6	10		345.7	.0004		.18	164	71	67	265	255	45		7
3 5	15		346.9	.0004		.18	164	72	69	264	252	45		7
4 5	20		348.23	.0004		.18	164	72	69	264	252	45		7
5 4	25		349.49	.0004		.18	166	72	69	265	253	45		7
6 4	30		350.54	.0003		.13	166	72	70	266	253	46		7
7 3	35		351.42	.0002	.009	.09	167	73	71	267	252	47		5
8 3	40	939	352.3	.0005	.209	.21	150	74	71	267	252	47		5
9 2	45		353.94	.0009		.38	153	74	72	267	250	46		10
10 2	50	949	355.811	.0009		.38	153	75	72	265	252	46		10
11														
12														
13														
14														
15														
16														
17														
18														
19														
20														
21														
22														
23														
24														
25														

Notes:

Field Data Sheet

Horizon Engineering

Client/Plant/Location : OSU/Kelsey/Cyc 2

Date 12-19-98

Test Method 7

Concurrent Testing 25A

Run # 21 West Cyc 2

Operator DRB Support

Temperature, Am (Ta) 30

Pressure, Bar (Pb) 30.3

Pressure, Static (Pstat) 0

Filters 78M206 S 15

Probe 3-1 Cp Heat Set 250

Pitot Pretest in in/min

Leak Check Post 4 in 0.0 in/min

Nozzle 988

Sample Box 46 Heat Set 250

Meter Box 4 dH@ Y

Meter Pretest 0.011 cfm 15 inHg

Leak Check Post 0.0 cfm 13 inHg

Stack Diagram

Cyclonic Flow ?

Moisture 30 Tdb Twb

Traverse Point Number	Sampling Time min (dt)	Clock Time (24 hr)	Dry Gas Meter Reading cuft (Vm)	Velocity Head inH2O (dPs)	Orifice Pressure inH2O DESIRED	Orifice Pressure inH2O ACTUAL (dH)	STACK °F (Ts)	METER Inlet/Avg. °F (Tm-in)	METER Outlet °F (Tm-out)	PROBE °F (Tp)	OVEN Filter °F (To)	IMPINGER Outlet °F (Ti)	AUX °F (Tx)	Pump Vacuum inHg (Pv)
		955	117.167				Amb:	Amb:	Amb:	Amb:	Amb:	Amb:		
1 6	5		118.47	.0007		.19	157	78	76	258	251	58		9
2 6	10		120.17	.0007		.29	162	79	76	257	251	51		8
3 5	15		.	.0006		.25	162	80	77	257	251	46		7
4 5	20		123.38	.0005		.23	163	82	79	258	250	46		6
5 4	25		124.72	.0005		.23	163	82	79	258	251	50		6
6 4	30		.	.0006		.25	163	84	80	258	251	52		5
7 3	35		127.72	.0006										
8 3	40		128.72	.0004		.17	163	85	83	258	250	52		4
9 2	45		129.999	.0006		.25	163	86	83	258	249	54		5
10 2	50		131.399	.0006		.25	163	86	83	258	241	54		5
11 1	55		132.86	.0006		.25	164	85	83	257	250	55		4
12 1	60	1055	134.49	.0008	.378	.34	164	84	83	255	251	53		5
13 1	65		135.98	.0007		.30	165	83	82	257	250	50		5
14 1	70		137.999	.0007		.30	165	82	82	257	250	54		5
15 2	75		139.15	.0007		.30	165	81	81	256	250	54		5
16 2	80	1115	140.221	.0007		.30	161	79	79	250	250	49		
17 3	~~85~~		.											
18 3	90	HCL	.											
19			.											
20			.											
21			.											
22			.											
23			.											
24			.											
25			.											

Notes:

Blank Correction

Willamette Industries - OSU						14-Dec-98
Kiln Test No. 2 Cycle No. 1 Douglas Fir						drb
Corvalis, OR						part_gas
EPA 1-4, ODEQ 5						mew
BLANKS						
Acetone	126	ml	0.0016	gm	1.27	mg/100ml
H2O, Residue	358	ml	-0.0003	gm	-0.08	mg/100ml
H2O, DCM	358	ml	-0.0001	gm	-0.03	mg/100ml
Filter-Front	m98-196	ID	-0.0001	gm		
Filter-Back	s98-5x	ID	0.0001	gm		
RUNS			West	East		Total
ACETONE-Front	Volume	ml	112	148		
	Weight	mg	3.4	9.8		
	Blank	mg/100ml	1.00	1.00		
	Correction	mg	-1.12	-1.48		
	Net	mg	2.28	8.32		10.60
ACETONE-Back	Volume	ml	186	322		
	Weight	mg	19.6	22.7		
	Blank	mg/100ml	1.00	1.00		
	Correction	mg	-1.86	-3.22		
	Net	mg	17.74	19.48		37.22
IMP WATER-Residue	Volume	ml	200	200		
	Weight	mg	6.40	5.70		
	Blank	mg/100ml	0.00	0.00		
	Correction	mg	0.00	0.00		
	Net	mg	6.40	5.70		12.10
IMP WATER-Extract (DCM)	Volume	ml	200	200		
	Weight	mg	14.50	10.60		
	Blank	mg/100ml	0.00	0.00		
	Correction	mg	0.00	0.00		
	Net	mg	14.50	10.60		25.10
FILTER-Front	ID		m98-283	*m98-250*		
	Weight	mg	15.70	*1.90*		17.60
FILTER-Back	ID		s98-51	s98-52		
	Weight	mg	5.20	0.50		5.70
FRONT HALF TOTAL		mg	17.98	10.22		28.20
BACK HALF TOTAL		mg	43.84	36.28		80.12
TOTAL	mn	mg	61.82	46.50		108.32
PERCENT BACK HALF		%	70.9%	78.0%		74.0%

Filter m98-250 was shredded on edge

Blank Correction

Willamette Industries - OSU							16-Dec-98
Kiln Test No. 2 Cycle No. 2 Douglas Fir							drb
Corvalis, OR							part_gas
EPA 1-4, ODEQ 5							mew
BLANKS							
Acetone	126	ml	0.0016	gm		1.27	mg/100ml
H2O, Residue	358	ml	-0.0003	gm		-0.08	mg/100ml
H2O, DCM	358	ml	-0.0001	gm		-0.03	mg/100ml
Filter-Front	m98-196	ID	-0.0001	gm			
Filter-Back	s98-5x	ID	0.0001	gm			
RUNS			West		East		Total
ACETONE-Front	Volume	ml	95		74		
	Weight	mg	2.7		3.6		
	Blank	mg/100ml	1.00		1.00		
	Correction	mg	-0.95		-0.74		
	Net	mg	1.75		2.86		4.61
ACETONE-Back	Volume	ml	222		214		
	Weight	mg	20.8		20.5		
	Blank	mg/100ml	1.00		1.00		
	Correction	mg	-2.22		-2.14		
	Net	mg	18.58		18.36		36.94
IMP WATER-Residue	Volume	ml	200		200		
	Weight	mg	12.30		11.00		
	Blank	mg/100ml	0.00		0.00		
	Correction	mg	0.00		0.00		
	Net	mg	12.30		11.00		23.30
IMP WATER-Extract (DCM)	Volume	ml	200		200		
	Weight	mg	13.20		8.50		
	Blank	mg/100ml	0.00		0.00		
	Correction	mg	0.00		0.00		
	Net	mg	13.20		8.50		21.70
FILTER-Front	ID		m98-206		m98-200		
	Weight	mg	33.70		5.10		38.80
FILTER-Back	ID		s98-15		s98-14		
	Weight	mg	-0.40		0.50		0.10
FRONT HALF TOTAL		mg	35.45		7.96		43.41
BACK HALF TOTAL		mg	43.68		38.36		82.04
TOTAL	mn	mg	79.13		46.32		125.45
PERCENT BACK HALF		%	55.2%		82.8%		65.4%

ANTECH

Analysis/Technology

Mr. David Rossman
HORIZON ENGINEERING
13585 NE Whitaker
Portland, OR 97230

January 15, 1999 Identification: OSU/Willamette Industries
Job # 9835500-48 Date received: 12/22/98

Sample #	35506-09	35510-13	35513-14	35515-16	35517-19	35520-21
Identification:	OSU west cycle 1 R 1,3,5,7	OSU west cycle 1 R 9,11,13	OSU west cycle 1 R 15,17	OSU west cycle 1 R19,21	OSU west cycle 2 R 3,5,7	OSU west cycle 2 R 9,11
Impinger water:						
volume (mls)	989	965	760	808	980	800
residue (g)	0.0017	0.0024	0.0015	0.0008	0.0043	0.0033
DCM:						
volume (mls)	150	150	150	150	150	150
residue (g)	0.0040	0.0038	0.0014	0.0053	0.0036	0.0035

Sample #	35522-24	35525-26	35527-29	35530-32	35533-35	35536
Identification:	OSU west cycle 2 R 13,15,17	OSU west cycle 2 R 19,21	OSU east cycle 1 R 2,4,6	OSU east cycle 1 R 8,10,12	OSU east cycle 1 R 14,16,18	OSU east cycle12 R 20
Impinger water:						
volume (mls)	985	1050	758	825	905	562
residue (g)	0.0024	0.0023	0.0022	0.0016	0.0016	0.0003
DCM:						
volume (mls)	150	150	150	150	150	150
residue (g)	0.0042	0.0019	0.0042	0.0017	0.0013	0.0034

Sample #	35537-39	35540-42	35543-45	35546-16	35547	35548
Identification:	OSU east cycle 2 R 2,4,6	OSU east cycle 2 R 8,10,12	OSU east cycle 2 R 14,16,18	OSUeastt cycle 2 R 20	OSU cycle 1 blank	OSU cycle 2 blank
Impinger water:						
volume (mls)	764	853	604	559	358	340
residue (g)	0.0012	0.0011	0.0007	0.0008	-0.0003	0.0001
DCM:						
volume (mls)	150	150	150	150	150	150
residue (g)	0.0020	0.0009	0.0027	0.0029	-0.0001	-0.0003

Respectfully submitted:
ANTECH

Diana Tracy

Diana Tracy, president

501 N.E. THOMPSON MILL ROAD
CORBETT, OREGON 97019
503/695-2135
FAX 503/695-2139

ANTECH

Analysis/Technology

Mr. David Rossman
HORIZON ENGINEERING
13585 NE Whitaker
Portland, OR 97230

January 15, 1999 — Identification: OSU/Willamette Industries
Job # 9835500-48 — Date received: 12/22/98

Sample #	35500	35501	35502
Identification:	Kiln East Cycle 1 Run 1	Kiln East Cycle 2 Run 2	Kiln East Blank Run 3
Front acetone:			
volume (mls)	148	74	126
residue (g)	0.0098	0.0036	0.0016
Back acetone:			
volume (mls)	322	214	
residue (g)	0.0277	0.0205	
Filters:			
number	8M-250	98M-200	
residue (g):	0.0019*	0.0051	
Filters:			
number	98S-52	98S-14	
residue (g)	0.0005	0.0005	

*note: Filter 98M-.250 edge of filter was shredded.

Respectfully submitted:
ANTECH

Diana Tracy
president

501 N.E. THOMPSON MILL ROAD
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ANTECH

Analysis/Technology

Mr. David Rossman
HORIZON ENGINEERING
13585 NE Whitaker
Portland, OR 97230

January 15, 1999 — Identification: OSU/Willamette Industries
Job # 9835500-48 — Date received: 12/22/98

Sample #	35503	35504	35505
Identification:	Kiln West Cycle 1 Run 1	Kiln West Cycle 2 Run 2	Kiln West Blank Run 3
Front acetone:			
volume (mls)	112	95	115
residue (g)	0.0034	0.0027	0.0017
Back acetone:			
volume (mls)	186	222	
residue (g)	0.0196	0.0208	
Filters:			
number	98M-283	98M-2206	98M-196
residue (g):	0.0157	0.0337	-0.0001
Filters:			
number	98S-51	98S-15	98S-57
residue (g)	0.0052	-0.0004	0.0001

Respectfully submitted:
ANTECH

Diana Tracy

Diana Tracy
president

501 N.E. THOMPSON MILL ROAD
CORBETT, OREGON 97019
503/695-2135
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12-26 70°/56° 10A
12-27 72°/21° 9AM
12-28 71°/62° 8AM

SAMPLE DATA: EPA RESIDUES
analyst: [illegible] reviewer:
Job # 355 Identification: OSU/Willamette Industries - j# 1079

FAXED 12-30-98

FRONT ACETONE:	date gross 1:		date gross 2:		
Sample #	35500	35501	35502		
sample ID	OSU E cycle 1	OSU E cycle 2	OSU cycle 1		
cont. #			Blank		
vol mark (check if OK)	✓	✓	✓		
volume(ml)	148ml	74ml	126ml		
gross1(g)	118.8229	106.7486	88.3635	12-27	
gross2(g)	118.8231	106.7190	88.3640	12-28	
average gross(g)*	118.8230	106.7488	88.3638		
tare(g)	118.8132	106.7452	88.3622		
residue(g)	.0098	.0036	.0016		

BACK ACETONE:	date gross 1:		date gross 2:		
Sample #	35500	35501			
sample ID	OSU E cycle 1	OSU E cycle 2			
cont. #					
vol mark (check if OK)	✓	✓			
volume(ml)	322ml	214ml			
gross1(g)	107.3830	107.7184		12-27	
gross2(g)	107.3835	107.7192		12-28	
		107.7196 12-29			
average gross(g)*	107.3833	107.7194			
tare(g)	107.3606	107.6989			
residue(g)	.0227	.0205			

IMPINGER WATER:	date gross 1:		date gross 2:		
Sample #					
sample ID					
cont. #					
vol mark (check if OK)					
volume(ml)					
gross1(g)					
gross2(g)					
average gross(g)*					
tare(g)					
residue(g)					

revised copy 2/10/99

SAMPLE DATA: EPA RESIDUES

analyst: [illegible] reviewer: _____
Job # 355 Identification: OSU/Williamette Industries # 1079

DCM: date gross 1: _____ date gross 2: _____

Sample #					
sample ID					
cont. #					
volume(ml)					
gross1(g)					
gross2(g)					
average gross(g)*					
tare(g)					
residue(g)					

FILTERS: date gross 1: _____ date gross 2: _____

Sample #	35500	35500	35501	35501	
sample ID	OSU E	OSU E	OSU G	OSU E	
	cycle 1	cycle 1	cycle 2	cycle 2	
Filter #	98M-250	98S-52	98M-200	98S-14	
gross1(g)	.4172	.2045	.4240	.2527 12-27	12-23
gross2(g)	.4166	.2043	.4202	.2529 12-27	12-27
	.4184 12-28		.4155 12-28		
	.4179 12-29		.4158 12-29		
average gross(g)*	.4182	.2044	.4157	.2528	
tare(g)	.4163	.2039	.4106	.2523	
residue(g)	.0019 *	.0005	.0051	.0005	

Temperature day 1 _____ Humidity day 1 _____

Temperature day 2 _____ Humidity day 2 _____

NBS thermometer # _____

Balance service date: _____

* edge of filter was shredded. - [illegible]

12-23 70°/56° 10AM
12-27 72°/61° 9AM
12-28 71°/62° 8AM

SAMPLE DATA: EPA RESIDUES
analyst: _____ reviewer: _____
Job # 355 Identification: OSU/Willamette Industries # 1079.

FAXED 12-30-98

FRONT ACETONE:		date gross 1:		date gross 2:	
Sample #	35503	35504	35505		
sample ID	OSU W cycle 1	OSU W cycle 2	OSU W cycle 2		
cont. #			Blank		
vol mark (check if OK)	✓	✓	✓		
volume(ml)	112 ml.	95 ml.	115 ml.		
gross1(g)	102.3482	102.3748	101.6702	12-27	
gross2(g)	102.3483	102.3750	101.6706	12-28	
average gross(g)*	102.3483	102.3749	101.6704		
tare(g)	102.3449	102.3722	101.6687		
residue(g)	.0034	.0027	.0017		

BACK ACETONE:		date gross 1:		date gross 2:		
Sample #	35503	35504			355	
sample ID	OSU W cycle 1	OSU W cycle 2			Blank 12-23-98	
cont. #						
vol mark (check if OK)	✓	✓				
volume(ml)	186 ml.	222 ml.			empty	
gross1(g)	125.5244	109.2527			116.9070	12-27
gross2(g)	125.5246	109.2527			116.9072	12-28
average gross(g)*	125.5245	109.2527			116.9071	
tare(g)	125.5049	109.2319			116.9070	
residue(g)	.0196	.0208			.0001	

IMPINGER WATER:		date gross 1:		date gross 2:	
Sample #					
sample ID					
cont. #					
vol mark (check if OK)					
volume(ml)					
gross1(g)					
gross2(g)					
average gross(g)*					
tare(g)					
residue(g)					

SAMPLE DATA: EPA RESIDUES

analyst: lw reviewer:
Job # 355 Identification: OSU / Willamette Industries #1079

DCM: date gross 1: date gross 2:

Sample #					
sample ID					
cont. #					
volume(ml)					
gross1(g)					
gross2(g)					
average gross(g)*					
tare(g)					
residue(g)					

FILTERS: date gross 1: date gross 2:

Sample #	35503	35503	35504	35504	35505	35505	
sample ID	OSU W cycle 1	OSU W cycle 1	OSU W cycle 2	OSU W cycle 2	OSU Blank	OSU Blank	
Filter #	98M-283	98S-51	98M-206	98S-15	98M-196	98S-57	
gross1(g)	.4287	.2089 10-27	.4457	.2498	.4149	.2027	12-23
gross2(g)	.4289	.2090 10-28	.4456	.2498	.4152	.2027	12-27
average gross(g)*	.4288	.2090	.4457	.2498	.4151	.2027	
tare(g)	.4131	.2038	.4120	.2502	.4152	.2026	
residue(g)	.0157	.0052	.0337	-.0004	-.0001	.0001	

Temperature day 1 Humidity day 1

Temperature day 2 Humidity day 2

NBS thermometer #

Balance service date:

Balance calibration data (certified weights):

1-1-99 74°/60° TAI
1-4-99 73°/61 1pm
1-5-99 69°/59° 8AM
1-6-99 70°/64° 8AM
1-7-99 72°/60° 8AM

SAMPLE DATA: EPA RESIDUES
analyst: MW reviewer: _____
Job # 355 Identification: OSU/Willamette Ind # 1079

FAXED 1-7-99

FRONT ACETONE:	date gross 1:		date gross 2:		
Sample #					
sample ID					
cont. #					
vol mark (check if OK)					
volume(ml)					
gross1(g)					
gross2(g)					
average gross(g)*					
tare(g)					
residue(g)					

BACK ACETONE:	date gross 1:		date gross 2:		
Sample #					
sample ID					
cont. #					
vol mark (check if OK)					
volume(ml)					
gross1(g)					
gross2(g)					
average gross(g)*					
tare(g)					
residue(g)					

IMPINGER WATER:	date gross 1:		date gross 2:		
Sample #	35506-09	35510-12	35513-14	35515-16	
sample ID	OSU W C1, R1,3,5,7	OSU W C1, R9,11,13	OSU W C1 R15,17	OSU W C1 R19,21	
cont. #					
vol mark (check if OK)					
volume(ml)	989ml	965ml.	760ml	808ml.	
gross1(g)	137.1781	133.4581	135.7782	131.9099	1-4
gross2(g)	137.1769	133.4571	135.7771	131.9087	1-5
	137.1783	133.4583	135.7780	131.9092	1-6
	137.1782	133.4578	135.7777 1-7		
average gross(g)*	137.1783	133.4581	135.7779	131.9090	
tare(g)	137.1766	133.4557	135.7764	131.9082	
residue(g)	.0017	.0024	.0015	.0008	

SAMPLE DATA: EPA RESIDUES

analyst: mj reviewer: _____
Job # 355 Identification: OSU/Willamette Dried, #1079

DCM: date gross 1: _____ date gross 2: _____

Sample #	35506-09	35510-12	35513-14	35515-16	
sample ID					
cont. #					
volume(ml)	(150)	(150)	(150)	(150)	
gross1(g)	107.4233	112.0114	86.7049	88.6956	1-1
gross2(g)	107.4246	112.0122	86.7057	88.6969	1-4
	107.4247	112.0122	86.7055	88.6969	1-5
average gross(g)*	107.4247	112.0122	86.7056	88.6969	
tare(g)	107.4207	112.0084	86.7042	88.6916	
residue(g)	.0040	.0038	.0014	.0053	

FILTERS: date gross 1: _____ date gross 2: _____

Sample #					
sample ID					
Filter #					
gross1(g)					
gross2(g)					
average gross(g)*					
tare(g)					
residue(g)					

Temperature day 1 _____ Humidity day 1 _____

Temperature day 2 _____ Humidity day 2 _____

NBS thermometer # _____

Balance service date: _____

Balance calibration data (certified weights):

SAMPLE DATA: EPA RESIDUES

analyst: MW reviewer: _____
Job # 355 Identification: OSU/Willamette Ind, #1079

DCM: date gross 1: _____ date gross 2: _____

Sample #	35517-19	35520-21	35522-24	35525-26	
sample ID					
cont. #					
volume(ml)	(150)	(150)	(150)	(150)	
gross1(g)	109.8100	87.5127	102.2848	86.6558	1-1
gross2(g)	109.8104	87.5129	102.2850	86.6569	1-4
				86.6569 1-5	
average gross(g)*	109.8102	87.5128	102.2849	86.6569	
tare(g)	109.80666	87.5093	102.2807	86.6550	
residue(g)	.0036	.0035	.0042	.0019	

FILTERS: date gross 1: _____ date gross 2: _____

Sample #					
sample ID					
Filter #					
gross1(g)					
gross2(g)					
average gross(g)*					
tare(g)					
residue(g)					

Temperature day 1 _____ Humidity day 1 _____

Temperature day 2 _____ Humidity day 2 _____

NBS thermometer # _____

Balance service date: _____

Balance calibration data (certified weights):

SAMPLE DATA: EPA RESIDUES
analyst: ___ reviewer: ___
Job # 355 Identification: OSU/Willamette Ind, #1079

FRONT ACETONE: date gross 1: ___ date gross 2: ___

Sample #					
sample ID					
cont. #					
vol mark (check if OK)					
volume(ml)					
gross1(g)					
gross2(g)					
average gross(g)*					
tare(g)					
residue(g)					

BACK ACETONE: date gross 1: ___ date gross 2: ___

Sample #					
sample ID					
cont. #					
vol mark (check if OK)					
volume(ml)					
gross1(g)					
gross2(g)					
average gross(g)*					
tare(g)					
residue(g)					

IMPINGER WATER: date gross 1: ___ date gross 2: ___

Sample #	35517-19	35520-21	35520-24	35525-26	
sample ID	OSU W C2 R3,5,7	OSU W C2 R9,11	OSU W C2 R13,15,17	OSU W C2 R19,21	
cont. #					
vol mark (check if OK)					
volume(ml)	980ml	800ml.	985ml.	1050ml	
gross1(g)	127.4371	134.7663	133.3232	132.5836	1-4
gross2(g)	127.4366	134.7652	133.3228	132.5830	1-5
		134.7656 1-6		132.5825 1-6	
average gross(g)*	127.4369	134.7654	133.3230	132.5828	
tare(g)	127.4326	134.7621	133.3206	132.5805	
residue(g)	.0043	.0033	.0024	.0023	

SAMPLE DATA: EPA RESIDUES
analyst: [illegible] reviewer: _____
Job # 355 Identification: OSU/Willamette Ind, #1079

FRONT ACETONE:	date gross 1:		date gross 2:	
Sample #				
sample ID				
cont. #				
vol mark (check if OK)				
volume(ml)				
gross1(g)				
gross2(g)				
average				
gross(g)*				
tare(g)				
residue(g)				

BACK ACETONE:	date gross 1:		date gross 2:	
Sample #				
sample ID				
cont. #				
vol mark (check if OK)				
volume(ml)				
gross1(g)				
gross2(g)				
average				
gross(g)*				
tare(g)				
residue(g)				

IMPINGER WATER:	date gross 1:		date gross 2:	
Sample #	35527-29	35530-32	35533-35	35536
sample ID	OSU E CI R2,4,6	OSU E CI R8,10,12	OSU E CI R 14,16,18	OSU E CI R20
cont. #				
vol mark (check if OK)				
volume(ml)	758ml.	825ml.	905ml.	562ml.
gross1(g)	125.0816	163.1682	141.1144	126.9868
gross2(g)	125.0806	163.1683	141.1142	126.9865
average	125.0813 1-6 125.0811 1-7 ~~125.0812~~	163.1683	141.1143	126.9867
gross(g)*				
tare(g)	125.0790	163.1667	141.1127	126.9864
residue(g)	.0022	.0016	.0016	.0003

SAMPLE DATA: EPA RESIDUES

analyst: MW reviewer: _____
Job # 355 Identification: OSU/Willamette Ind, #1079

DCM: date gross 1: _____ date gross 2: _____

Sample #	35527-29	35530-32	35533-35	35536	
sample ID					
cont. #					
volume(ml)	(150)	(150)	(150)	(150)	
gross1(g)	107.9388	117.3906	118.6638	117.2968	1-1
gross2(g)	107.9395	117.3907	118.6638	117.2967	1-4
	107.93960 1-5				
average gross(g)*	107.9396	117.3907	118.6638	117.2968	
tare(g)	107.9354	117.3890	118.6625	117.2934	
residue(g)	.0042	.0017	.0013	.0034	

FILTERS: date gross 1: _____ date gross 2: _____

Sample #					
sample ID					
Filter #					
gross1(g)					
gross2(g)					
average gross(g)*					
tare(g)					
residue(g)					

Temperature day 1 _____ Humidity day 1 _____

Temperature day 2 _____ Humidity day 2 _____

NBS thermometer # _____

Balance service date: _____

Balance calibration data (certified weights):

SAMPLE DATA: EPA RESIDUES
analyst: [illegible] reviewer: _____
Job # 355 Identification: OSU/Wilbrinette Ind, #1079

FRONT ACETONE: date gross 1: _____ date gross 2: _____

Sample #					
sample ID					
cont. #					
vol mark (check if OK)					
volume(ml)					
gross1(g)					
gross2(g)					
average					
gross(g)*					
tare(g)					
residue(g)					

BACK ACETONE: date gross 1: _____ date gross 2: _____

Sample #					
sample ID					
cont. #					
vol mark (check if OK)					
volume(ml)					
gross1(g)					
gross2(g)					
average					
gross(g)*					
tare(g)					
residue(g)					

IMPINGER WATER: date gross 1: _____ date gross 2: _____

Sample #	355 37-39	35540-42	35543-45	355 46	
sample ID	OSU E	OSU E	OSU E	OSU E	
	C2 R2,4,6	C2 R8,10,12	C2 R14,16,18	C2 R20	
cont. #					
vol mark (check if OK)					
volume(ml)	764 ml	853 ml	604 ml	559 ml	
gross1(g)	126.5039	170.0886	142.9927	120.7003	1-4
gross2(g)	126.5028	170.0882	142.9921	120.6993	1-5
	126.5038		142.9930	120.6997	1-6
	126.5038		142.9925		1-7
average	126.5038	170.0884	142.9928	120.6995	
gross(g)*					
tare(g)	126.5026	170.0873	142.9921	120.6987	
residue(g)	.0012	.0011	.0007	.0008	

SAMPLE DATA: EPA RESIDUES

analyst: [illegible] reviewer: _____
Job # 355 Identification: OSU/Willamette Ind, #1079

DCM: date gross 1: _____ date gross 2: _____

Sample #	35537-39	35540-42	35543-45	35546	
sample ID					
cont. #					
volume(ml)	(150)	(150)	(150)	(150)	
gross1(g)	119.2084	118.5927	116.1521	115.7566	1-1
gross2(g)	119.2096 119.20971-5	118.5931	116.1525	115.7568	1-4
average gross(g)*	119.2097	118.5929	116.1523	115.7567	
tare(g)	119.2077	118.5920	116.1496	115.7538	
residue(g)	.0020	.0009	.0027	.0029	

FILTERS: date gross 1: _____ date gross 2: _____

Sample #					
sample ID					
Filter #					
gross1(g)					
gross2(g)					
average gross(g)*					
tare(g)					
residue(g)					

Temperature day 1 _____ Humidity day 1 _____

Temperature day 2 _____ Humidity day 2 _____

NBS thermometer # _____

Balance service date: _____

Balance calibration data (certified weights):

SAMPLE DATA: EPA RESIDUES
analyst: [illegible] reviewer: [illegible]
Job # 355 Identification: OSU/Willamette Ind, #1079

FRONT ACETONE: date gross 1: _____ date gross 2: _____

Sample #					
sample ID					
cont. #					
vol mark (check if OK)					
volume(ml)					
gross1(g)					
gross2(g)					
average gross(g)*					
tare(g)					
residue(g)					

BACK ACETONE: date gross 1: _____ date gross 2: _____

Sample #					
sample ID					
cont. #					
vol mark (check if OK)					
volume(ml)					
gross1(g)					
gross2(g)					
average gross(g)*					
tare(g)					
residue(g)					

IMPINGER WATER: date gross 1: _____ date gross 2: _____

Sample #	35547	35548			355B
sample ID	OSU	OSU			Blank
	C1 Blank	C2 Blank			12-30-98
cont. #					
vol mark (check if OK)					
volume(ml)	358 ml.	340 ml.			empty
gross1(g)	166.6288	128.2229	1-4		117.2376 1-1
gross2(g)	166.6278 166.6283 1-6	128.2226	1-5		117.2381 1-4
average gross(g)*	166.6281	128.2228			117.2379
tare(g)	166.6284	128.2227			117.2378
residue(g)	-.0003	.0001			.0001

SAMPLE DATA: EPA RESIDUES

analyst: [illegible] reviewer: _____
Job # 355 Identification: OSU/Willamette, Ind, #1079

DCM:	date gross 1: _____		date gross 2: _____		
Sample #	35547	35548			
sample ID					
cont. #					
volume(ml)	(600)	(600)			
gross1(g)	116.4720	119.8366	1-4		
gross2(g)	116.4718	119.8366	1-5		
average gross(g)*	116.4719	119.8366			
tare(g)	116.4720	119.8369			
residue(g)	-.0001	-.0003			

FILTERS:	date gross 1: _____		date gross 2: _____		
Sample #					
sample ID					
Filter #					
gross1(g)					
gross2(g)					
average gross(g)*					
tare(g)					
residue(g)					

Temperature day 1 _____ Humidity day 1 _____

Temperature day 2 _____ Humidity day 2 _____

NBS thermometer # _____

Balance service date: _____

Balance calibration data (certified weights):

Moisture Catch

Willamette Industries - OSU
Kiln Test No. 2 Cycle No. 1 Douglas Fir
Corvalis, OR
EPA 4

14-Dec-98
drb
part_gas
mew

			1	2	3	4	5	6	7	8	9	10	11
Impinger No. 1	Initial	g	850	678	852	690	849	653	848	684	822	676	858
	Final	g	882	876	1161	949	1130	905	1092	920	1111	923	1165
Impinger No. 2	Initial	g	752	691	736	678	739	663	748	683	761	690	743
	Final	g	773	697	763	697	764	683	761	705	773	702	767
Impinger No. 3	Initial	g	732	595	733	595	732	592	731	594	731	596	733
	Final	g	736	595	737	595	738	599	734	598	735	598	734
Silica Gel Impinger	Initial	g	550	524	571	537	520	507	513	530	519	540	528
	Final	g	568	537	588	548	534	523	523	540	525	550	543
Vlc	Net Moisture Gain	ml	75.1	217.4	357.6	289.5	326.6	295.5	270.5	272.5	311.6	271.5	347.6

			12	13	14	15	16	17	18	19	20	21
Impinger No. 1	Initial	g	677	846	674	805	689	826	664	810	703	848
	Final	g	941	1078	907	1117	928	1153	973	1150	974	959
Impinger No. 2	Initial	g	684	746	686	748	706	760	691	748	650	752
	Final	g	714	813	706	797	714	833	770	881	748	799
Impinger No. 3	Initial	g	597	732	594	732	595	735	595	735	595	732
	Final	g	599	745	600	745	598	738	597	737	600	745
Silica Gel Impinger	Initial	g	517	536	507	516	522	533	531	528	515	532
	Final	g	529	547	516	532	531	547	539	539	524	540
Vlc	Net Moisture Gain	ml	308.5	323.6	268.5	390.7	259.5	417.7	398.7	486.9	383.7	179.3

Moisture Catch

Willamette Industries - OSU
Kiln Test No. 2 Cycle No. 2 Douglas Fir
Corvalis, OR
EPA 4

16-Dec-98
drb
part_gas
mew

			1	2	3	4	5	6	7	8	9	10	11
Impinger No. 1	Initial	g	666	831	677	810	670	825	695	820	654	801	668
	Final	g	677	1016	885	1072	965	1110	1015	1123	1007	1028	959
Impinger No. 2	Initial	g	697	689	710	697	693	693	679	703	702	700	687
	Final	g	710	697	720	707	711	703	822	721	766	712	772
Impinger No. 3	Initial	g	569	755	569	757	573	757	576	757	571	755	571
	Final	g	569	757	573	757	576	759	579	761	579	758	578
Silica Gel Impinger	Initial	g	522	524	522	522	536	533	510	525	522	523	533
	Final	g	533	535	530	533	550	543	531	539	544	532	555
Vlc	Net Moisture Gain	ml	35.1	206.4	230.4	283.5	330.6	307.5	487.9	339.6	447.8	251.4	405.7

			12	13	14	15	16	17	18	19	20	21
Impinger No. 1	Initial	g	810	667	836	662	821	691	810	655	811	648
	Final	g	1059	928	1016	967	1011	969	987	1047	1121	879
Impinger No. 2	Initial	g	689	694	666	687	672	695	679	696	667	672
	Final	g	697	705	672	732	679	755	691	927	766	679
Impinger No. 3	Initial	g	756	572	756	573	756	572	757	571	756	570
	Final	g	756	573	757	575	757	588	759	586	758	572
Silica Gel Impinger	Initial	g	538	536	546	524	503	519	522	532	535	500
	Final	g	546	550	555	543	510	540	530	551	543	506
Vlc	Net Moisture Gain	ml	265.5	287.5	196.3	371.7	205.4	375.7	199.4	658.2	419.7	246.4

Impinger Weight Gains in Grams

Date 12-16-98

Observers CDB, DRB, JDF

Cycle 2

Specie Doug Fir

Run#	Stack (E or W)	#1 Impinger Init.	#1 Impinger Final	#2 Impinger Init.	#2 Impinger Final	#3 Impinger Init.	#3 Impinger Final	Si Gel wo Stem Init.	Si Gel wo Stem Final
1	W	666	677	697	710	569	569	522	533
2	E	831	1016	689	697	755	757	524	535
3	W	677	885	710	720	569	573	522	550
4	E	810	1072	697	707	757	757	522	533
5	W	670	965	693	711	573	576	536	550
6	E	825	1110	693	703	757	759	533	543
7	W	654	1015	679	822	576	579	510	531
8	E	~~825~~ 839	1123	703	721	757	761	525	539
9	W	654	1007	702	766	571	579	522	544
10	E	801	1028	700	712	755	758	523	532
11	W	668	959	687	772	571	578	533	555
12	E	810	1059	689	697	756	756	538	546
13	W	667	928	694	705	572	573	536	550
14	E	836	1016	666	672	756	757	546	555
15	W	662	967	687	732	573	575	524	543
16	E	821	1011	672	679	756	757	503	510
17	W	691	969	695	755	572	588	519	540
18	E	810	987	679	691	757	759	522	530
19	W	655	1047	696	927	571	586	532	551
20	E	811	1121	667	766	756	758	535	543
21	W	648	979	672	679	570	572	500	506

Horizon Engineering (503) 255-5050

W = Sample box 6 = 98M-206 98S-15

E = Sample box 1 = 98M-200 98S-14

Impinger Weight Gains in Grams

Date 12/14 - 12/16

Observers CDB, DRB, JDP

Cycle 1

Specie Doug Fir

Run#	Stack (E or W)	#1 Impinger Init.	#1 Impinger Final	#2 Impinger Init.	#2 Impinger Final	#3 Impinger Init.	#3 Impinger Final	Sl Gel wo Stem Init.	Sl Gel wo Stem Final
1	3 W	850	882	752	773	732	735	550	568
2	2 E	678	876	691	697	595	595	524	537
3	W	852	1161	736	763	733	737	571	588
4	E	690	949	678	697	595	595	537	548
5	W	849	1130	739	764	732	738	520	534
6	E	653	905	663	683	592	599	507	523
7	W	848	1092	748	761	731	734	513	523
8	E	684	920	683	705	594	598	530	540
9	W	822	1111	761	773	731	735	519	525
10	E	676	923	690	702	596	598	540	550
11	W	858	1165	743	767	733	734	528	543
12	E	677	941	684	714	597	599	517	529
13	W	846	1078	746	813	732	745	536	547
14	E	674	907	686	706	594	600	507	516
15	W	805	1117	748	797	732	745	516	532
16	E	689	928	706	714	595	598	522	531
17	W	826	1153	760	833	735	738	533	547
19	E	664	973	691	770	595	597	531	539
19	W	810	1150	748	881	735	737	528	539
20	E	703	974	650	748	595	600	515	524
21	W	848	959	752	799	732	745	532	540

Horizon Engineering (503) 255-5050

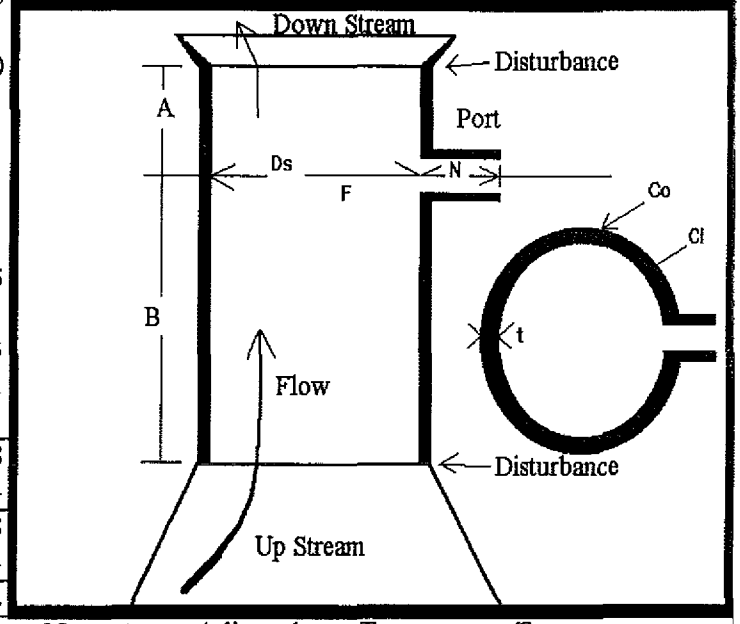
98s-051 = Sample Box 3 = 98m-238

98s 052 = Sam Box 2 = 98m-250

Traverse Point Location - Circular Stack

Willamette Industries - OSU	14-Dec-98
Kiln Test No. 2 Cycle No. 1 Douglas Fir	drb
Corvalis, OR	part_gas
EPA 1	mew

Outer Circumference	Co	in	
Wall thickness	t	in	
INSIDE of FAR WALL to OUTSIDE of Nipple	F	in	14.25
INSIDE of NEAR WALL to OUTSIDE of Nipple	N	in	0.00
STACK WALL to to OUTSIDE of Nipple	N-t	in	
DOWNstream Disturb	A	in	760.0
UPstream Disturb	B	in	308.0
Inner Diameter	Ds	in	14.25
Area	As	sqin	159.5
DOWNstream Ratio	A/Ds		53.33
UPstream Ratio	B/Ds		21.61



Traverse (Particulate)	8
Recommended #Pts/Diameter	4
Traverse (NON-Particulate)	8
Recommended #Pts/Diameter	4
Actual Points per Diameter	12

Trav Pt #No	Fract Stk ID (f)	Stack ID (Ds)	Actual Points (Dsxf)	Nearest 8ths (TP)	Adjusted Points (TP)	Traverse Points (TP + N)	Traverse Points (TP + N)
1	2.13%	14.3	0.3	0.250	0.500	0.500	0 1 / 2
2	6.70%	14.3	1.0	1.000	1.000	1.000	1
3	11.81%	14.3	1.7	1.625	1.625	1.625	1 5 / 8
4	17.73%	14.3	2.5	2.500	2.500	2.500	2 1 / 2
5	25.00%	14.3	3.6	3.625	3.625	3.625	3 5 / 8
6	35.57%	14.3	5.1	5.125	5.125	5.125	5 1 / 8
7	64.43%	14.3	9.2	9.125	9.125	9.125	9 1 / 8
8	75.00%	14.3	10.7	10.750	10.750	10.750	10 3 / 4
9	82.27%	14.3	11.7	11.750	11.750	11.750	11 3 / 4
10	88.19%	14.3	12.6	12.625	12.625	12.625	12 5 / 8
11	93.30%	14.3	13.3	13.250	13.250	13.250	13 1 / 4
12	97.87%	14.3	13.9	14.000	13.750	13.750	13 3 / 4

GASES

TGOC (as Carbon) Emissions - Cycle No.1 Summary

Willamette Ind. - OSU
Cycle No. 1 Douglas Fur - TGOC (as Carbon)
Dec 14-16, 1998

Run ID	Start	End	Time Min	Qsd dscfm	Bws % Kiln	Bws % Analyzer	TGOC [A] ppmv-C	TGOC [A] lbm-C/hr	TGOC [A] lbm-C
1	08:50	10:27	97	181.9	5.7%	3.1%	40.7	0.0139	0.0224
Calibration			31					0.0180	0.0093
2	10:58	11:23	25	50.1	17.7%	9.3%	365.1	0.0342	0.0143
Calibration			10					0.0440	0.0073
3	11:33	13:53	140	50.1	17.7%	6.0%	488.8	0.0458	0.1068
Calibration			15					0.0449	0.0112
4	14:08	15:07	59	81.8	20.5%	6.9%	280.0	0.0428	0.0421
Calibration			16					0.0402	0.0107
5	15:23	16:52	89	81.8	20.5%	14.8%	251.3	0.0384	0.0570
Calibration			13					0.0308	0.0067
6	17:05	19:54	169	73.6	12.2%	8.7%	195.2	0.0268	0.0756
Calibration			124					0.0254	0.0524
7	21:58	22:53	55	66.1	18.8%	13.9%	167.8	0.0207	0.0190
Calibration			14					0.0223	0.0052
8	23:07	02:03	176	61.1	20.4%	14.7%	199.0	0.0227	0.0667
Calibration			7					0.0193	0.0022
9	02:10	04:55	165	46.0	23.0%	16.2%	180.9	0.0156	0.0428
Calibration			14					0.0146	0.0034
10	05:09	07:56	167	48.3	22.7%	15.9%	150.7	0.0136	0.0379
Calibration			14					0.0139	0.0032
11	08:10	10:54	164	57.3	22.8%	16.3%	132.8	0.0142	0.0389
Calibration			18					0.0135	0.0040
12	11:12	13:56	164	49.4	23.0%	16.6%	138.1	0.0128	0.0349
Calibration			12					0.0132	0.0026
13	14:08	16:46	158	57.4	23.5%	16.7%	126.8	0.0136	0.0359
Calibration			26					0.0130	0.0056
14	17:12	19:54	162	59.4	20.4%	14.5%	112.2	0.0125	0.0337
Calibration			11					0.0114	0.0021
15	20:05	22:55	170	56.3	22.0%	15.8%	98.5	0.0104	0.0294
Calibration			13					0.0097	0.0021
16	23:08	02:06	178	50.9	21.7%	15.5%	95.1	0.0090	0.0268
Calibration			5					0.0091	0.0008
17	02:11	05:05	174	70.4	22.6%	15.9%	69.9	0.0092	0.0267
Calibration			6					0.0085	0.0008
18	05:11	07:58	167	46.5	22.2%	15.7%	88.9	0.0077	0.0215
Calibration			36					0.0103	0.0062
19	08:34	11:22	168	76.4	24.5%	17.3%	89.9	0.0128	0.0360
Calibration			5					0.0128	0.0011
20	11:27	14:22	175	45.0	31.2%	21.9%	152.5	0.0128	0.0374
Calibration			5					0.0118	0.0010
21	14:27	17:40	193	53.3	32.6%	23.5%	108.4	0.0108	0.0348
Calibration			20					0.0113	0.0038
22	18:00	20:40	160	47.9	30.4%	22.5%	131.6	0.0118	0.0314
Calibration			6					0.0112	0.0011
23	20:46	22:17	91	53.6	29.0%	21.4%	100.9	0.0101	0.0154

	Interval min	Time Weighted Average Qsd dscfm	Bws % Kiln	Bws % Analyzer	ppmv-C	lbm-C/hr [C]	lbm-C
Total Cycle Time	3,687					0.0168	1.0304
Total Actual Testing Time	3,266	60.9	22.6%	15.7%	149.7		
Percent Actual Testing Time of Cycle Time	88.6%						

Production 2,560 bft
0.403 lbm-C/Mdbft (Corrected for calibration intervals)

NOTES

[A] Emissions during calibration intrevals are time weighted averages of the previous and following tests.

[B] The gas sample probe was not moved during run no. 7, the untested time appears in the calibration time interval prior to the gas sampling period.

[C] The time weighted average lbm-C/hr does not match the TGOC emissions average because the missing data explained in [B] occured during a high emissions interval and increases the average.

TGOC (as Carbon) Emissions - Cycle No.2 Summary

Willamette Ind. - OSU
Cycle No. 2 Douglas Fur - TGOC (as Carbon)
Dec 16-19, 1998

Run ID	Start	End	Time Min	Qsd dscfm	Bws % Kiln	Bws % Analyzer	TGOC [A] ppmv-C	TGOC [A] lbm-C/hr	TGOC [A] lbm-C
1	22:22	01:00	158	247.3	4.2%	3.1%	97.2	0.0449	0.1184
Calibrations			5					0.0250	0.0021
2	01:05	03:44	159	45.3	18.3%	13.1%	61.9	0.0052	0.0139
Calibrations			6					0.0163	0.0016
3	03:50	06:44	174	53.9	18.3%	13.0%	262.5	0.0265	0.0767
Calibrations			5					0.0242	0.0020
4	06:49	09:41	172	61.1	20.6%	15.0%	192.2	0.0220	0.0630
Calibrations			5					0.0223	0.0019
5	09:46	12:42	176	75.8	20.6%	15.2%	159.1	0.0225	0.0661
Calibrations			5					0.0209	0.0017
6	12:47	15:37	170	53.2	20.3%	15.0%	192.1	0.0191	0.0542
Calibrations			12					0.0228	0.0046
7	15:49	18:37	168	89.0	20.8%	15.4%	159.8	0.0266	0.0745
Calibrations			13					0.0220	0.0048
8	18:50	21:36	166	62.7	23.0%	16.9%	148.0	0.0174	0.0480
Calibrations			10					0.0177	0.0030
9	21:46	00:48	182	76.2	22.6%	16.4%	126.5	0.0180	0.0547
Calibrations			10					0.0145	0.0024
10	00:58	03:48	170	44.2	22.7%	16.5%	130.6	0.0108	0.0306
Calibrations			6					0.0146	0.0015
11	03:54	06:38	164	81.8	22.7%	16.6%	121.7	0.0186	0.0509
Calibrations			14					0.0143	0.0033
12	06:52	09:51	179	49.2	22.6%	16.6%	111.8	0.0103	0.0307
Calibrations			6					0.0113	0.0011
13	09:57	12:38	161	79.2	23.0%	16.8%	83.3	0.0123	0.0331
Calibrations			10					0.0106	0.0018
14	12:48	15:39	171	54.6	22.9%	16.6%	88.4	0.0090	0.0257
Calibrations			15					0.0112	0.0028
15	15:54	18:39	165	92.8	17.9%	12.8%	77.0	0.0134	0.0368
Calibrations			9					0.0098	0.0015
16	18:48	21:54	186	52.0	17.1%	12.3%	68.3	0.0066	0.0206
Calibrations			16					0.0095	0.0025
17	22:10	00:55	165	93.5	17.8%	12.9%	72.5	0.0127	0.0349
Calibrations			14					0.0096	0.0022
18	01:09	04:05	176	50.4	17.0%	12.0%	71.8	0.0068	0.0198
Calibrations			5					0.0104	0.0009
19	04:10	07:04	174	68.2	17.1%	12.1%	109.7	0.0140	0.0406
Calibrations			6					0.0120	0.0012
20	07:10	09:56	166	45.6	17.3%	12.2%	115.7	0.0099	0.0273
Calibrations			12					0.0105	0.0021
21	10:08	11:21	73	57.3	30.6%	21.2%	112.8	0.0121	0.0147

	Interval min	Time Weighted Average Qsd dscfm	Bws % Kiln	Bws % Analyzer	ppmv-C	lbm-C/hr	lbm-C
Total Cycle Time	3,659					0.0161	0.9801
Total Actual Testing Time	3,475	72.7	19.6%	14.2%	122.6		
Percent Actual Testing Time of Cycle Time	95.0%						

Production 2,304 bft
0.425 lbm-C/Mdbft (Corrected for calibration intervals)

NOTES [A] Emissions during calibration intrevals are time weighted averages of the previous and following tests.

TGOC Data Emissions 1 of 2

Willamette Industries - OSU
Test 2 Cycle 1- Douglas Fir

TGOC-EPA 25A

14-Dec-98

Number of Completed Runs			1	2	3	4	5	6	7	8	9	10	11	12	Average
			west	east	west	east	west	east	west	east	west	east	west	east	Time Weight
Date Tested			14-Dec	14-Dec	14-Dec	14-Dec	14-Dec	14-Dec	14-Dec	14-Dec	15-Dec	15-Dec	15-Dec	15-Dec	
System Calibration Time - Initial		Tci	08:40	10:42	11:30	14:00	15:20	16:58	20:00	23:00	02:06	05:02	08:03	11:03	
Test Time-Starting		Tts	08:50	10:58	11:33	14:08	15:23	17:05	21:58	23:07	02:10	05:09	08:10	11:12	
Test Time-Ending		Tte	10:27	11:23	13:53	15:07	16:52	19:54	22:53	02:03	04:55	07:56	10:54	13:56	
System Calibration Time - Final		Tcf	10:42	11:28	14:00	15:13	16:58	20:00	23:00	02:06	05:02	08:03	11:03	14:02	
Test Mid-point Time		Tx	09:38	11:10	12:43	14:37	16:07	18:29	22:25	00:35	03:32	06:32	09:32	12:34	
Time		min	97	25	140	59	89	169	55	176	165	167	164	164	
Volumetric Flowrate, Dry Standard	dscf/min	Qsd	181.9	50.1	50.1	81.8	81.8	73.6	66.1	61.1	46.0	48.3	57.3	49.4	60.9
Moisture, Mole Fraction dry Gas		mfg	94%	82%	82%	80%	80%	88%	81%	80%	77%	77%	77%	77%	77.4%
Moisture (Kiln)		bws	5.7%	17.7%	17.7%	20.5%	20.5%	12.2%	18.8%	20.4%	23.0%	22.7%	22.8%	23.0%	22.6%
Moisture (Analyzer)		bws	3.1%	9.3%	6.0%	6.9%	14.8%	8.7%	13.9%	14.7%	16.2%	15.9%	16.3%	16.6%	15.7%
Dilution	bws(analyzer)/bws(kiln		53.2%	52.7%	33.9%	33.5%	72.1%	71.6%	73.6%	72.1%	70.1%	70.0%	71.5%	72.2%	68.4%
Total Gaseous Organic Concentration	**(TGOC)**	Span	100	100	100	100	100	100	100	100	100	100	100	100	
Span Gas- Instrument Response Factor	JUM Factor	C3H8	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Span Gas- Carbon Count Equivalent		K	3												
Cylinder Value - High Range calibration gas	ppmv		84.0	84.0	84.0	84.0	84.0	84.0	84.0	84.0	84.0	84.0	84.0	84.0	
Cylinder Value - Low Range (Zero) calibration gas	ppmv	Coa	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Indicated average- Wet	ppmv-C3H8	Ciw	7.34	59.21	52.60	30.29	51.73	42.68	35.58	41.06	35.91	30.41	27.06	28.18	27.7
Span Gas Concentration- Equivalent	ppmv	Sc	84.0	84.0	84.0	84.0	84.0	84.0	84.0	84.0	84.0	84.0	84.0	84.0	
Zero Gas Concentration- Equivalent	ppmv	Zc	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
System Calibration Response - High Range gas - Initia	ppmv	Ss	44.8	45.2	29.5	28.8	61.4	60.2	60.4	62.3	59.5	59.3	60.0	61.3	
System Calibration Response - Low Range gas - Initial	ppmv	Zs	0.2	0.5	0.3	1.1	0.0	0.5	-0.2	0.2	0.3	0.6	1.1	0.0	
System Calibration Response - Low Range gas - Final	ppmv	Ze	0.5	1.4	1.1	1.3	0.5	-0.2	0.2	0.3	0.6	1.1	0.0	1.0	
System Calibration Response - High Range gas - Final	ppmv	Se	45.2	45.4	28.8	29.8	60.2	60.4	62.3	59.5	59.3	60.0	61.3	60.9	
Actual average - Wet (Corrected for Drift & Response	ppmv-C3H8		13.2	110.4	153.2	86.9	71.4	59.4	48.2	56.6	50.5	42.2	37.1	38.4	42.7
Actual average - Dry (Corrected for Drift & Response	ppmv-C3H8		13.6	121.7	162.9	93.3	83.8	65.1	55.9	66.3	60.3	50.2	44.3	46.0	49.9
Actual average - Dry	ppmv-C	Cgas	40.7	365.1	488.8	280.0	251.3	195.2	167.8	199.0	180.9	150.7	132.8	138.1	149.7
Mass Emissions	lbm / hr		0.0139	0.0342	0.0458	0.0428	0.0384	0.0268	0.0207	0.0227	0.0156	0.0136	0.0142	0.0128	0.0163

TGOC Data Emissions 2 of 2

Willamette Industries - OSU
Test 2 Cycle 1- Douglas Fir

TGOC-EPA 25A

14-Dec-98

Number of Completed Runs			12	13	14	15	16	17	18	19	20	21	22	23	Average
			east	west	east	west	east	west	east	west	east	west	east	west	Time Weight
Date Tested			15-Dec	15-Dec	15-Dec	15-Dec	15-Dec	16-Dec	16-Dec	16-Dec	16-Dec	16-Dec	16-Dec	16-Dec	
System Calibration Time - Initial		Tci	11:03	14:02	16:59	19:59	23:01	02:08	05:08	08:16	11:24	14:24	17:50	20:43	
Test Time-Starting		Tts	11:12	14:08	17:12	20:05	23:08	02:11	05:11	08:34	11:27	14:27	18:00	20:46	
Test Time-Ending		Tte	13:56	16:46	19:54	22:55	02:06	05:05	07:58	11:22	14:22	17:40	20:40	22:17	
System Calibration Time - Final		Tcf	14:02	16:59	19:59	23:01	02:08	05:08	08:16	11:24	14:24	17:50	20:43	22:25	
Test Mid-point Time		Tx	12:34	15:27	18:33	21:30	00:37	03:38	06:34	09:58	12:54	16:03	19:20	21:31	
Time		min	164	158	162	170	178	174	167	168	175	193	160	91	
Volumetric Flowrate, Dry Standard	dscf/min	Qsd	49.4	57.4	59.4	56.3	50.9	70.4	46.5	76.4	45.0	53.3	47.9	53.6	60.9
Moisture, Mole Fraction dry Gas		mfg	77%	77%	80%	78%	78%	77%	78%	75%	69%	67%	70%	71%	77.4%
Moisture (Kiln)		bws	23.0%	23.5%	20.4%	22.0%	21.7%	22.6%	22.2%	24.5%	31.2%	32.6%	30.4%	29.0%	22.6%
Moisture (Analyzer)		bws	16.6%	16.7%	14.5%	15.8%	15.5%	15.9%	15.7%	17.3%	21.9%	23.5%	22.5%	21.4%	15.7%
Dilution	bws(analyzer)/bws(kiln		72.2%	71.1%	71.1%	72.0%	71.3%	70.1%	70.4%	70.6%	70.1%	72.1%	73.8%	73.7%	68.4%
Total Gaseous Organic Concentration	**(TGOC)**	Span	100	100	100	100	100	100	100	100	100	100	100	100	
Span Gas- Instrument Response Factor	JUM Factor	C3H8	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Span Gas- Carbon Count Equivalent		K													
Cylinder Value - High Range calibration gas	ppmv		84.0	84.0	84.0	84.0	84.0	84.0	84.0	84.0	84.0	84.0	84.0	84.0	
Cylinder Value - Low Range (Zero) calibration gas	ppmv	Coa	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Indicated average- Wet	ppmv-C3H8	Ciw	28.18	25.82	23.09	19.89	19.42	14.49	17.94	17.96	28.97	20.60	25.30	19.75	27.7
Span Gas Concentration- Equivalent	ppmv	Sc	84.0	84.0	84.0	84.0	84.0	84.0	84.0	84.0	84.0	84.0	84.0	84.0	
Zero Gas Concentration- Equivalent	ppmv	Zc	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
System Calibration Response - High Range gas - Initia	ppmv	Ss	61.3	60.9	60.1	60.1	60.8	59.6	59.6	59.4	60.1	59.9	62.6	61.8	
System Calibration Response - Low Range gas - Initial	ppmv	Zs	0.0	1.0	0.6	0.1	-0.1	0.7	0.8	-0.2	1.0	1.3	0.0	0.4	
System Calibration Response - Low Range gas - Final	ppmv	Ze	1.0	0.6	0.1	-0.1	0.7	0.8	-0.2	1.0	1.3	0.0	0.4	0.1	
System Calibration Response - High Range gas - Final	ppmv	Se	60.9	60.1	60.1	60.8	59.6	59.6	59.4	60.1	59.9	62.6	61.8	62.6	
Actual average - Wet (Corrected for Drift & Response	ppmv-C3H8		38.4	35.2	32.0	27.6	26.8	19.6	25.0	24.8	39.7	27.7	34.0	26.4	42.7
Actual average - Dry (Corrected for Drift & Response	ppmv-C3H8		46.0	42.3	37.4	32.8	31.7	23.3	29.6	30.0	50.8	36.1	43.9	33.6	49.9
Actual average - Dry	ppmv-C	Cgas	138.1	126.8	112.2	98.5	95.1	69.9	88.9	89.9	152.5	108.4	131.6	100.9	149.7
Mass Emissions	lbm / hr		0.0128	0.0136	0.0125	0.0104	0.0090	0.0092	0.0077	0.0128	0.0128	0.0108	0.0118	0.0101	0.0163

TGOC Data Emissions 1 of 2

Willamette Industries - OSU
Test 2 Cycle 2- Douglas Fir

16-Dec-98

TGOC-EPA 25A

Number of Completed Runs			1	2	3	4	5	6	7	8	9	10	11	12	Average
			west	east	west	east	west	east	west	east	west	east	west	east	Time Weight
Date Tested			16-Dec	17-Dec	17-Dec	17-Dec	17-Dec	17-Dec	17-Dec	17-Dec	17-Dec	18-Dec	18-Dec	18-Dec	
System Calibration Time - Initial		Tci	22:15	01:02	03:47	06:46	09:43	12:44	15:43	18:43	21:41	00:53	03:51	06:45	
Test Time-Starting		Tts	22:22	01:05	03:50	06:49	09:46	12:47	15:49	18:50	21:46	00:58	03:54	06:52	
Test Time-Ending		Tte	01:00	03:44	06:44	09:41	12:42	15:37	18:37	21:36	00:48	03:48	06:38	09:51	
System Calibration Time - Final		Tcf	01:02	03:47	06:46	09:43	12:44	15:43	18:43	21:41	00:53	03:51	06:45	09:54	
Test Mid-point Time		Tx	23:41	02:24	05:17	08:15	11:14	14:12	17:13	20:13	23:17	02:23	05:16	08:21	
Time		min	158	159	174	172	176	170	168	166	182	170	164	179	
Volumetric Flowrate, Dry Standard	dscf/min	Qsd	247.3	45.3	53.9	61.1	75.8	53.2	89.0	62.7	76.2	44.2	81.8	49.2	72.7
Moisture, Mole Fraction dry Gas		mfg	95.8%	81.7%	81.7%	79.4%	79.4%	79.7%	79.2%	77.0%	77.4%	77.3%	77.3%	77.4%	80.4%
Moisture (Kiln)		bws	4.2%	18.3%	18.3%	20.6%	20.6%	20.3%	20.8%	23.0%	22.6%	22.7%	22.7%	22.6%	19.6%
Moisture (Analyzer)		bws	3.1%	13.1%	13.0%	15.0%	15.2%	15.0%	15.4%	16.9%	16.4%	16.5%	16.6%	16.6%	14.2%
Dilution	bws(analyzer)/bws(kiln		73.5%	71.7%	71.1%	72.7%	73.9%	73.7%	74.2%	73.3%	72.3%	72.7%	73.4%	73.4%	72.4%
Total Gaseous Organic Concentration	**(TGOC)**	Span	100	100	100	100	100	100	100	100	100	100	100	100	
Span Gas- Instrument Response Factor	JUM Factor	C3H8	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Span Gas- Carbon Count Equivalent		K	3												
Cylinder Value - High Range calibration gas	ppmv		84.0	84.0	84.0	84.0	84.0	84.0	84.0	84.0	84.0	84.0	84.0	84.0	
Cylinder Value - Low Range (Zero) calibration gas	ppmv	Coa	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Indicated average- Wet	ppmv-C3H8	Ciw	23.32	13.38	54.55	40.20	34.27	41.35	34.19	30.57	26.10	26.68	24.82	23.39	25.9
Span Gas Concentration- Equivalent	ppmv	Sc	84.0	84.0	84.0	84.0	84.0	84.0	84.0	84.0	84.0	84.0	84.0	84.0	
Zero Gas Concentration- Equivalent	ppmv	Zc	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
System Calibration Response - High Range gas - Initia	ppmv	Ss	62.6	61.4	60.2	60.2	63.2	63.0	63.3	62.9	61.3	61.4	61.3	62.1	
System Calibration Response - Low Range gas - Initial	ppmv	Zs	0.1	0.4	0.7	0.3	0.9	1.2	1.2	0.3	0.7	0.5	0.0	-0.0	
System Calibration Response - Low Range gas - Final	ppmv	Ze	0.4	0.7	0.3	0.9	1.2	1.2	0.3	0.7	0.5	0.0	-0.0	1.2	
System Calibration Response - High Range gas - Final	ppmv	Se	61.4	60.2	60.2	63.2	63.0	63.3	62.9	61.3	61.4	61.3	62.1	62.4	
Actual average - Wet (Corrected for Drift & Response	ppmv-C3H8		31.4	17.9	76.1	54.5	45.0	54.4	45.1	41.0	35.3	36.3	33.8	31.1	35.0
Actual average - Dry (Corrected for Drift & Response	ppmv-C3H8		32.4	20.6	87.5	64.1	53.0	64.0	53.3	49.3	42.2	43.5	40.6	37.3	40.9
Actual average - Dry	ppmv-C	Cgas	97.2	61.9	262.5	192.2	159.1	192.1	159.8	148.0	126.5	130.6	121.7	111.8	122.6
Mass Emissions	lbm / hr		0.0449	0.0052	0.0265	0.0220	0.0225	0.0191	0.0266	0.0174	0.0180	0.0108	0.0186	0.0103	0.0161

TGOC Data Emissions 2 of 2

Willamette Industries - OSU
Test 2 Cycle 2- Douglas Fir

16-Dec-98

TGOC-EPA 25A

Number of Completed Runs			12	13	14	15	16	17	18	19	20	21	Average
			east	west	east	west	east	west	east	west	east	west	Time Weight
Date Tested			18-Dec	18-Dec	18-Dec	18-Dec	18-Dec	18-Dec	**19-Dec**	19-Dec	19-Dec	19-Dec	
System Calibration Time - Initial		Tci	06:45	09:54	12:43	15:46	18:43	22:02	01:02	04:07	07:07	10:02	
Test Time-Starting		Tts	06:52	09:57	12:48	15:54	18:48	22:10	01:09	04:10	07:10	10:08	
Test Time-Ending		Tte	09:51	12:38	15:39	18:39	21:54	00:55	04:05	07:04	09:56	11:21	
System Calibration Time - Final		Tcf	09:54	12:43	15:46	18:43	22:02	01:02	04:07	07:07	10:02	11:23	
Test Mid-point Time		Tx	08:21	11:17	14:13	17:16	20:21	23:32	02:37	05:37	08:33	10:44	
Time		min	179	161	171	165	186	165	176	174	166	73	
Volumetric Flowrate, Dry Standard	dscf/min	Qsd	49.2	79.2	54.6	92.8	52.0	93.5	50.4	68.2	45.6	57.3	72.7
Moisture, Mole Fraction dry Gas		mfg	77.4%	77.0%	77.1%	82.1%	82.9%	82.2%	83.0%	82.9%	82.7%	69.4%	80.4%
Moisture (Kiln)		bws	22.6%	23.0%	22.9%	17.9%	17.1%	17.8%	17.0%	17.1%	17.3%	30.6%	19.6%
Moisture (Analyzer)		bws	16.6%	16.8%	16.6%	12.8%	12.3%	12.9%	12.0%	12.1%	12.2%	21.2%	14.2%
Dilution	bws(analyzer)/bws(kiln		73.4%	72.9%	72.6%	71.5%	72.1%	72.4%	70.9%	70.7%	70.6%	69.3%	72.4%
Total Gaseous Organic Concentration	**(TGOC)**	Span	100	100	100	100	100	100	100	100	100	100	
Span Gas- Instrument Response Factor	JUM Factor	C3H8	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Span Gas- Carbon Count Equivalent		K											
Cylinder Value - High Range calibration gas	ppmv		84.0	84.0	84.0	84.0	84.0	84.0	84.0	84.0	84.0	84.0	
Cylinder Value - Low Range (Zero) calibration gas	ppmv	Coa	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Indicated average- Wet	ppmv-C3H8	Ciw	23.39	17.93	18.85	16.69	14.54	15.15	14.90	22.87	24.14	21.04	25.9
Span Gas Concentration- Equivalent	ppmv	Sc	84.0	84.0	84.0	84.0	84.0	84.0	84.0	84.0	84.0	84.0	
Zero Gas Concentration- Equivalent	ppmv	Zc	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
System Calibration Response - High Range gas - Initi	ppmv	Ss	62.1	62.4	62.2	61.8	59.7	61.7	59.8	59.3	59.7	59.4	
System Calibration Response - Low Range gas - Initi	ppmv	Zs	-0.0	1.2	1.0	1.0	0.4	-0.1	-0.1	0.0	0.3	0.2	
System Calibration Response - Low Range gas - Final	ppmv	Ze	1.2	1.0	1.0	0.4	-0.1	-0.1	0.0	0.3	0.2	0.8	
System Calibration Response - High Range gas - Fina	ppmv	Se	62.4	62.2	61.8	59.7	61.7	59.8	59.3	59.7	59.4	58.1	
Actual average - Wet (Corrected for Drift & Respons	ppmv-C3H8		31.1	23.1	24.6	22.4	20.0	21.0	21.0	32.1	33.8	29.6	35.0
Actual average - Dry (Corrected for Drift & Respons	ppmv-C3H8		37.3	27.8	29.5	25.7	22.8	24.2	23.9	36.6	38.6	37.6	40.9
Actual average - Dry	ppmv-C	Cgas	111.8	83.3	88.4	77.0	68.3	72.5	71.8	109.7	115.7	112.8	122.6
Mass Emissions	lbm / hr		0.0103	0.0123	0.0090	0.0134	0.0066	0.0127	0.0068	0.0140	0.0099	0.0121	0.0161

Calibration Field Record

Client: WI/OSU
Date: 12-14-98
Source: OSU

Tester: DR/JDF/CDB
Observer:
Data Logger ID: RP

830-845
w/o - Dil = 5.5 w/dil w/dil

Leak Checks: Pre-OK Post-OK Response Time	Valve Position	Cylinder #	Span Gas	Cylinder Value (CV)	Analyzer Calibration Response (ACR)	Start Run 1 System Calibration Response (SCRx)	End Run __ Start Run __ System Calibration Response (SCRx)	End Run __ Start Run __ System Calibration Response (SCRx)	End Run __ System Calibration Response (SCRx)	
Times						835	840	1033	1120	
CO2 % ch____			CO2	0		-.6	0.2	0.5	1.4	
Range		14	CO2	27.92		27.49	14.9	14.9	15.1	
Analyzer Model		23	N2	50.5		49.3	26.5	26.4	27.0	
Analyzer SN:		33		84.0		84.0	44.8	45.2	45.4	
CO ppm ch____			CO							
Range			CO							
Analyzer Model			N2			Recal		w/ dil	w/dil	w/dil
Analyzer SN:		12-14 time ↓		1124	1400	1508	1515	1700	2000	2300
O2% ch____		0	O2	0.3	1.10	1.3	0.0	0.5	-0.2	0.2
Range		14	O2	9.8	9.8	10.2	19.9	20.0	19.4	20.0
Analyzer Model		23	N2	17.32	17.1	17.5	35.9	35.7	35.3	35.9
Analyzer SN:		33		29.5	28.8	29.8	61.4	60.2	60.4	62.3
NOx ppm ch____			NOx							
Range			NOx							
Analyzer Model			N2							
Analyzer SN:		12/15	Time	2303	503	757	1104	1400	1705	2000
TGOC ppm ch____		0		0.34	0.59	1.09	0.0	0.15	0.60	0.1
Range		14		19.71	19.67	19.80	19.8	19.8	20.0	19.5
Analyzer Model		23		35.41	35.25	35.27	35.7	35.7	35.8	35.4
Analyzer SN:		33	Air	59.47	59.28	60.01	61.3	60.9	60.1	60.1
			Time	2303	12/16→	206	505	802	1120	1420
ch____		0		-0.1		0.73	0.78	-0.2	1.0	1.3
Range		14		19.4		18.66	19.78	18.9	19.3	19.2
Analyzer Model		23		35.2		34.27	34.86	34.4	34.0	34.9
Analyzer SN:		33		60.8		59.64	59.59	59.4	60.1	59.9

Check	Performance Specs			
Analyzer Calibration Error	|ACR-CV| / SPAN	2 (25A @ 5%)	Hot Line Temp	127°C Monday
Sampling System Bias	(SRCx-ACR) /SPAN	5	Hot Line Temp	134°C Wed
Zero and Cal Drift	(SRC2-SRC1) /SPAN	3		

855-1025
038-

Test Times	Run 1	Run 2	Run 3
Start Time			
End Time			

Calibration Field Record

Client OSU/WI
Date 12-16-98
Source Dry Kiln

Recal
Fuel P=Ø
w/o dil

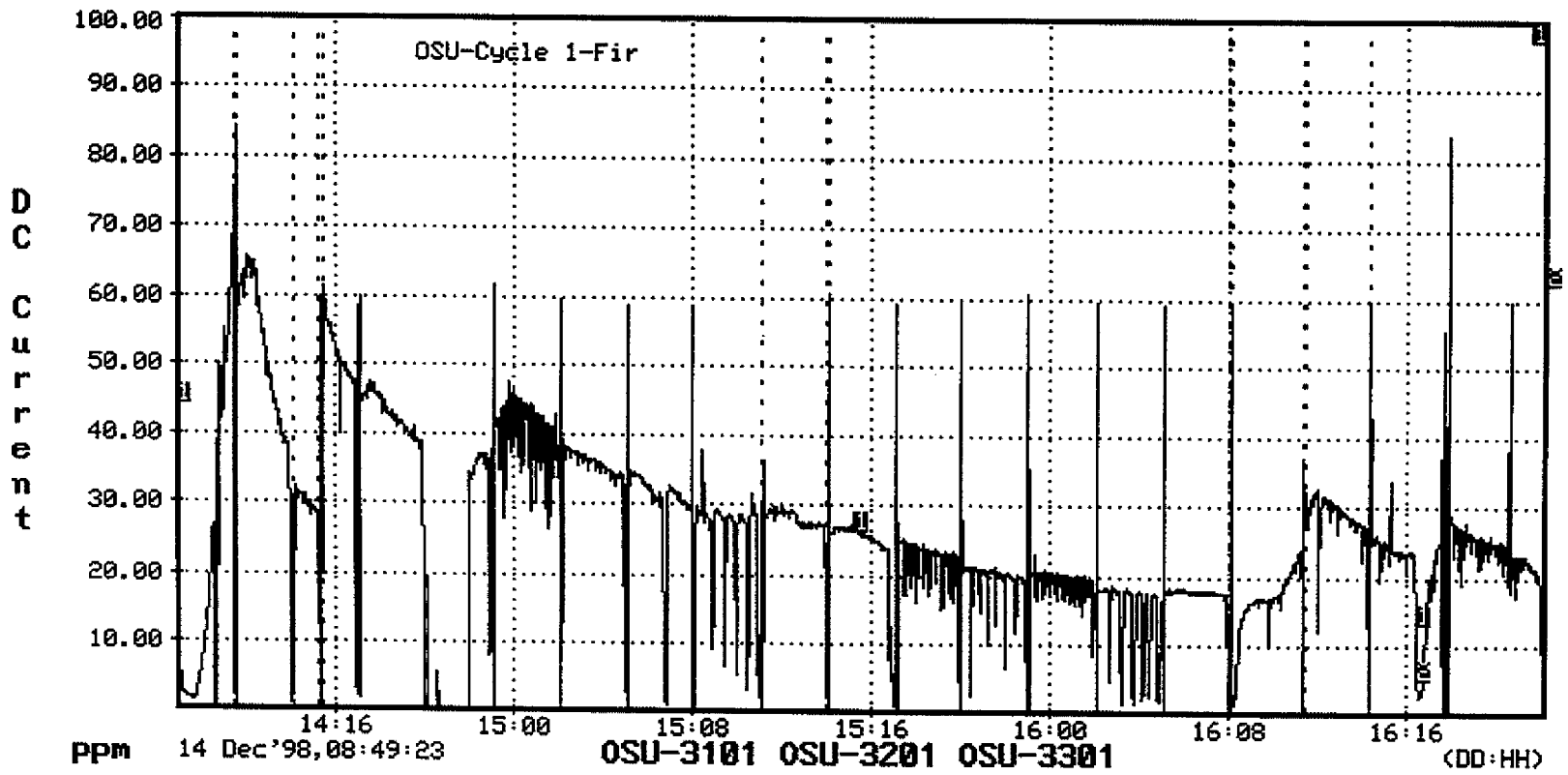
Tester JDF/COB/DRB
Observer
Data Logger ID RR

Leak Checks: Pre-OK Post-OK Response Time	Valve Position	Cylinder #	Span Gas	Cylinder Value (CV)	12-16-98 Analyzer Calibration Response (ACR)	Start Run __ System Calibration Response (SCRx)	End Run __ Start Run __ System Calibration Response (SCRx)	End Run 1 (end cycle) Start Run 2 System Calibration Response (SCRx)	End Run __ System Calibration Response (SCRx)	
Times					1739	1755	2040	2215		
CO2 % ch___			CO2	0	0.0	0.0	0.4	0.1		
Range		14	CO2	27.92	27.2	19.8	20.5	20.3		
Analyzer Model		23	N2	50.5	49.3	35.9	36.8	36.5		
Analyzer SN:		33		84.0	84.0	62.6	61.8	62.6		
CO ppm ch___			CO							
Range			CO							
Analyzer Model			N2							
Analyzer SN:		12/17	Time	100	345	644	938	1239	1542	1845
O2% ch___			O2	0.42	0.65	0.28	0.9	1.2	1.2	0.3
Range			O2	20.63	20.61	20.83	20.7	20.8	20.9	20.7
Analyzer Model			N2	36.68	36.83	36.60	36.8	36.9	37.1	37.0
Analyzer SN:				61.37	60.19	60.15	63.2	63.0	63.3	62.9
NOx ppm ch___			NOx							
Range			NOx							
Analyzer Model			N2	12/17	12/18 →					
Analyzer SN:				2140	1252	349	647	950	1242	1549
TGOC ppm ch___				0.7	0.48	0.02	-.04	1.2	1.0	1.0
Range		14		20.4	20.19	20.28	20.59	20.4	20.3	19.9
Analyzer Model		23		36.7	36.38	36.52	36.78	36.4	36.4	35.9
Analyzer SN:		33		61.3	61.36	61.33	62.06	62.4	62.2	61.8
				1842	2202	1044	405	705	603	1123
ch___				0.4	-0.1	-.08	0.04	0.27	0.19	0.8
Range		14		20.3	19.9	20.18	20.10	19.97	19.71	19.6
Analyzer Model		23		36.3	36.0	35.64	35.54	35.59	35.41	35.4
Analyzer SN:		33		59.7	61.7	59.78	59.33	59.73	59.40	58.1

Check	Performance Specs			
Analyzer Calibration Error	| ACR-CV | / SPAN	2 (25A @ 5%)	Hot Line Temp	133°C
Sampling System Bias	(SRCx-ACR) /SPAN	5	Hot Line Temp	
Zero and Cal Drift	(SRC2-SRC1) /SPAN	3		

Test Times	Run 1	Run 2	Run 3
Start Time			
End Time			

12/17 @ 105 change to 10,000 scale
@ 350 change to 1000 scale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DC Current
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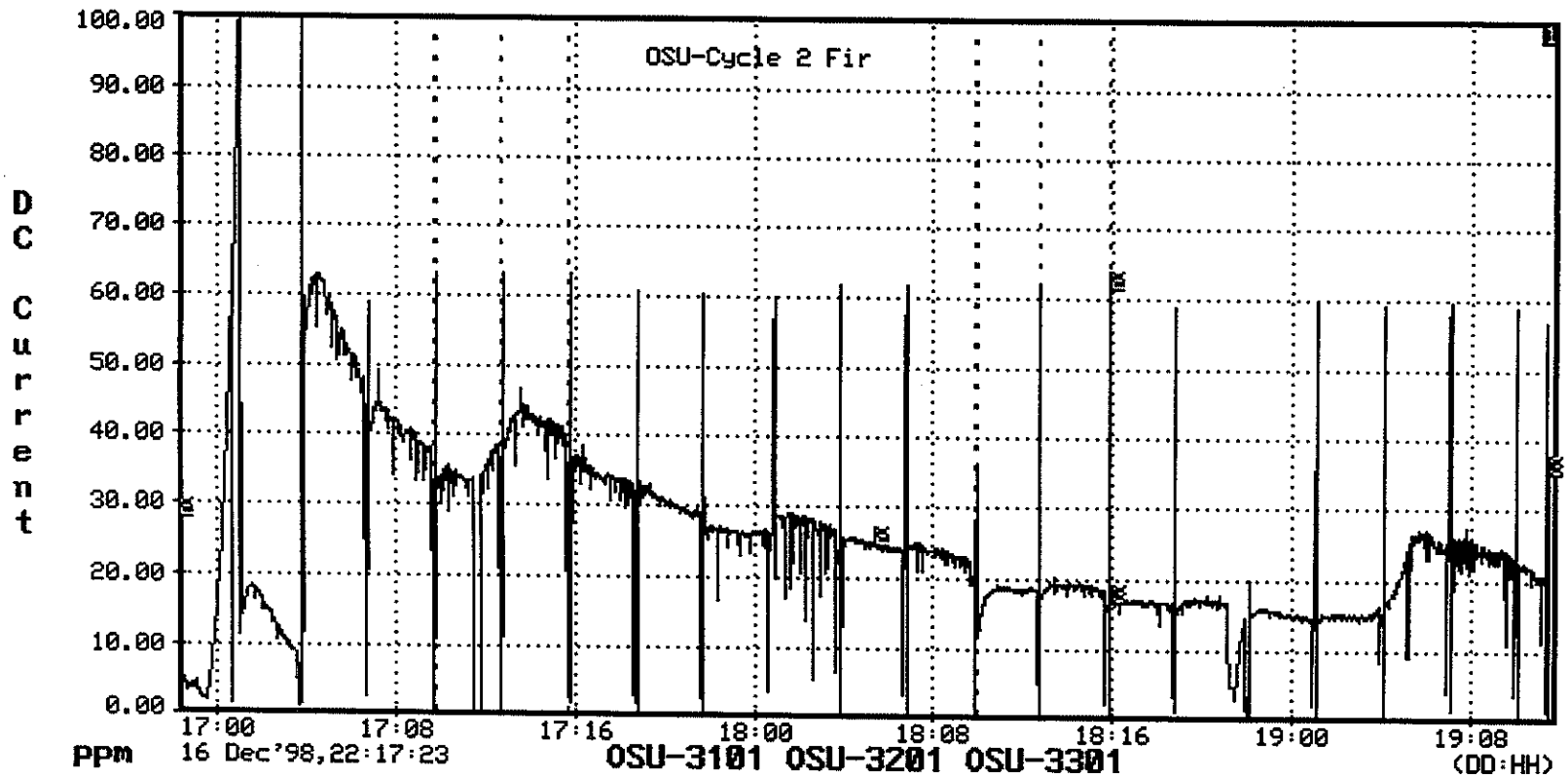
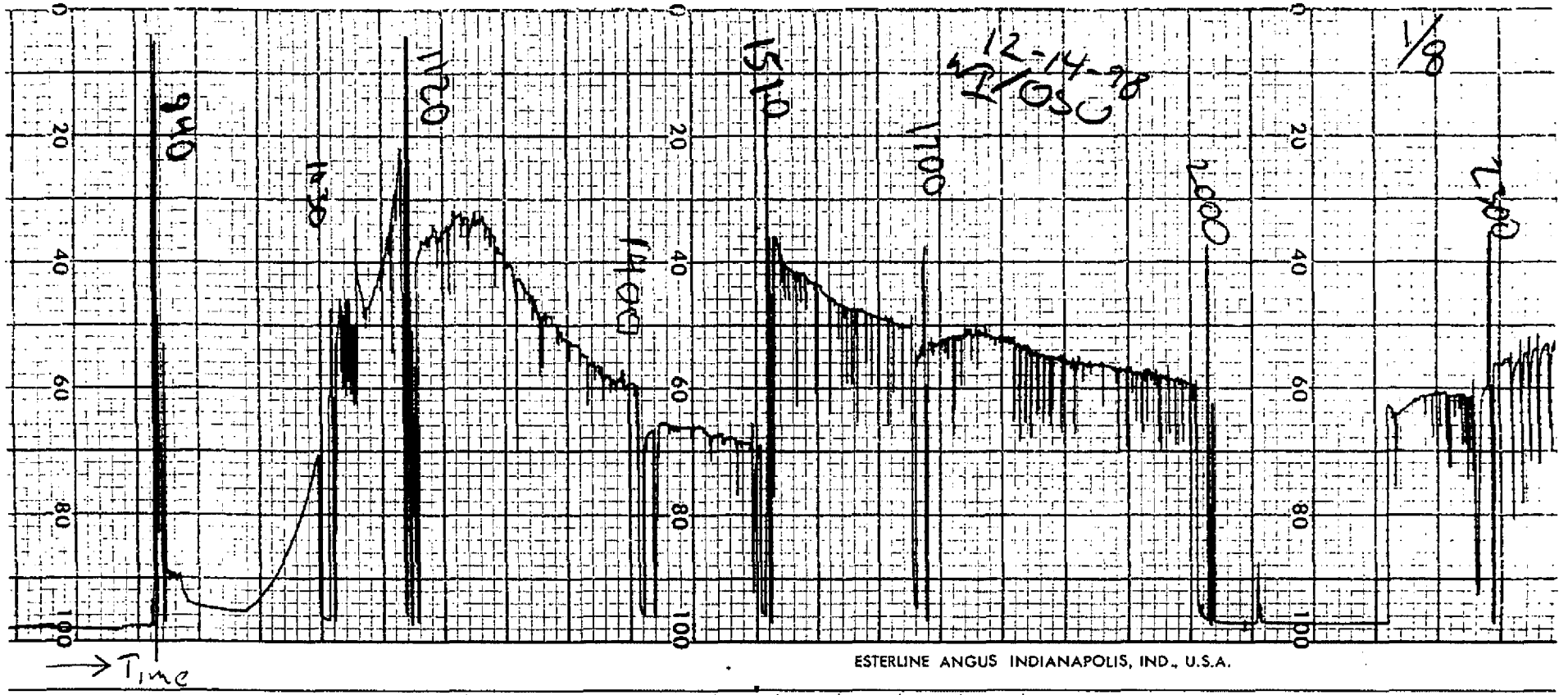
90.00
80.00
70.00
60.00
50.00
40.00
30.00
20.00
10.00
14:16
15:00
15:08
15:16
16:00
16:08
16:16
PPm
14 Dec'98,08:49:23
OSU-3101 OSU-3201 OSU-3301
(DD:HH)


OSU-Cycle 2 Fir
DC Current
100.00
90.00
80.00
70.00
60.00
50.00
40.00
30.00
20.00
10.00
0.00
PPM
17:00
17:08
17:16
18:00
18:08
18:16
19:00
19:08
(DD:HH)
16 Dec'98,22:17:23
OSU-3101 OSU-3201 OSU-3301



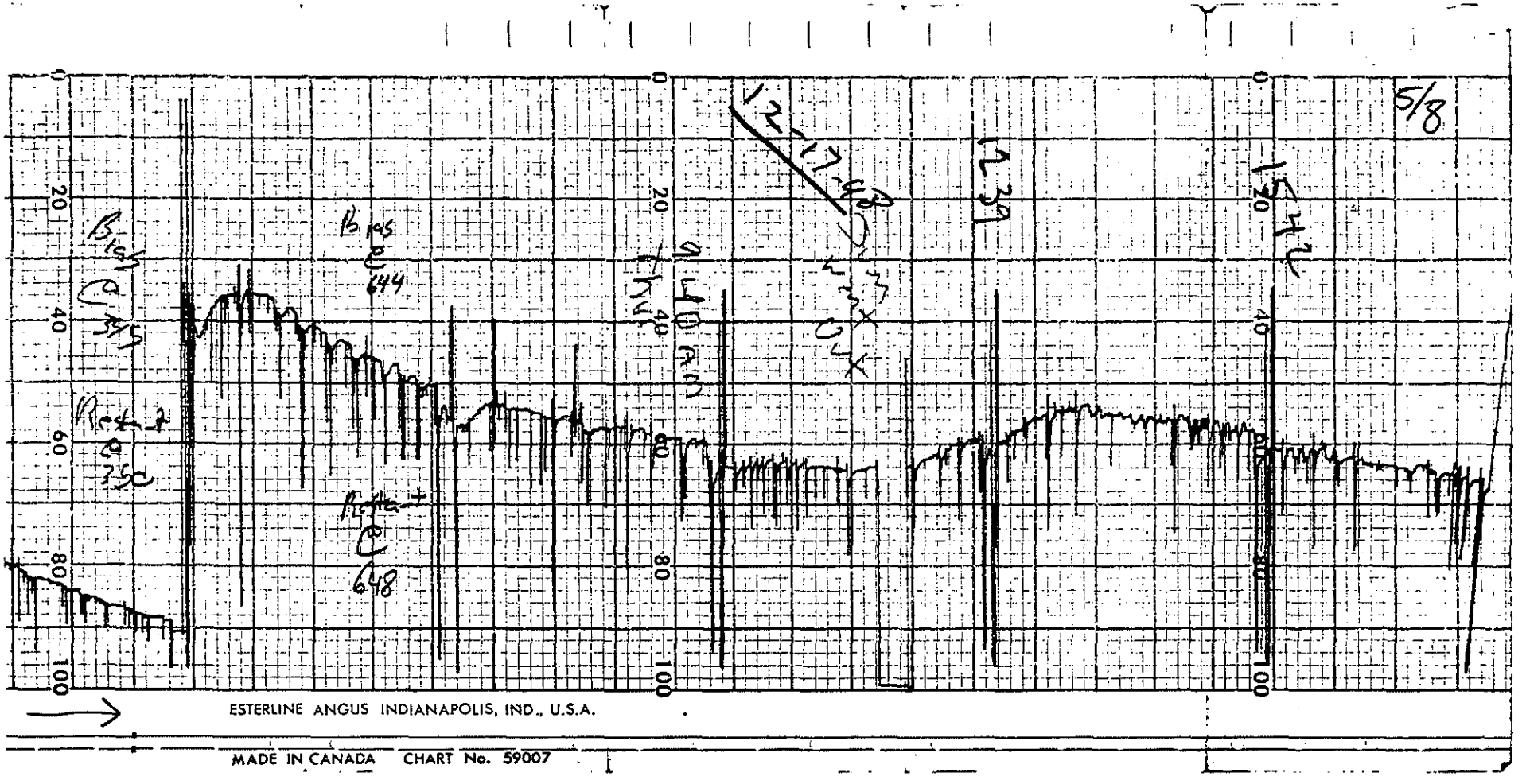
ESTERLINE ANGUS INDIANAPOLIS, IND., U.S.A.

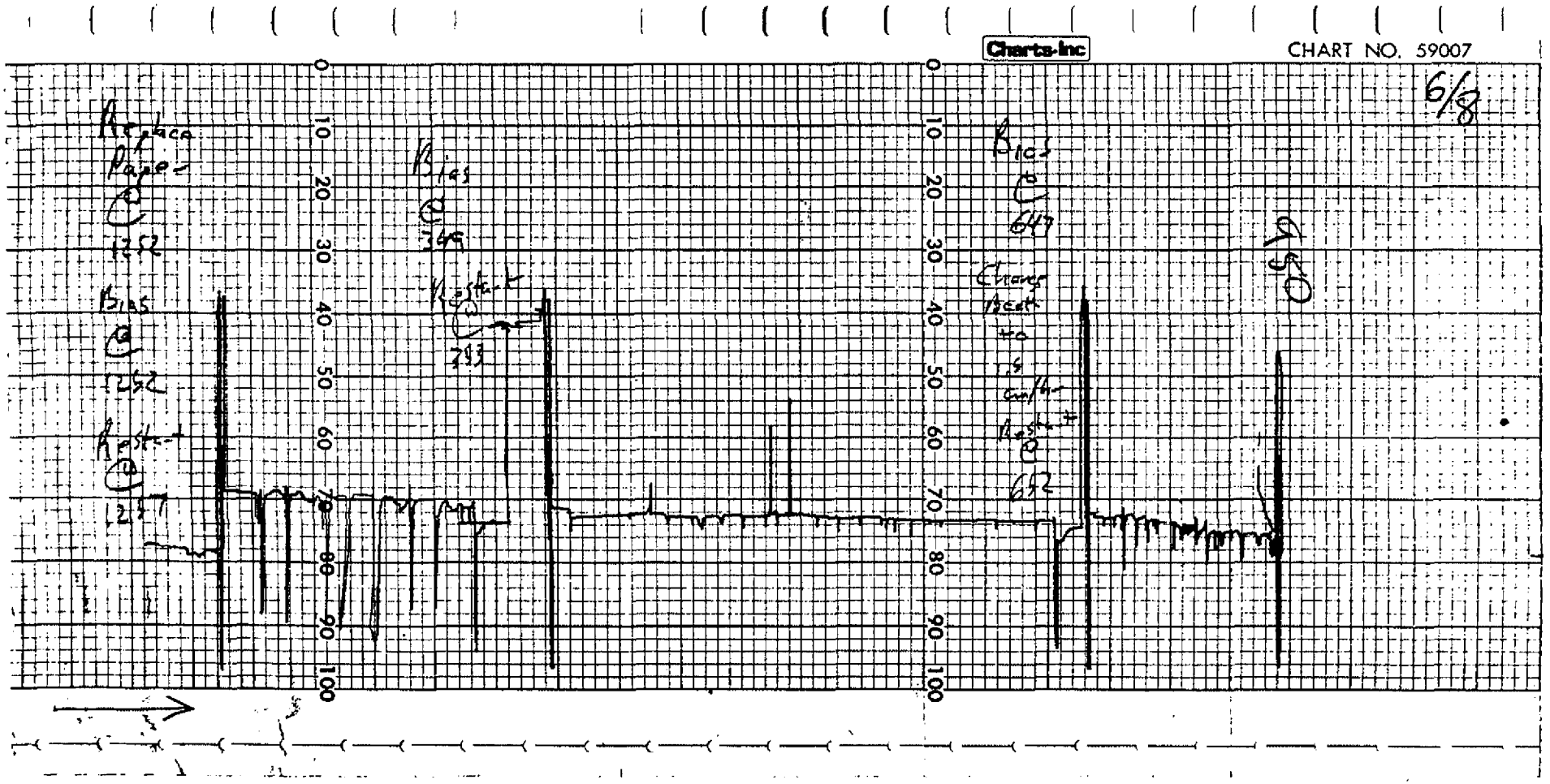
MADE IN CANADA CHART No. 59007

2/8
1400
1100
0
20
40
60
80
100
0
20
40
60
80
100
ESTERLINE ANGUS INDIANAPOLIS, IND., U.S.A.
MADE IN CANADA CHART No. 59007

3/8
800 AM Wind
0
20
40
60
80
100
Bas C 1.04 Hrs
Bas C 206 Hrs
2300
12-15-88
1000
1705
ESTERLINE
MADE IN

0
20
40
60
80
100
0
20
40
60
80
100
0110
1120
9/26
1125-1135
0400
2215
5/8
ANGUS INDIANAPOLIS, IND., U.S.A.
CANADA CHART No. 59007


5/8
Bias @ 35
Bias @ 644
Bias @ 648
0
20
40
60
80
100
ESTERLINE ANGUS INDIANAPOLIS, IND., U.S.A.
MADE IN CANADA CHART No. 59007


Charts-Inc
CHART NO. 59007
6/8
Replace Paper @ 1252
Bias @ 1252
Restart @ 1247
Bias @ 1345
Restart @ 1353
Bias @ 1647
Change Beat to 15 Complete Restart @ 1652
1750

(8110)
Charts-Inc
7/8
Bias
@
445
Resist
@
Bias
@
104
Resist
@
108
2202
1842
1549
1242

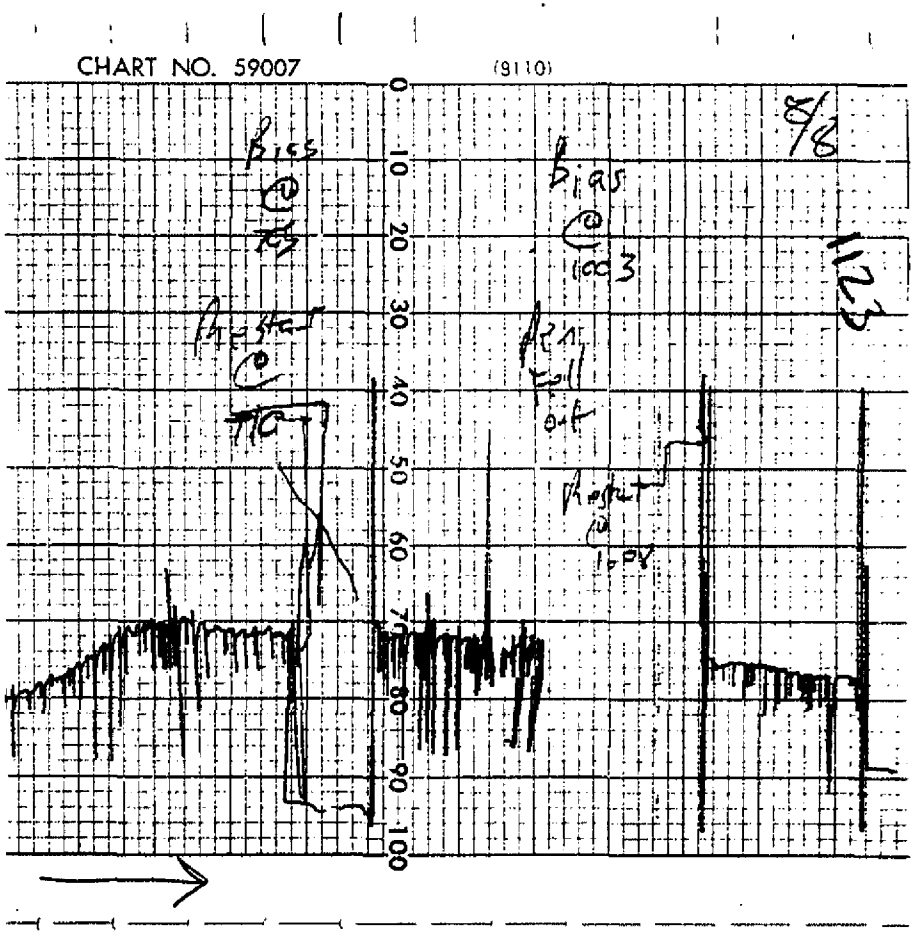


CHART NO. 59007
(9110)
0
10
20
30
40
50
60
70
80
90
100
8/8
1123
bias
@
bias
@
100 3
Reactor
@
Reactor
@
1 PSI

SCOTT-MARRIN, INC.

6531 BOX SPRINGS BLVD. • RIVERSIDE, CA 92507
TELEPHONE (909) 653-6780 • FAX (909) 653-2430

14

10 22 98

REPORT OF ANALYSIS
NIST TRACEABLE GAS MIXTURES

HENGØ1

TO:

DATE: 1Ø/Ø9/98
P002241- 9/14/98

DAVID ROSSMAN
HORIZON ENG'G/INFRARED NW
13585 NE WHITAKER WAY
PORTLAND, OR 9723Ø-

CUSTOMER ORDER NUMBER: ØØ2241

CYLINDER NUMBER	COMPONENT	CONCENTRATION(v/v)	NIST TRACEABLE REFERENCE STANDARD
CAØ11Ø9	Carbon dioxide	5.98 ± Ø.Ø6 %	SRM 1674B
	Nitric oxide	69.9 ± Ø.7 ppm	SRM 1684b
	Carbon monoxide	291.2 ± 2.9 ppm	SRM 2636
	Propane	27.92 ± Ø.28 ppm	SRM 1667B
	Nitrogen,O2-Free	Balance	
	NOx	69.9 ppm	

ppm = umole/mole % = mole-%

The above analyses are traceable to the National Institute of Standards and Technology by intercomparison with the reference standards listed above.
Where indicated, volumetric and gravimetric reference standards are traceable thru use of our analytical balance, NIST Weight Report No. MMAP 232.Ø9/2Ø2491.

Analyst: M.S. Calhoun

Approved: J.T. Marrin

The only liability of this company for gas which fails to comply with this analysis shall be replacement or reanalysis thereof by the company without extra cost.

STANDARD CALIBRATION GASES IN ALUMINUM CYLINDERS

SCOTT-MARRIN, INC.
6531 BOX SPRINGS BLVD. • RIVERSIDE, CA 92507
TELEPHONE (909) 653-6780 • FAX (909) 653-2430

12-01
#23
PO 2352
of 15200

REPORT OF ANALYSIS
NIST TRACEABLE GAS MIXTURES

HENG01

TO:

DATE: 11/20/98

DAVID ROSSMAN
HORIZON ENG'G/INFRARED NW
13585 NE WHITAKER WAY
PORTLAND, OR 97230-

CUSTOMER ORDER NUMBER: 002352

PAGE 1

CYLINDER NUMBER	COMPONENT	CONCENTRATION(v/v)	NIST TRACEABLE REFERENCE STANDARD
CC66249	Carbon dioxide	12.44 ± 0.12 %	SRM 1675B
	Nitric oxide	124.9 ± 1.2 ppm	SRM 1685b
	Carbon monoxide	493 ± 5 ppm	SRM 1680b
	Propane	50.5 ± 0.5 ppm	SRM 1667b
	Nitrogen,O2-Free	Balance	
	NOx	124.9 ppm	

ppm = umole/mole % = mole-%

The above analyses are traceable to the National Institute of Standards and Technology by intercomparison with the reference standards listed above.
Where indicated, volumetric and gravimetric reference standards are traceable thru use of our analytical balance, NIST Weight Report No. MMAP 232.09/202491.

Analyst: M.S. Calhoun

Approved: J.T. Marrin

The only liability of this company for gas which fails to comply with this analysis shall be replacement or reanalysis thereof by the company without extra cost.

STANDARD CALIBRATION GASES IN ALUMINUM CYLINDERS

SCOTT-MARRIN, INC.
6531 BOX SPRINGS BLVD. • RIVERSIDE, CA 92507
TELEPHONE (909) 653-6780 • FAX (909) 653-2430

12-01-98
#35
PO 2334
4/10/5/98

REPORT OF ANALYSIS
NIST TRACEABLE GAS MIXTURES

HENG01

TO:

DATE: 11/20/98

DAVID ROSSMAN
HORIZON ENG'G/INFRARED NW
13585 NE WHITAKER WAY
PORTLAND, OR 97230-

CUSTOMER ORDER NUMBER: 2334

PAGE 1

CYLINDER NUMBER	COMPONENT	CONCENTRATION(v/v)	NIST TRACEABLE REFERENCE STANDARD
CC53889	Carbon dioxide	21.79 ± 0.22 %	SRM 1675B
	Nitric oxide	184.8 ± 1.8 ppm	SRM 1685b
	Carbon monoxide	877 ± 9 ppm	SRM 1681b
	Propane	86.4 ± 0.9 ppm	SRM 1668b
	Nitrogen,O2-Free	Balance	
	NOx	184.8 ppm	

ppm = umole/mole % = mole-%

The above analyses are traceable to the National Institute of Standards and Technology by intercomparison with the reference standards listed above.
Where indicated, volumetric and gravimetric reference standards are traceable thru use of our analytical balance, NIST Weight Report No. MMAP 232.09/202491.

Analyst: M.S. Calhoun

Approved: J.T. Marrin

The only liability of this company for gas which fails to comply with this analysis shall be replacement or reanalysis thereof by the company without extra cost.

STANDARD CALIBRATION GASES IN ALUMINUM CYLINDERS

CALIBRATION DATA

file/date 7MB97423.WB1
Method EPA #5.3.2 & 5.6
Location Horizon Shop
Meter Box ID 7
Meter ID 2962453
calibrated cdb
Assigned

Std M #2
Pb= 29.79 (in Hg)
Ta= 60 (oF)
LeakCheck
Date 12/2/98
Rate 0.00 in/min

	Old 10-28-98	New 12/2/98	Change (+/-)
Y=	0.99083	0.97729	-1.4%
dH@=	1.75911	1.75783	-0.1%

7777777777	VAC (in Hg)	dH (inH2O)	Standard Meter (ft3)	Net (ft3)	Field Meter (ft3)	Net (ft3)	Standard Tw (oF)	Meter Tw (oR)	Field Tdi (oF)	Meter Tdo (oF)	To (oR)	Tm (oR)	Time t (min)	Y	dH@	Allowable Y 0.020	Tolerance dH@ 0.20
Initial	16.0	4.00	435.3840	6.2540	295.2300	6.3320	60.0	520.5	60.0	60.0	520.0	520.3	5.583	0.97756	1.77830	0.000	0.02
Final			441.6380		301.5620		61.0		61.0	60.0							
Initial	18.0	3.00	441.8720	6.2600	301.7920	6.3600	61.0	521.0	61.0	60.0	520.5	521.0	6.467	0.97704	1.78741	0.000	0.03
Final			448.1320		308.1520		61.0		62.0	61.0							
Initial	20.0	2.00	448.2470	6.1030	308.2710	6.2050	63.0	523.0	62.0	61.0	521.0	522.0	7.633	0.97686	1.75862	0.000	0.00
Final			454.3500		314.4760		63.0		64.0	61.0							
Initial	10.0	1.00	454.8550	6.0600	314.9900	6.1820	63.0	523.5	63.0	61.0	522.0	523.8	10.733	0.97832	1.76328	0.001	0.01
Final			460.9150		321.1720		64.0		68.0	63.0							
Initial	11.0	0.50	461.0320	6.5130	321.2880	6.6920	64.0	524.5	67.0	63.0	524.5	527.0	16.033	0.97669	1.70152	0.001	0.06
Final			467.5450		327.9800		65.0		72.0	66.0							
														0.97729	1.75783	0.001	0.02

Method EPA #5.3.2 & 5.6
Location Horizon Shop
Meter Box ID 7
Meter ID None
calibrated kds
Assigned Van II

Pb= 29.60 (in Hg)
Ta= 59 (oF)
LeakCheck
Date 1-11-99
Rate 0.00 in/min

	Old 12/2/98	New 1-11-99	Change (+/-)
Y=	0.97729	0.98126	0.4%
dH@=	1.75783	1.77045	0.7%

7777777777	VAC (in Hg)	dH (inH2O)	Standard Meter (ft3)	Net (ft3)	Field Meter (ft3)	Net (ft3)	Standard Tw (oF)	Meter Tw (oR)	Field Tdi (oF)	Meter Tdo (oF)	To (oR)	Tm (oR)	Time t (min)	Y	dH@	Allowable Y 0.020	Tolerance dH@ 0.20
Initial	14.1	4.00	612.1320	6.1960	630.4060	6.2820	59.0	519.0	61.0	58.0	518.5	520.8	5.550	0.97990	1.79648	0.001	0.03
Final			618.3280		636.6880		59.0		65.0	59.0							
Initial	13.6	3.00	620.3430	6.4500	638.7450	6.5630	60.0	520.0	65.0	59.0	519.5	523.0	6.370	0.98114	1.64103	0.000	0.13
Final			626.7930		645.3080		60.0		68.0	60.0							
Initial	15.6	2.00	627.7330	6.9860	646.2670	7.1330	60.0	520.5	67.0	60.0	520.5	524.0	9.000	0.98110	1.86163	0.000	0.09
Final			634.7190		653.4000		61.0		68.0	61.0							
Initial	11.7	1.00	635.5570	5.6340	654.2720	5.7650	60.0	520.5	67.0	61.0	521.5	524.8	10.150	0.98281	1.81677	0.002	0.05
Final			641.1910		660.0370		61.0		69.0	62.0							
Initial	11.5	0.50	641.7580	5.4550	660.6220	5.6050	61.0	521.0	68.0	63.0	523.5	526.0	13.600	0.98136	1.73632	0.000	0.03
Final			647.2130		666.2270		61.0		69.0	64.0							
														0.98126	1.77045	0.001	0.07

Source Test Control Box Calibrations

file/date	4MB96918.WB1																		
Method	EPA #5.3.2 & 5.6																		
Location	Horizon Shop						Std M	#2											
Meter Box ID	4						Pb=	30.21	(in Hg)										
Meter ID	None						Ta=	59	(oF)										
calibrated	kds						LeakCheck												
Assigned	Van II						Date	12-08-98											
							Rate	0.00	in/min										
444444444444 444444444444 444444444444 444444444444	VAC (in Hg)	dH (inH2O)	Standard Meter (ft3)	Net (ft3)	Field Meter (ft3)	Net (ft3)	Standard Tw (oF)	Meter Tw (oR)	Field Tdi (oF)	Meter Tdo (oF)	To (oR)	Tm (oR)	Time t (min)	Y	dH@	Allowable Tolerance Y 0.020	dH@ 0.20		
Initial	11.5	4.00	469.1090	6.0830	956.6640	6.0800	59.0	519.0	59.0	58.0	518.5	519.5	5.480	0.99180	1.78044	0.002	0.01		
Final			475.1920		962.7440		59.0		62.0	59.0									
Initial	11.0	3.00	476.0260	6.3740	963.5790	6.3930	59.0	519.5	62.0	59.0	519.5	521.5	6.630	0.99361	1.78018	0.004	0.01		
Final			482.4000		969.9720		60.0		65.0	60.0									
Initial	14.4	2.00	498.3710	6.0750	986.1030	6.1710	63.0	523.0	71.0	63.0	524.0	528.0	7.800	0.98904	1.81699	0.001	0.05		
Final			504.4460		992.2740		63.0		73.0	65.0									
Initial	14.0	1.00	491.2330	6.0950	978.8730	6.1840	62.0	522.0	69.0	62.0	522.0	525.8	10.750	0.99028	1.71433	0.001	0.05		
Final			497.3280		985.0570		62.0		70.0	62.0									
Initial	12.7	0.50	505.6230	6.0910	993.4500	6.2230	62.0	522.5	70.0	65.0	525.5	525.8	15.400	0.98368	1.75303	0.006	0.02		
Final			511.7140		999.6730		63.0		62.0	66.0									
														0.98968	1.76899	0.003	0.03		

	Old 6-22-98	New 12-08-98	Change (+/-)
Y=	0.99556	0.98968	-0.6%
dH@=	1.72084	1.76899	2.8%

Method	EPA #5.3.2 & 5.6																		
Location	Horizon Shop						Std M	#2											
Meter Box ID	4						Pb=	30.05	(in Hg)										
Meter ID	None						Ta=	76	(oF)										
calibrated	cdb						LeakCheck												
Assigned	Van II						Date	6-22-98											
							Rate	0.00	in/min										
444444444444 444444444444 444444444444 444444444444	VAC (in Hg)	dH (inH2O)	Standard Meter (ft3)	Net (ft3)	Field Meter (ft3)	Net (ft3)	Standard Tw (oF)	Meter Tw (oR)	Field Tdi (oF)	Meter Tdo (oF)	To (oR)	Tm (oR)	Time t (min)	Y	dH@	Allowable Tolerance Y 0.020	dH@ 0.20		
Initial	17.0	4.00	454.5450	6.3400	153.2320	6.3500	76.0	535.5	76.0	76.0	536.0	536.3	5.600	0.99013	1.77204	0.005	0.05		
Final			460.8850		159.5820		75.0		77.0	76.0									
Initial	18.0	3.00	461.1540	6.4500	159.8620	6.4700	74.0	533.5	77.0	76.0	536.0	537.0	6.533	0.99614	1.73475	0.001	0.01		
Final			467.6040		166.3320		73.0		79.0	76.0									
Initial	19.5	2.00	467.8530	6.1700	166.5820	6.2270	75.0	535.0	78.0	76.0	536.5	538.3	7.700	0.99201	1.76376	0.004	0.04		
Final			474.0230		172.8090		75.0		82.0	77.0									
Initial	21.0	1.00	474.1680	6.0630	172.9560	6.0990	77.0	536.0	80.0	77.0	537.5	539.5	10.433	0.99815	1.67990	0.003	0.04		
Final			480.2310		179.0550		75.0		83.0	78.0									
Initial	23.0	0.50	480.4130	6.2340	179.2550	6.2700	72.0	536.0	82.0	78.0	538.5	540.5	15.067	1.00138	1.65377	0.006	0.07		
Final			486.6470		185.5250		80.0		83.0	79.0									
														0.99556	1.72084	0.004	0.04		

	Old 06-10-98	New 6-22-98	Change (+/-)
Y=	0.98913	0.99556	0.7%
dH@=	1.70085	1.72084	1.2%

Pitot Calibration Calculations

Date 17-Sep-98 Pb= 29.92 in Hg cdb
File pt98317 Ta= 541.0 R
Method #2 sec 4 Location Whitaker Shop

Pitot	Tested Last	|Cp| New	|S|	|Cp| Old	|%| Change
gs3-1	8/27/98	0.79013	0.00685	0.79057	-0.1%
ss3-2	8/27/98	0.80537	0.00650	0.80626	-0.1%
ss3-3	8/27/98	0.79136	0.00531	0.80551	-1.8%
**wc3-4	3/20/98	0.80699	0.00511	0.80699	0.0%
ss3-5	8/27/98	0.79800	0.00284	0.80696	-1.4%
ss3-6	8/27/98	0.80133	0.00742	0.80438	-0.4%
ss3-7	8/27/98	0.80168	0.00502	0.79250	1.2%
ss3-8	8/27/98	0.79295	0.00112	0.79150	0.2%
ss4-1	8/27/98	0.79801	0.00095	0.80105	-0.4%
ss4-2	8/27/98	0.80288	0.00597	0.79684	0.8%
ss4-3	8/27/98	0.80025	0.00404	0.80350	-0.4%
ss4-4	8/27/98	0.79877	0.00476	0.79722	0.2%
ss4-5	8/27/98	0.79411	0.00394	0.79915	-0.6%
	Average	0.79881	0.00466	0.80027	-0.18%

Pitot	Tested Last	|Cp| New	|S|	|Cp| Old	|%| Change
ss4-6	8/27/98	0.79627	0.00194	0.78592	1.3%
ss4-7	8/27/98	0.80423	0.00452	0.79533	1.1%
ss5-2	9/11/98	0.79588	0.00780	0.79438	0.2%
ss5-3	9/11/98	0.80139	0.00974	0.80203	-0.1%
ss5-4	8/31/98	0.78090	0.00347	0.79128	-1.3%
ss5-5	8/31/98	0.79984	0.00876	0.79501	0.6%
ss5-6	9/11/98	0.80103	0.00992	0.79307	1.0%
ss5-7	8/28/98	0.80803	0.00210	0.80270	0.7%
ss5-8	8/28/98	0.79984	0.00533	0.79879	0.1%
ss5-9	8/31/98	0.80336	0.00779	0.80336	0.0%
ss7-1	9/2/98	0.80797	0.00863	0.80781	0.0%
ss7-2	9/2/98	0.80057	0.00368	0.79447	0.8%
ss7-3	9/2/98	0.79767	0.00533	0.81022	-1.6%
	Average	0.79987	0.00636	0.79724	0.33%

	dPp	dPs	Cp	dS	Avg Cp	S
gs3-1	1.250	1.950	0.79263	0.00250	0.79013	0.00685
Pass	0.950	1.450	0.80133	0.01120		
8/27/98	0.390	0.620	0.78518	0.00495		
cdb	0.380	0.610	0.78138	0.00875		
ss3-2	1.325	2.050	0.79591	0.00946	0.80537	0.00650
Pass	1.050	1.600	0.80199	0.00338		
8/27/98	0.430	0.650	0.80522	0.00015		
cdb	0.410	0.600	0.81837	0.01300		
ss3-3	1.275	2.050	0.78075	0.01061	0.79136	0.00531
Pass	1.050	1.625	0.79580	0.00443		
8/27/98	0.430	0.670	0.79311	0.00174		
cdb	0.420	0.650	0.79580	0.00443		
**wc3-4	1.250	1.875	0.80833	0.00134	0.80699	0.00511
Pass	0.880	1.300	0.81453	0.00754		
3/20/98	0.570	0.880	0.79877	0.01022		
cdb	0.360	0.540	0.80833	0.00134		
ss3-5	1.250	1.950	0.79263	0.00337	0.79800	0.00284
Pass	1.000	1.525	0.80168	0.00568		
8/27/98	0.400	0.620	0.79519	0.00082		
cdb	0.380	0.590	0.79451	0.00149		
ss3-6	1.250	1.950	0.79263	0.00870	0.80133	0.00742
Pass	1.050	1.600	0.80199	0.00066		
8/27/98	0.400	0.620	0.79519	0.00615		
cdb	0.380	0.580	0.81552	0.01418		
ss3-7	1.200	1.875	0.79200	0.00968	0.80168	0.00502
Pass	0.950	1.450	0.80133	0.00035		
8/27/98	0.420	0.630	0.80833	0.00665		
cdb	0.410	0.620	0.80507	0.00338		
ss3-8	1.250	1.950	0.79263	0.00032	0.79295	0.00112
Pass	1.000	1.550	0.79519	0.00224		
8/27/98	0.410	0.640	0.79239	0.00056		
cdb	0.390	0.610	0.79159	0.00136		
ss4-1	1.300	2.000	0.79816	0.00016	0.79801	0.00095
Pass	0.970	1.500	0.79611	0.00189		
8/27/98	0.430	0.660	0.79909	0.00109		
cdb	0.410	0.630	0.79885	0.00085		
ss4-2	1.300	2.000	0.79816	0.00471	0.80288	0.00597
Pass	1.050	1.550	0.81462	0.01195		
8/27/98	0.390	0.600	0.79816	0.00471		
cdb	0.388	0.560	0.80035	0.00252		
ss4-3	1.300	2.000	0.79816	0.00209	0.80025	0.00404
Pass	1.100	1.700	0.79036	0.00390		
8/27/98	0.390	0.600	0.79816	0.00209		
cdb	0.360	0.540	0.80833	0.00808		
ss4-4	1.275	2.000	0.79045	0.00831	0.79877	0.00476
Pass	1.100	1.650	0.80833	0.00957		
8/27/98	0.410	0.630	0.79885	0.00011		
cdb	0.370	0.570	0.79763	0.00114		
ss4-5	1.275	2.000	0.79045	0.00365	0.79411	0.00394
Pass	1.050	1.600	0.80199	0.00789		
8/27/98	0.410	0.640	0.79239	0.00172		
cdb	0.390	0.610	0.79159	0.00251		

	dPp	dPs	Cp	dS	Avg Cp	S
ss4-6	1.300	2.000	0.79816	0.00160	0.79627	0.00194
Pass	1.100	1.700	0.79036	0.00009		
8/27/98	0.410	0.640	0.79239	0.00388		
cdb	0.390	0.600	0.79816	0.00190		
ss4-7	1.300	1.950	0.80833	0.00410	0.80423	0.00452
Pass	1.000	1.550	0.79519	0.00904		
8/27/98	0.420	0.630	0.80833	0.00410		
cdb	0.410	0.620	0.80507	0.00084		
ss5-2	1.300	2.050	0.78837	0.00751	0.79588	0.00780
Pass	1.075	1.600	0.81148	0.01560		
9/11/98	0.440	0.690	0.79056	0.00532		
cdb	0.430	0.670	0.79311	0.00277		
ss5-3	1.300	2.025	0.79322	0.00817	0.80139	0.00974
Pass	1.100	1.600	0.82087	0.01947		
9/11/98	0.430	0.660	0.79909	0.00230		
cdb	0.410	0.640	0.79239	0.00900		
ss5-4	1.300	2.100	0.77893	0.00197	0.78090	0.00347
Pass	1.100	1.750	0.78490	0.00400		
8/31/98	0.430	0.700	0.77593	0.00497		
cdb	0.420	0.670	0.78363	0.00294		
ss5-5	1.250	2.000	0.76268	0.01698	0.79984	0.00876
Pass	1.050	1.550	0.81462	0.01518		
8/31/98	0.430	0.660	0.79909	0.00055		
cdb	0.420	0.640	0.80199	0.00235		
ss5-6	1.300	2.050	0.78837	0.01266	0.80103	0.00992
Pass	1.100	1.600	0.82087	0.01983		
9/11/98	0.430	0.660	0.79909	0.00194		
cdb	0.420	0.650	0.79580	0.00523		
ss5-7	1.200	1.800	0.80833	0.00030	0.80803	0.00210
Pass	0.890	1.350	0.80363	0.00420		
8/28/98	0.410	0.610	0.81164	0.00361		
cdb	0.400	0.600	0.80833	0.00030		
ss5-8	1.325	2.050	0.79591	0.00392	0.79984	0.00533
Pass	1.050	1.600	0.80199	0.00216		
8/28/98	0.430	0.670	0.79311	0.00673		
cdb	0.420	0.630	0.80833	0.00850		
ss5-9	1.275	1.975	0.79544	0.00792	0.80336	0.00779
Pass	0.980	1.500	0.80021	0.00315		
8/31/98	0.410	0.610	0.81164	0.00828		
cdb	0.400	0.590	0.81515	0.01179		
ss7-1	1.200	1.850	0.79733	0.01063	0.80797	0.00863
Pass	0.950	1.450	0.80133	0.00663		
9/2/98	0.420	0.620	0.81482	0.00688		
cdb	0.410	0.600	0.81837	0.01041		
ss7-2	1.300	2.000	0.79816	0.00241	0.80057	0.00368
Pass	1.000	1.500	0.80833	0.00776		
9/2/98	0.390	0.600	0.79816	0.00241		
cdb	0.370	0.570	0.79763	0.00295		
ss7-3	1.250	1.950	0.79263	0.00503	0.79767	0.00533
Pass	1.000	1.500	0.80833	0.01067		
9/2/98	0.400	0.620	0.79519	0.00248		
cdb	0.380	0.590	0.79451	0.00316		

Note: ** Not calibrated; will calibrate when needed.

Shortridge Instruments, Inc.
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CERTIFICATE OF CALIBRATION

INSTRUMENT AirData Multimeter

MODEL ADM-870 SERIAL NO M94064

TEST BY L. Laubmeier DATE 12-17-96

This is to certify that this instrument has been calibrated using instrumentation which is traceable to masters at the National Institute of Standards and Technology. Quality Assurance Program and calibration procedures meet the requirements for 10CFR50, Appendix B; 10CFR21; ANSI/N45.2; and MIL-STD45662A.

CERTIFIED BY Ernest R. Shortridge

CERTIFICATION OF NIST TRACEABILITY

Calibration equipment and standards used by Shortridge Instruments, Inc. are traceable to the National Institute of Standards & Technology. The Calibration Certification test report numbers are: differential and absolute pressure M4212 (dated 8/93), TN-251820-93 (dated 6/93) and 822/255136-95 (dated 3/95); temperature - 88024 (dated 10/90). Calibration is performed in conformance with 10CFR50, Appendix B; ANSI/N45.2; MIL-STD-45662A and manufacturer's specifications.

Calibration equipment is calibrated using Shortridge Instruments' Inc. Calibration Test Standard Master Meter Serial Number M96455 (cal date 08/20/96), M96452 (cal date 09/25/96), M89216 (cal date 08/03/95) or M89218 (cal date 09/12/95) certified yearly through an outside testing facility which is directly traceable to NIST.

All AirData Multimeters and AirData FlowMeters calibrated between the dates of June 20, 1996 and June 20, 1997 are included under this certification. All such meters are certified for accuracy when used with properly functioning accessories only.

CALIBRATION ACCURACY

Calibration accuracy of Shortridge Instruments, Inc. Calibration Master Meters as compared to AirData Multimeters or AirData FlowMeters being calibrated or recalibrated, is as follows:

Differential Pressure: Accuracy ratio for differential pressure is 4:1.

Master Meter: ± 0.50% of reading ± one count as compared with a NIST Traceable Calibration Standard with specified accuracy of ± 0.005% of reading ± 0.00003 psi (0.0008 in wc).

Test Meter: ± 2.0% of reading ± 0.0001 in wc.

Absolute Pressure: Accuracy ratio for absolute pressure is 4:1.

Master Meter: ± 0.50% of reading ± one count as compared with a NIST Traceable Calibration Standard with specified accuracy of ± 0.005% of reading ± 0.003 psi.

Test Meter: ± 2.0% of reading ± 0.1 in Hg.

Temperature: Accuracy ratio for temperature is 2:1.

Master Meter: ± 0.25°F as compared with a NIST Traceable Calibration Standard with specified accuracy of ± 0.10°F or better.

Test Meter: ± 0.5°F between 32°F and 212°F.

Air Flow: Accuracy ratio for the Electronic FlowHood is 2:1; for the Mechanical FlowHood it is 2:1 minimum.

Master Meter: ± 1.38% of reading ± 5.0 cfm. Air flow readout accuracy is the square root of the combined accuracies of the differential pressure, absolute pressure and temperature measurements by both the Master Meter and the FlowHood Test Stand Meter used for direct flow readout.

Test Meter: ± 3.0% of reading ± 5.0 cfm for the Electronic FlowHood. It is ± 3.0% of range (full scale) for the Mechanical FlowHood.

SHORTRIDGE INSTRUMENTS, INC.
7855 East Redfield Road Scottsdale, AZ 85260
Telephone (602) 991-6744 FAX (602) 443-1267

Thermocouple Calibration

Date:	24-Mar-98	Deviation	@60 F	7.8	Allowable Diff.			Pb=	29.88	In Hg	JDF	
Next Calibration:	20-Sep-98	Limit	@212 F	10.1	Allowable Diff.			Ta=	70.0	oF	980324tc	
			@325 F	11.8	Allowable Diff.							

	Probe/ID	Ambient Standard, F	Ambient Measured, F	Ambient Difference F	Boiling, Water Standard, F	Boiling, Water Measured, F	Boiling, Water Difference F	Boiling, Oil Standard, F	Boiling, Oil Measured, F	Boiling, Oil Difference F	Average Difference F
Probe	3-1	33.2	33.0	0.2	211.4	211.4	0.0	357.8	358.4	-0.6	-0.13
Probe	3-2	33.2	33.4	-0.2	212.6	213.6	-1.0	352.8	356.8	-4.0	-1.73
Probe	3-3	34.8	34.8	0.0	210.6	212.6	-2.0	336.4	333.8	2.6	0.20
Probe	wc3-4	33.4	34.6	-1.2	212.2	214.2	-2.0	319.0	316.8	2.2	-0.33
Probe	3-5	33.2	33.4	-0.2	212.8	212.6	0.2	353.8	365.0	-11.2	-3.73
Probe	3-6	34.2	36.0	-1.8	211.6	213.8	-2.2	329.0	334.0	-5.0	-3.00
Probe	3-7	33.2	33.0	0.2	212.8	214	-1.2	358.6	356.8	1.8	0.27
Probe	3-8	33.2	33.6	-0.4	212.8	211.8	1.0	358.2	361.4	-3.2	-0.87
Probe	4-1	35.0	34.6	0.4	211.8	215	-3.2	346.6	346.8	-0.2	-1.00
Probe	4-2	34.6	33.0	1.6	211.2	208.2	3.0	332.4	328.4	4.0	2.87
Probe	4-3	35.4	36.2	-0.8	210.8	211.8	-1.0	332.8	336.0	-3.2	-1.67
Probe	4-4	34.4	33.2	1.2	210.6	211.6	-1.0	340.8	340.8	0.0	0.07
Probe	4-5	34.2	34.6	-0.4	210	212.2	-2.2	338.2	340.0	-1.8	-1.47
Probe	4-6	34.4	33.8	0.6	210.2	210.2	0.0	334.0	332.6	1.4	0.67
Probe	4-7	35.0	35.0	0.0	210.6	212.2	-1.6	336.4	340.4	-4.0	-1.87
Probe	5-2	33.0	33.8	-0.8	212.4	210	2.4	316.4	309.2	7.2	2.93
Probe	5-3	33.6	33.6	0.0	214.6	210.6	4.0	316.0	310.0	6.0	3.33
Probe	5-4	33.0	32.0	1.0	212.4	210.6	1.8	315.8	311.0	4.8	2.53
Probe	5-5	32.2	33.0	-0.8	211.4	210.4	1.0	314.4	314.0	0.4	0.20
Probe	5-6	33.0	32.6	0.4	213	210.8	2.2	315.4	313.8	1.6	1.40
Probe	5-7	32.4	32.4	0.0	214.4	211.2	3.2	319.6	317.4	2.2	1.80
Probe	5-8	33.0	32.8	0.2	212.4	211	1.4	324.4	321.8	2.6	1.40
Probe	5-9	33.0	32.6	0.4	212	211.2	0.8	317.4	320.0	-2.6	-0.47
Probe	7-1	33.6	32.6	1.0	210.8	210.8	0.0	313.0	315.8	-2.8	-0.60
Probe	7-2	33.6	33.0	0.6	211.8	211	0.8	318.6	318.6	0.0	0.47
Probe	7-3	33.2	33.6	-0.4	213.6	211	2.6	318.4	316.0	2.4	1.53
Probe	7-4	33.6	33.6	0.0	212.8	211.2	1.6	315.0	313.0	2.0	1.20
Probe	7-5	32.8	32.6	0.2	213.6	211.2	2.4	320.4	312.0	8.4	3.67
Probe	7-6	32.8	33.0	-0.2	213.4	211.6	1.8	312.4	311.8	0.6	0.73
Probe	10-1	33.6	33.6	0.0	211.8	211.8	0.0	317.2	315.6	1.6	0.53
Probe	10-2	33.8	33.2	0.6	213.8	211	2.8	315.4	316.2	-0.8	0.87
Probe	10-3	33.2	34.4	-1.2	212.2	212.4	-0.2	315.6	318.4	-2.8	-1.40
Pitot	11-S	34.2	33.6	0.6	212.4	214.2	-1.8	314.8	314.2	0.6	-0.20
Pitot	10-S	33.8	33.4	0.4	212.4	213.8	-1.4	325.2	319.0	6.2	1.73
	F3	36.0	34.6	1.4	210.4	211.8	-1.4	280.8	278.6	2.2	0.73
	F23	34.2	35.8	-1.6	210	212.6	-2.6	274.0	272.0	2.0	-0.73
	F51	34.0	34.2	-0.2	211.4	211.8	-0.4	319.0	320.0	-1.0	-0.53
	F84	35.4	33.8	1.6	211.2	213.6	-2.4	308.2	311.8	-3.6	-1.47
	F85	35.2	33.8	1.4	211.2	213	-1.8	306.8	304.2	2.6	0.73
	F100	34.0	34.0	0.0	212.2	211.8	0.4	318.8	316.6	2.2	0.87
	A1	33.2	32.6	0.6	210.8	211.6	-0.8	370.8	368.8	2.0	0.60
	A2	33.4	34.0	-0.6	212	211	1.0	370.4	367.4	3.0	1.13
	A3	33.2	33.8	-0.6	213	212	1.0	368.0	368.8	-0.8	-0.13
	A4	33.4	33.2	0.2	212.6	212	0.8	366.2	363.4	2.8	1.27
	A5	33.4	33.0	0.4	211.8	212.6	-0.8	364.8	362.8	2.0	0.53
	A6	33.2	33.8	-0.6	212.4	209.8	2.6	364.2	357.0	7.2	3.07
	B3	35.8	35.2	0.6	210.6	203.8	6.8	294.8	295.4	-0.6	2.27
	B7	36.2	35.0	1.2	211.2	201.6	9.6	287.4	290.6	-3.2	2.53
	B8	36.2	34.6	1.6	211.4	210.6	0.8	322.8	325.6	-2.8	-0.13
	B10	35.6	35.2	0.6	211.4	213.4	-2.0	312.8	314.8	-2.0	-1.13
	B11	36.2	35.4	0.8	211.2	208.4	2.8	328.0	328.6	-0.6	1.00
	B13	36.0	33.8	2.2	212	211.4	0.6	316.2	316.4	-0.2	0.87
	B14	35.6	34.3	1.3	211.4	213	-1.6	301.6	304.2	-2.4	-0.90
AVERAGE		34.0	33.8	0.2	211.9	211.4	0.5	326.9	326.5	0.5	0.4
				0.04%			0.07%			0.06%	
Hivol Dial Gauges											
9118		35.4	35	0.4							
D-2					211.6	211	0.6	320.6	326.0	-5.4	
D-5					211.4	210	1.4	322.0	330.0	-8.0	
D-7		35.2	35	0.2	211.4	206	5.4				
D-9					211.2	210	1.2	321.8	328.0	-6.2	
D-10		33.4	36	-2.6	210.6	212	-1.4				
D-14		36.2	32	4.2							

Standard Used Fluke 5895570

Thermocouple Indicator Calibration

Date: 4-20-98		Deviation	@32 F	7.4	Pb=	30.05	in Hg					drb
Next Calibration: 4-98		Limit	@212 F	10.1	Ta=	55.0	oF					TCINDm97.WB1
			@400 F	12.9								
Thermocouple Indicator	Channel	Measured, F	Standard, F	Deviation % absolute	Measured, F	Standard, F	Deviation % absolute	Measured, F	Standard, F	Deviation % absolute	Average Deviation, %	
Dial multi-indicator	1	115	114.2	0.1	408	407.8	0.0	704	703.0	0.1	0.08	
	2	109	107.4	0.3	301	301.0	0.0	705	703.2	0.2	0.15	
	3	109	107.8	0.2	408	407.2	0.1	738	736.8	0.1	0.13	
	4	96	94.2	0.3	292	292.0	0.0	739	737.0	0.2	0.18	
	5	96	94.4	0.3	287	287.0	0.0	787	785.6	0.1	0.13	
	6	101	100.0	0.2	361	360.4	0.1	786	785.4	0.0	0.10	
	7	107	105.4	0.3	352	352.4	-0.0	855	854.4	0.0	0.09	
	8	101	100.2	0.1	406	405.4	0.1	851	849.4	0.1	0.11	
	9	102	100.6	0.2	366	364.2	0.2	707	705.6	0.1	0.20	
	10	86	84.4	0.3	486	485.0	0.1	707	705.4	0.1	0.18	
Omega trendicator	1	86	84.6	0.3	355	353.8	0.1	862	859.4	0.2	0.20	
	2	86	84.6	0.3	450	447.8	0.2	768	766.8	0.1	0.20	
	3	121	119.0	0.3	394	392.4	0.2	768	766.8	0.1	0.21	
	4	121	119.0	0.3	408	406.4	0.2	689	687.4	0.1	0.22	
	5	86	84.4	0.3	312	311.0	0.1	689	687.4	0.1	0.19	
Fluke 6393007		93.2	93.6	-0.1	463.8	465.0	-0.1	912.8	913.4	-0.0	-0.08	
Fluke 7029062		91	89.4	0.3	346	344.8	0.1	927.6	926.6	0.1	0.17	
Meter Box 2	1	89	92.4	-0.6	214	214.4	-0.1	461	462.6	-0.2	-0.28	
	2	75	77.2	-0.4	254	255.4	-0.2	429	431.0	-0.2	-0.28	
	3	97	99.4	-0.4	246	246.8	-0.1	481	483.4	-0.3	-0.27	
	4	99	101.2	-0.4	240	240.2	-0.0	410	408.2	0.2	-0.07	
	5	95	94.8	0.0	269	269.6	-0.1	353	353.6	-0.1	-0.04	
Meter Box 4	1	77	76.4	0.1	331	328.6	0.3	785	783.2	0.1	0.19	
	2	95	95.8	-0.1	386	385.8	0.0	793	793.4	-0.0	-0.05	
	3	95	96.0	-0.2	357	355.6	0.2	717	717.4	-0.0	-0.01	
	4	81	81.2	-0.0	303	300.6	0.3	708	705.6	0.2	0.16	
	5	80	79.2	0.1	324	322.2	0.2	787	785.8	0.1	0.16	
Meter Box 5	1	104	104.6	-0.1	352	352.2	-0.0	746	744.2	0.1	0.01	
	2			0.0	269	268.0	0.1			0.0	0.05	
	3			0.0	279	278.6	0.1			0.0	0.02	
	4	110	109.4	0.1	346	345.8	0.0	742	740.2	0.1	0.09	
	5	107	107.8	-0.1	376	375.2	0.1	762	758.4	0.3	0.08	
Meter Box 6	1	86	84.6	0.3	408	404.6	0.2	872	871.4	0.0	0.15	
	2	86	84.6	0.3	460	459.6	0.0	777	776.2	0.1	0.12	
	3	86	87.0	-0.2	460	459.2	0.1	777	774.8	0.2	0.03	
	4	86	84.6	0.3	460	458.8	0.1	777	776.2	0.1	0.15	
	5	86	84.2	0.3	460	458.6	0.2	777	775.6	0.1	0.20	
Meter Box 7	1	79	80.2	-0.2	439	437.8	0.1	754	754.2	-0.0	-0.03	
	2	93	92.6	0.1	381	378.4	0.3	755	755.8	-0.1	0.11	
	3	93	92.8	0.0	457	456.4	0.1	825	826.4	-0.1	-0.00	
	4	92	91.6	0.1	439	437.4	0.2	825	824.8	0.0	0.09	
	5	92	92.0	0.0	388	388.0	0.0	772	772.0	0.0	0.00	
Meter Box 8	1	94	93.6	0.1	401	398.6	0.3	918	917.2	0.1	0.14	
	2	95	94.6	0.1	401	401.6	-0.1	918	917.6	0.0	0.01	
	3	94	94.8	-0.1	402	401.8	0.0	918	919.2	-0.1	-0.07	
	4	94	93.8	0.0	402	401.6	0.0	918	917.0	0.1	0.05	
	5	93	91.8	0.2	402	403.0	-0.1	918	916.0	0.1	0.08	
temp. control box 1	1			0.0			0.0			0.0	0.00	
temp. control box 2	1	97	98.2	-0.2	318	320.0	-0.3	871	871.6	-0.0	-0.17	
Van II Heater Controls	1			0.0	251	254.2	-0.4			0.0	-0.15	
	2			0.0	256	261.4	-0.7			0.0	-0.25	
	3			0.0	255.2	251.0	0.6			0.0	0.20	
	4			0.0	260.6	253.2	1.0			0.0	0.35	
				0.0			0.0			0.0	0.00	
				0.0			0.0			0.0	0.00	
				0.0			0.0			0.0	0.00	
				0.0			0.0			0.0	0.00	
AVERAGE		82.19	81.88	0.05	351.71	351.09	0.07	655.50	654.84	0.05	0.06	

Standard used, fluke 5895670 calibrated 4-1-98 by Grant Edgle Co.

Stainless Steel Nozzle Size List
Horizon Engineering

"28Aug98
noz0898

Diameter	I.D. #	'Measurements (in.)			Average	Old Average	
1"	S-BO1	0.9895	0.9875	0.9870	0.9880	0.9852	0.003
3/4"	S-C01	0.7530	0.7530	0.7545	0.7535	0.7553	-0.002
	S-C02	0.7520	0.7525	0.7520	0.7522	0.7493	0.003
5/8"	S-A01	0.6300	0.6300	0.6290	0.6297	0.6362	-0.007
	S-A02	0.6150	0.6190	0.6180	0.6173	0.6175	0.000
1/2"	S-801	0.5000	0.4990	0.4975	0.4988	0.4968	0.002
	S-802	0.5120	0.5125	0.5120	0.5122	0.5165	-0.004
	S-803	0.4990	0.5015	0.5000	0.5002	0.5008	-0.001
	S-804	0.4980	0.5020	0.5010	0.5003	0.4995	0.001
	S-805	0.4965	0.4990	0.4965	0.4973	0.4968	0.001
	S-806	0.5005	0.4980	0.5000	0.4995	0.5030	-0.004
	S-807	0.4905	0.4935	0.4910	0.4917	0.4928	-0.001
	S-808	0.4950	0.4950	0.4935	0.4945	0.4990	-0.005
	S-809	0.4975	0.4955	0.4935	0.4955	0.4957	0.000
7/16"	S-701	0.4320	0.4300	0.4315	0.4312	0.4310	0.000
	S-702	0.4670	0.4670	0.4685	0.4675	0.4672	0.000
	S-703	0.4375	0.4415	0.4395	0.4395	0.4363	0.003
3/8"	S-601	0.3680	0.3705	0.3700	0.3695	0.3673	0.002
	S-602	0.3955	0.3970	0.3950	0.3958	0.3977	-0.002
	S-603	0.3880	0.3915	0.3890	0.3895	0.3867	0.003
	S-604	0.3705	0.3695	0.3670	0.3690	0.3677	0.001
	S-605	0.3750	0.3755	0.3765	0.3757	0.3752	0.000
	S-606						
	S-607	0.3600	0.3640	0.3640	0.3627	0.3638	-0.001
	S-608	0.3620	0.3615	0.3605	0.3613	0.368	-0.007
	S-609	0.3705	0.3720	0.3715	0.3713	0.374	-0.003
	S-610	0.3780	0.3790	0.3795	0.3788	0.3815	-0.003
	S-611	0.3690	0.3670	0.3680	0.3680	0.3762	-0.008
	S-669	0.3760	0.3760	0.3765	0.3762	0.3757	0.000
	S-613	0.3550	0.3550	0.3560	0.3553	0.3547	0.001

Diameter	I.D. #	'Measurements (in.)			Average	Old Average	
5/16"	S-501	0.3000	0.2990	0.3025	0.3005	0.2975	0.003
	S-502	0.2995	0.3035	0.3025	0.3018	0.3017	0.000
	S-503	0.3100	0.3090	0.3025	0.3072	0.3178	-0.011
	S-504	0.2950	0.2990	0.2975	0.2972	0.2985	-0.001
	S-505	0.3000	0.2970	0.2965	0.2978	0.2995	-0.002
	S-506	0.2990	0.2980	0.2985	0.2985	0.2998	-0.001
	S-507	0.3070	0.3085	0.3080	0.3078	0.3068	0.001
1/4"	S-401	0.2445	0.2445	0.2460	0.2450	0.2465	-0.002
	S-402	0.2530	0.2490	0.2520	0.2513	0.2538	-0.002
	S-403	0.2450	0.2480	0.2460	0.2463	0.2500	-0.004
	S-404	0.2485	0.2525	0.2495	0.2502	0.2525	-0.002
	S-405	0.2495	0.2480	0.2480	0.2485	0.2493	-0.001
	S-406	0.2485	0.2480	0.2460	0.2475	0.2487	-0.001
	S-407	0.2455	0.2445	0.2460	0.2453	0.2477	-0.002
	S-408	0.2515	0.2490	0.2525	0.2510	0.2507	0.000
	S-409	0.2525	0.2500	0.2515	0.2513	0.2513	0.000
	S-410	0.2495	0.2515	0.2505	0.2505	0.2500	0.001
	S-411	0.2500	0.2500	0.2480	0.2493	0.2463	0.003
	S-412	0.2570	0.2585	0.2565	0.2573	0.2568	0.001
	S-413	0.2420	0.2455	0.2455	0.2443	0.2452	-0.001
	S-414	0.2430	0.2405	0.2415	0.2417	0.2395	0.002
3/16"	S-301	0.1850	0.1825	0.1835	0.1837	0.1852	-0.002
	S-302	0.1825	0.1835	0.1830	0.1830	0.1835	-0.001
	S-303	0.1680	0.1675	0.1680	0.1678	0.1668	0.001
	S-304	0.1740	0.1740	0.1745	0.1742	0.1745	0.000
	S-305	0.1650	0.1690	0.1685	0.1675	0.1638	0.004
1/8"	S-201	0.1240	0.1220	0.1245	0.1235	0.1242	-0.001

All nozzles must be within 0.004 in. for all diameters.

HORIZON ENGINEERING LLC

13585 N.E. Whitaker Way • Portland, OR 97230
Phone (503)255-5050 • Fax (503)255-0505
horizone@teleport.com

April 28, 1998
Horizon Shop
DRB

The new FSL digital barometer was reading 1018 hPa (30.147 in. Hg) at 13:55 while the weather station at PDX was reporting 1017.8 hPa (30.141 in. Hg).

KILN INFORMATION

DEPARTMENT OF FOREST PRODUCTS

OREGON STATE UNIVERSITY
105 Forest Research Laboratory . Corvallis, Oregon 97331-7402
United States of America
Telephone: 541-737-4210 FAX: 541-737-3385 milotam@frl.orst.edu

12-24-98

December 22, 1998

Dave Rossman
Horizon Engineering
13585 N.E. Whitaker Way
Portland, OR 97230

Dear Dave,

Enclosed is the data from the second part of the particulate/voc source tests. This data is summarized in the table below.

	Charge 1	Charge 2	Units
Run time	60.0	60.0	hours
Initial MC	38.3	37.7	% dry basis
Hot check MC	13.1 @ 46:38 12.0 @ 54:56	14.2 @ 46:08	% dry basis @ hr:min
Final MC (cold)	12.8	11.9	% dry basis
Charge size	2560	2560	board feet

The initial moisture content is based on 10 samples from each charge. A 3" section was cut from the middle of 10 different 16' boards and the oven-dry method was used to determine moisture content. The remaining two eight-foot sections from each board were put back into the kiln charge so the board footage was not affected.

The hot check is done by going into the kiln and using a meter to sample for moisture content. Since only the boards at the sides of the pile are accessible, the MC is usually a few percent lower than the charge average. One essentially uses this estimate to guess the charge average, then dry for enough additional time to reach the target moisture content. There is a downward spike on the kiln charts (Attachment 3) because the kiln is temporarily shut down during a moisture content check.

Attachment 1. Moisture data.

S:\Everyone\Milota\Willamette\MC_Dgflr1.xls

Douglas fir Charge #1
Willamette - Horizon - OSU
December 14, 1998

Initial Charge Moisture Content, Oven Dry Method						
			Green	OD		Initial
Board			Wt	Wt		MC
ID			(gm)	(gm)		(%)
1			140.5	104.0		35.1
2			120.0	89.4		34.3
3			148.1	104.2		42.2
4			147.4	103.4		42.6
5			199.0	146.9		35.5
6			125.7	91.8		36.9
7			148.5	104.0		42.8
8			164.2	121.6		35.0
9			131.4	98.1		34.1
10			208.2	145.4		43.2
Sums			1533.0	1108.8		
Average						**38.3**

Near-End of Run Moisture Meter Check - 1				
Run Time 46:38				
Course	NE side	SE side	NW side	SW side
1	13.7	13.3	10.4	10.6
2	11.9	12.8	12.2	13.6
3	11.2	15.0	15.7	17.2
4	11.8	12.1	14.3	14.7
5	15.3	13.0	13.0	12.7
6	10.0	16.4	12.0	12.5
7	14.2	15.3	13.9	13.6
8	11.5	11.7	13.5	14.0
9	12.9	13.1	11.4	12.3
10	11.5			
Averages	12.4	13.6	12.9	13.5
				13.1

Near-End of Run Moisture Meter Check				
Run Tim 54:46				
Course	NE side	SE side	NW side	SW side
1	10.3	13.3	9.1	9.9
2	9.7	12.6	12.3	11.3
3	10.8	10.9	15.3	13.6
4	13.4	14.4	14.1	13.2
5	9.3	10.9	12.0	12.4
6	13.9	13.8	11.1	13.7
7	8.6	15.1	11.6	13.0
8	11.2	13.3	11.2	11.3
9	11.9	10.1	11.6	
10	11.5			
Averages	11.1	12.7	12.0	12.3
				12.0

S:\Everyone\Milota\Willamette\MC_Dgfir2.xls

Douglas fir Charge #2
Willamette - Horizon - OSU
December 16, 1998

Initial Charge Moisture Content, Oven Dry Method						
			Green	OD		Initial
Board			Wt	Wt		MC
ID			(gm)	(gm)		(%)
1			162.2	121.6		33.4
2			233.4	176.1		32.5
3			235.5	176.0		33.8
4			130.2	95.5		36.3
5			141.7	105.8		33.9
6			124.7	93.2		33.7
7			141.8	89.0		59.3
8			114.3	82.8		38.0
9			161.4	116.5		38.6
10			132.0	96.2		37.2
Sums						
Average						**37.7**

Near-End of Run Moisture Meter Check				
Run Time 46:08				
Course	NE side	SE side	NW side	SW side
1	14.7	14.9	15.2	14.5
2	13.4	15.3	11.8	17.9
3	13.5	13.8	15.7	13.7
4	15.1	14.1	11.7	14.1
5	16.0	15.6	14.4	12.0
6	13.7	10.9	12.6	13.6
7	15.7	14.6	14.0	14.6
8	13.6	13.4	15.1	14.7
9	12.0	12.8	17.0	13.9
10				
Averages	14.2	13.9	14.2	14.3

14.2

Cold MC checks

Douglas-fir Charge 1, 12-17-98

	Course 1	Course 2	Course 3	Course 4	Course 5	
	14.6	12.8	12.8	15.1		
	13.5	14.1	15.0	12.8		
	13.7	12.9	8.1	11.7		
	11.5	12.6	13.1	13.9		
	13.5	11.2	10.6	11.5		
	14.0	10.4	12.6	14.6		
	11.7	10.8	14.5	18.2		
	8.2	11.4	12.0	16.9		
Average	**12.6**	**12.0**	**12.3**	**14.3**		**12.8**

Douglas-fir Charge 2, 12-21-98

	Course 1	Course 2	Course 3	Course 4	Course 5	
	17.6	12.5	14.7	13.1	6.6	
	10.0	13.5	11.7	10.6	12.2	
	9.6	10.5	9.9	12.5	14.7	
	10.6	11.4	7.9	13.4	11.5	
	10.8	9.3	15.1	12.6	13.3	
	12.9	13.9	11.4	9.7	12.2	
	13.4	11.1	10.8	11.2	14.5	
Average	**12.1**	**11.7**	**11.6**	**11.9**	**12.1**	**11.9**

Attachment 2. Kiln Schedule.

2x4 - 2x6
Summer

WILLAMETTE INDUSTRIES

Kiln No. 1

Schedule Number: 4

tep umber	Dry Bulb Setpoint	Wet Bulb Setpoint		Step Time (Hours)		D.A.L. (Auto Step)	Fan Reversal Time (Hours)	Fan Speed
1	120	180	0	2.0	2	0	3.0	90
2	155	145	10	22.0	24	0	3.0	100
3	165	150	15	22.0	46	0	3.0	100
4	170	155	15	22.0	68	0	3.0	100
5	180	170	10	22.0		0	3.0	90
6	0	0		0.0		0	0.0	0
7	0	0		0.0		0	0.0	0
8	0	0		0.0		0	0.0	0
9	0	0		0.0		0	0.0	0
10	0	0		0.0		0	0.0	0
				90				

Normal Valley Operation

utomatic Spray Control Step 1
oisture Content Setpoint 12

T_d	T_w	Time		Time
80	70	0-2	2hrs ramp	0-2
155	145	10	10	2-12
165	150	12	15	12-24
170	~~[illegible]~~ 150	24	24	24-48
180	165	12	15	48-end

Douglas-fir 1

Christine 979-2007 (cell)
924-5381 (office)

0 7462

T_d	T_w	Time
80	70	0-2
155	145	2-10
165	150	12-24
170	140	24-~~48~~ 36
~~180~~	~~165~~	
170	140	36-52
180	165	52-60

Douglas-fir 2

Attachment 3. Kiln data.

Willamette Industries, Inc.
BMG Engineering - Western Region

2730 Pacific Blvd. S.E.
P.O. Box 907
Albany, OR 97321
Office: (541) 924-5380
Fax: (541) 928-1988

12-31-98

December 30, 1998

Mr. David Rossman, Horizon Engineering
13585 NE Whitaker Way
Portland, OR 97230

FAXED 12/30/98

RE: Process data for Douglas Fir Lumber Dry Kiln Source Testing at OSU
Vaughn Laminating Complex, Title V No. 200550
Warrenton Sawmill, Title V No. 04-0041

The following Douglas Fir lumber data is provided for inclusion into Willamette's dry kiln source test report. The data is representative of Vaughn Laminating Complex dry kiln operation, but will be used for Warrenton Sawmill's dry kiln emission factor verification.

Lumber specie: Coastal and Cascade Douglas Fir
Lumber dimensions (wt. ave.): 2" x 6" x 16'
Lumber cut date: 11/9/98
Lumber transport to OSU date: 12/11/98
transported under cover
OSU stored under cover outside
Number of units: 2
Lumber pieces per unit: Run 1 - 160
3/4" stickers
20 boards high, 8 boards wide
Run 2 - 144
3/4" stickers
18 boards high, 8 boards wide
Lumber grade breakdown: 113 Pcs of #1
183 Pcs of #2 and #3
8 Pcs of Economy
(based on grades produced since May 1997 to October 1998)

Log source: 20 to 60 days old
mixed decks from Willamette's Coburg sawmill
including coastal and cascade Douglas Fir

Target oven-dry moisture content for dried lumber: 12%
Length of kiln schedule: 60 hours

Questions? Please call me at 541 924 5388.

Sincerely,

Jon Lund
Environmental Affairs

OREGON STATE UNIVERSITY
Department of Forest Products
Corvallis, OR 97331

To: Kate Krisor
Organization: Horizon Engineering
Fax Number: (503) 255-0505

DATE: February 12, 1999

Total pages 1

The schedules look fine except for the "spray" column.

Our spray was enabled for the entire cycle. Whether or not it was on depended on the wet-bulb temperature. In Attachment 3, the Spray column tells what % the valve was open.

Small kilns have a higher surface to volume ratio and often cannot hold the wet-bulb temperature without some steam spray compared to a larger kiln.

From: Michael R. Milota
Voice Number: (541) 737-4210
FAX Number: (541) 737-3385
E-Mail: MilotaM@frl.orst.edu

ADMINISTRATIVE

HORIZON ENGINEERING LLC

13585 N.E. Whitaker Way • Portland, OR 97230
Phone (503)255-5050 • Fax (503)255-0505
horizone@teleport.com

October 27, 1998

Mr. Jack Herbert
Oregon Department of Environmental Quality
2020 SW 4th, #400
Portland, OR 97201-4987

Ms. Gracia Castro
Lane Regional Air Pollution Authority
1010 Main Street
Springfield, OR 97477

Re: Source Testing: Willamette Industries, Inc.
for Warrenton, OR
for Vaughn, OR

This correspondence is notice that Horizon Engineering is to do source testing to confirm emission factors for the above-referenced and other facilities, scheduled for November 16-21 and December 14-19, 1998. The work will be done at the Forest Research Lab at Oregon State University in Corvallis. This will serve as the Source Test Plan unless changes are requested prior to the start of testing.

1. **Source(s) to be Tested:** Wellons Test Kiln (two exhausts)

2. **Purpose of the Testing:** Compliance with Title V Permit requirements at Warrenton and Vaughn Plants.

3. **Source Description:** The test kiln handles 2 mbf of lumber (4'x4'x16' unit). The kiln has two stacks, one exhausting at a time depending on fan direction and damper positions. The direction of flow (and the stack that is exhausting) changes every three hours (after an initial 1½-hour change). Exhaust is natural draft. The drying cycle for Douglas Fir is expected to be 60 hours and Hemlock is expected to be 50 hours.

4. **Pollutants to be Tested:** Particulate and VOC

11. **Horizon Engrg. Contacts:** David Rossman or
David Broderick
(503) 255-5050
Fax (503) 255-0505

12. **Source Site Personnel:** Jon Lund
(541) 924-5388
Fax (541) 928-1988

13. **Regulatory Contacts:** Jack Herbert (503) 229-5579 Gracia Castro (541) 726-2514
Fax (503) 229-5265 (541) 726-1205

14. **Applicable Process/Production Information:** Process operating data and production information that characterizes the source operation is considered to be: wood specie, lumber grade, dimensions of boards, stacking arrangement, start and end moisture content, and complete records of wet and dry bulb temperatures during the drying cycle. Process information is to be gathered by the source-site personnel and provided to Horizon for inclusion in the report.

15. **Control Device Operating Parameters:** NA

16. **Other Process Considerations,** including intermittent production, special feed or product, etc.: None known

17. **Administrative:** Unless notified prior to the start of testing, this test plan is considered approved for compliance testing of this source. A letter acknowledging receipt of this plan and agreement on the content (or changes as necessary) would be appreciated.

The Department and Lane Regional will be notified of any changes in source test plans prior to testing. It is recognized that significant changes not acknowledged, which could affect accuracy and reliability of the results, could result in test report rejection.

Source Test Reports will be prepared by Horizon Engineering and will include all results and example calculations, field sampling and data reduction procedures, laboratory analysis reports and QA/QC documentation. Source Test Reports will be submitted to you within 45 days of the completion of the fieldwork, unless another deadline has been stipulated. Willamette Industries, Inc. should send two (2) copies of the completed Source Test Report to you at the addresses above.

Any questions or comments relating to this test plan should be directed to David Rossman, David Broderick or David Bagwell.

Sincerely,

David Bagwell

cc: Jon Lund @ Willamette Industries, Inc., Albany, OR

Oregon
John A. Kitzhaber, M.D., Governor

Department of Environmental Quality
Northwest Region
2020 SW Fourth Avenue
Suite 400
Portland, OR 97201-4987
(503) 229-5263 Voice
TTY (503) 229-5471

11-17-98

November 13, 1998

WILLAMETTE INDUSTRIES
ATTN JON LUND
PO BOX 791
ALBANY OR 97321

OREGON STATE UNIVERSITY
FOREST PRODUCTS DEPARTMENT
FRL 124
ATTN DR MIKE MILOTA
CORVALLIS OR 97331-5709

HORIZON ENGINEERING
ATTN DAVID R ROSSMAN
13585 NE WHITAKER WAY
PORTLAND OR 97230

Re: AQ Clatsop County
Permit No 04-0041
Willamette Industries' Warrenton Mill
Source-test plan for particulate and VOC emissions from lumber kiln

Dear Messrs Lund, Milota, and Rossman:

The Department received your test plan on October 28, 1998. Beth Moore showed it to me about November 5. She did not realize that I had not received it. You plan to test particulate and volatile organic compound (VOC) emissions from a Wellons lumber kiln at Oregon State University.

Each batch of lumber is to consist of a representative distribution of grades for the mill it represents. The lumber sizes are the most common sizes that each mill produces. You plan to test emissions from hemlock drying the week of November 16 to 20 and Douglas fir drying the week of December 14 to 19, 1998.

I understand that the hemlock test is to represent current operations and emissions at Warrenton and the Douglas-fir test is to represent Vaughn's conditions. Willamette Industries should document or describe as well as they can the origins and storage time and conditions of the timber and the storage time and conditions of the lumber. This letter deals with the applications of the test results to the Warrenton Mill. Lane Regional Air Pollution Authority has separate jurisdiction over tests for mills in their region.

I approve the test plan for the Department with the following additions that we discussed for application of the results to the Warrenton Mill's emissions.

1. The conditions of the lumber entering and leaving the kiln and the operation of the kiln shall be representative of the mill's lumber and their kiln operations.
2. Particulate and VOC sampling shall begin when or slightly before the kiln's vents open to ensure sampling initial emissions.
3. Sampling shall begin in each stack when or slightly before each exhaust cycle through that stack begins to catch any strong initial emissions. If testing indicates there are none, such sampling is not essential.
4. Each particulate sampling run may last during the entire drying of each lumber charge. The reason would be to minimize errors in measuring small sample masses. If the back-half sample masses are large, those of each type may be combined or not. The testers plan to use two sampling trains, one for each stack. To prevent overfilling the impingers, they can collect moisture and particulate samples from each sampling train during the run, while the other train is sampling the other stack.
5. The testers should inspect Method 7's back-half filter frequently enough to ensure that it is not overloading. It may need changing frequently to reduce sample loss or clogging. If the filter support collects matter, the testers should collect this matter in the back-half rinse.
6. The testers shall sample both stacks as fully as is feasible. Quality-assurance checks of the gas-concentration monitoring will be normal interruptions. Sampling may continue longer than normal at a sampling point if a tester's break or gas QA/QC requires the tester to be absent. The testers need not record flow data every five minutes unless the data vary significantly in that period at the same sampling location.

Thank you for helping clarify the test plan. Thane Jennings and Mark Fisher advised me for the Department.

If you have questions or information regarding the test, its plan, or its schedule, please call me at (503) 229-5579 or fax me at 229-5265.

Sincerely,

Jack Herbert

Jack Herbert
Source Testing Coordinator

JHH
c: Beth Moore:NWR

From: Diane Lorenzen <dianelorenzen@optimum.net>
Sent: Sunday, September 08, 2013 10:54 PM
To: Shawnee Chen
Cc: 'Miller, Jim'; 'Short, Jesse'
Subject: IFG - Lewiston Figure 9
Attachments: Figure 9.pdf

Follow Up Flag: Follow up
Flag Status: Flagged

Diane Lorenzen
Lorenzen Engineering, Inc.
406-549-3995
dianelorenzen@optimum.net

Figure 9: Proposed Point Source Locations

From: Diane Lorenzen <dianelorenzen@optimum.net>
Sent: Sunday, September 08, 2013 10:53 PM
To: Shawnee Chen
Cc: 'Miller, Jim'; 'Short, Jesse'
Subject: IFG Lewiston - Figure 8
Attachments: Figure 8.pdf

Follow Up Flag: Follow up
Flag Status: Flagged

Diane Lorenzen
Lorenzen Engineering, Inc.
406-549-3995
dianelorenzen@optimum.net

Figure 8: Property Boundary and Proposed Changes

IDAHO FOREST GROUP

200 0 200 400
Scale: 1" = 200'

From: Diane Lorenzen <dianelorenzen@optimum.net>
Sent: Sunday, September 08, 2013 10:53 PM
To: Shawnee Chen
Cc: 'Miller, Jim'; 'Short, Jesse'
Subject: IFG Response to August 19, 2013 Letter
Attachments: IFG Response to Aug 19 Letter.pdf; Clearwater Sources.pdf; Revised Section 6 and Fig 4-7.pdf; IFG_Modeling_Calcs_rev2.xls

Follow Up Flag: Follow up
Flag Status: Flagged

Shawnee,

I'm going to send you a series of emails that comprise the IFG response to the Aug. 19, 2013 incompleteness letter for the Lewiston permit application.

This email includes the response letter, with additional information. There will be single emails for Figures 8 and 9, because they are large files. Please let me know if these emails don't come through.

Diane Lorenzen
Lorenzen Engineering, Inc.
406-549-3995
dianelorenzen@optimum.net

September 8, 2013

VIA EMAIL

Shawnee Chen, P.E.
Idaho Department of Environmental Quality
Air Quality Division
1410 N. Hilton
Boise, ID 83706
Tel: (208) 373 – 0502

RE: Facility ID No. 069-00003, IFG – Lewiston, Lewiston

Dear Shawnee:

On July 25, 2013, IFG submitted a a permit to construct application for installing additional kilns, upgrading equipment, and increasing production at the IFG-Lewiston sawmill. DEQ reviewed the application materials and issued a letter on August 19, 2013 stating that the application was incomplete. This letter provides a response to the DEQ incompleteness letter. Revised permit application materials are also attached, as described in the letter.

Response to DEQ Comments

DEQ Comment 1: Please revise $PM_{2.5}$ emissions calculation for the lumber drying kilns by assuming that 100% PM_{10} emissions are $PM_{2.5}$.

The August 19 letter included information from Oregon DEQ (AQ-EF08 and AQ-EF02) and Southwest Clean Air Agency (SWCAA, lumber drying emissions factors, 7/2009) based on those agencies' assumptions that that 100% of dry kiln PM_{10} emissions are $PM_{2.5}$. AQ-EF02 states that the PM (total particulate) emission factor for drying hemlock is 0.05 lb/mbdft, and the emission factor for drying Douglas-fir is 0.02 lb/mbdft. Footnotes for AQ-EF02 indicate that the source of the date was a 2000 OSU test, which refers to a 1998 OSU test that was published in 2000.

The letter also referenced ODEQ document AQ-EF08, in which ODEQ sets a default $PM_{2.5}$ fraction as 100% of PM_{10}. The source of the $PM_{2.5}$ percentage in the AQ-EF08 is listed as "DEQ Estimate".

The DEQ letter referenced a list of default lumber dry kiln emission factors from the SWCAA (Southwest Clean Air Agency, Washington). The SWCAA emission factor list assumes that all dry kiln $PM=PM_{10}=PM_{2.5}$. This assumption is apparently based on the assumption that all PM from dry kilns is condensable and is therefore $PM_{2.5}$. The SWCAA emission factor list references the 2000 OSU test as well. DEQ provided photocopies of the cover and page 4 from the 2000 OSU test, which was performed by Horizon Engineering on behalf of OSU. IFG contacted Horizon Engineering and obtained the entire OSU 2000 test report for the Douglas-fir portion of the test (included with this email).

The OSU 2000 source test used Oregon Method 7, which measures filterable particulate using filters and condensable particulate using cooled impingers. The PM test result is the sum of the filterable and condensable particulate. As stated on Page 3 of the test report, the particulate matter included the "back-half" condensable material collected in the impingers and on a filter following the impingers (as specified in ODEQ Method 7). The condensable fraction of material averaged about 70% for the two test runs. Data presented on pages 114 and 115 of the test report file show that the average condensable portion of the PM was 68.7%.

IFG has identified $PM_{2.5}$ is the fraction of the measured particulate matter that is collected as condensable particulate matter. Based on a complete review of the OSU 2000 test data, IFG has determined that the $PM_{2.5}$ emission in 68.7% of the total PM. IFG and DEQ both assume that 100% of the total PM is PM_{10}.

To provide the most conservative short-term and long-term emission estimates, IFG has used the hemlock emission factor (0.051 lb/MBF) for all kiln emissions even though the PM emissions from other species would be lower. IFG has applied the $PM_{2.5}$ percentage represented by the condensable portion of the test results to the PM_{10} emission factor to obtain a conservative $PM_{2.5}$ emission factor of 0.035 lb/MBF (68.7% * 0.051 lb/MBF).

DEQ Comment 2: Please revise $PM_{2.5}$ emissions calculation for the three sawmill cyclones and the fuel hog cyclone by assuming that 50% PM_{10} emissions are $PM_{2.5}$.

IFG had determined $PM_{2.5}$ percentages as documented in the footnotes of the Cyclone Emission Factors page of the spreadsheet in Appendix C of the permit application. The $PM_{2.5}$ emission factors for cyclones processing dry wood were 50% of PM_{10}, based on SCC Code 30700805. The $PM_{2.5}$ emission factors for cyclones processing green wood were 29% of PM_{10} based on SCC Code 30700820.

The DEQ August 19 letter states that the information from Oregon DEQ (AQ-EF08, 8/1/2011) and in the PM Calculator from EPA TTN with SCC 30700804 for sawmill cyclones and 30700808 for other cyclones for sawmill production indicates that 50% PM_{10} emissions are $PM_{2.5}$ for all cyclones. IFG has applied this change to the sawmill and chip cyclones that process green wood, and to all the cyclone sources at the pulp and paper mill, as discussed below.

DEQ Comment 3: Please revise $PM_{2.5}$ emissions calculation for the truck bin baghouse by assuming that 67% PM_{10} emissions are $PM_{2.5}$.

IFG has applied the 67% $PM_{2.5}$ percentage to all baghouses on the IFG and Clearwater facilities to be consistent.

DEQ Comment 4: In the 7/25/2013 application, IFG assumed that annualized hourly emissions rates from drying kilns are the same as daily average hourly emissions rates. Please provide kiln production data to support/verify the assumption the same way as that in Appendix B, Table 4 of the statement of basis for PTC No. P-050200 issued August 16,

2005, which is attached with this letter.

Table A below lists the kiln loading capacity and drying times for the species that are regularly processed in the Lewiston mill. The drying times were established by CWP, and IFG may use longer drying times to improve lumber quality. As the table shows, IFG is now requesting an annual kiln production limit that is below the maximum annual kiln capacity assuming drying only the fastest drying species. The emissions calculations in the attached spreadsheet show how the emissions are calculated on a short-term basis and on an annual basis.

Table A: Potential Kiln Production Rates

	Hemlock/White Fir (HF)	**Douglas Fir/Larch (DF/L)**	**Cedar**
MBF/kiln/charge	230.4	230.4	161.28
hours/charge	31	23	21
MBF/kiln/hr	7.43	10.02	7.68
MBF/track/yr	65,107	87,752	67,277
Total Potential MBF/yr using 4 kilns	260,426	351,009(1)	269,107
Total Potential MBF/yr using 6 kilns	390,639	526,514	403,661
Proposed Permit Production (MBF/yr)	470,000	470,000	470,000

DEQ Comment 5: Please provide supporting documents on the emissions rates of the off-site sources listed in Appendix F of the application.

The original list of Clearwater emission sources and modeling parameters was compiled by Clearwater for the previous modeling. IFG contacted Clearwater to verify that the list was still accurate. Clearwater staff verified that the list was still representative of their equipment, with one source (PNP510) having been removed. Clearwater staff noted that no additional sources had been added. Copies of the emails between IFG and Clearwater are available upon request. The revised list of PNP sources is included showing changes in $PM_{2.5}$ emissions and some cyclone modeling configurations.

DEQ Comment 6: Update modeling analysis to reflect the emissions rates changes if needed.

Changes to the modeling are extensive, based on the equipment changes discussed below. IFG is attaching a revision of Section 6.0 of the July 25, 2013 permit application. The $PM_{2.5}$ emissions have been changed as described above. A number of sources have been removed or had controls added. Source modeling parameters have been reviewed and are justified in the footnotes to the tables and in the text.

The emission inventory spreadsheet included in Appendix C of the July 29 application has been updated and is included with this email. All changes have resulted in elimination of sources and reduction of emissions. These changes are in response to DEQ comments and do not constitute a change in the project.

Changes to Equipment in Response to DEQ Letter

IFG is proposing a number of mill changes in order to accommodate the increased particulate emissions from the additional dry kilns. The proposed changes will reduce particulate emissions from other sources and move emission sources away from the vicinity of the dry kilns and the nearby property boundary. These changes are a response to comments and do not change the permit application that currently in process.

The aerial photographs in **Figure 8** and **Figure 9** have been modified to show how the mill will look after the sources are changed. The cyclone and baghouse designations have been changed as shown on Figure 9 for clarity in future mill permitting actions. The following is a summary of the proposed changes at the mill:

1. Add two additional dry kilns (as included in the current permit application).
2. Move the truck bins from the current location to a location west of the planer building. Eliminate the truck bin cyclones (IFGCY6, IFGCY7 and IFGCY8) and the truck bin baghouse (IFGBH4).
3. Remove the three existing planer shavings material handling baghouses (IFGBH1, IFGBH2, IFGBH3). Add a planer shavings material handling cyclone on top of the truck bins at the new location. Route the emissions from the planer shavings cyclone to an emissions control baghouse (BH-1, modeled as SHAVEBH).
4. Add a material handling baghouse on the south side of the new sawmill to collect shavings and chips from the new sawline (BH-3, modeled as HEWSAWBH).
5. Eliminate the material handling cyclone attached to the #4 splitter (IFGCY1).
6. Route the emissions from the Bruks chipper cyclone (was IFGCY2, now CY-3, non-emitting) to a new chip baghouse (BH-2, modeled as CHIPBH) located west of the sawmill building.
7. Re-entrain the material collected in the three sawmill cyclones (IFGCY3, IFGCY4a and IFGCY4b, now CY-1, CY-2A and CY-2B) and transport it to the new chip baghouse (BH-2).

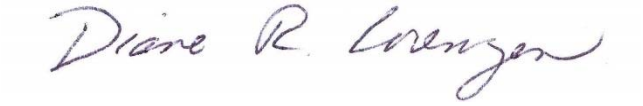
IFG is providing the following table to help clarify the changes at the mill. The revised table would replace Table 2.1 of the Tier I permit.

TABLE 2.1 REGULATED SOURCES (Revised Sep. 8, 2013)

Permit Condition Section	Source Description	Emissions Control
4.0	4 Double-Track Kilns – manufactured by Wellons 2 Double-Track Kilns – manufacturer to be determined	None
5.0	Cutoff saws and debarkers	Reasonable control
5.0	Sawmill cyclones to collect ambient building air and wood residuals, CY-1, CY-2A and CY2-B	None
5.0	Sawdust and chip collection from small log sawline	Sawline baghouse, BH-3
5.0	Chip conveyor belt to adjoining pulp and paper mill	Reasonable control
5.0	Chips from Bruks chipper, CY-3	Baghouse control, BH-2
5.0	Planer shavings and ambient air collected pneumatically from all planer building areas, CY-4 (Planer Shavings Cyclone)	Planer Shavings Cyclone Baghouse, BH-1
6.0	Fuel hog, IFG-CY5	None

IFG has authorized Lorenzen Engineering to submit these changes directly to the DEQ via email. If you have any questions about the submittal or require additional information, please contact Jim Miller at (208)-848-2322. The electronic emissions calculation spreadsheet and modeling results spreadsheet are included with this email. The modeling files will follow in separate emails. Thank you for your assistance with this project.

Sincerely,
LORENZEN ENGINEERING, INC.



Diane R. Lorenzen, P.E.
Environmental Engineer

CC Jim Miller, IFG, via email at jdmiller@idfg.com
Jesse Short, IFG, via email at jshort@idfg.com

Attachments:
Revised Section 6.0 of the July 25, 2013 application and Figures 4-9
Revised List of Clearwater Sources

Clearwater Sources Included in Model
Source information provided by Clearwater, verified by Clearwater

ID	Stack Type	Description	UTM E (m)	UTM N (M)	Elev (m)	H (ft)	T (F)	V (fps)	D (ft)	PM10 (lb/hr)	PM2.5 (lb/hr)
PNP189	DEFAULT	No. 4 Recovery	501,997	5,141,868	228	325	350	43.2	9.0	40.63	32.50
PNP774	DEFAULT	Sawdust Transfer Cyclone	501,867	5,141,822	228	127	-460	0.0	3.5	5.27	2.63
PNP775	DEFAULT	Sawdust Transfer Cyclone	501,871	5,141,814	228	119	-460	0.0	3.5	5.27	2.63
PNP157	DEFAULT	No. 4 Smelt Dissolving Tank	502,013	5,141,866	228	215	160	47.1	3.0	8.28	4.14
PNP721	DEFAULT	No. 5 Recovery	502,015	5,141,922	228	350	350	101.5	9.0	58.00	46.40
PNP204	DEFAULT	No. 5 Smelt Dissolving Tank	502,016	5,141,908	228	208	170	23.6	5.2	10.40	5.20
PNP709	DEFAULT	No. 1 PM Coater Burners	501,804	5,141,717	228	66	116	42.7	5.0	0.11	0.09
PNP2009	DEFAULT	No. 2 PM Coater Burners	501,712	5,141,712	228	66	100	42.0	4.5	0.11	0.09
PNP511	DEFAULT	No. 3 Lime Kiln	502,125	5,141,802	229	154	375	79.1	3.7	5.20	4.16
PNP512	DEFAULT	No. 4 Lime Kilns	502,106	5,141,778	229	154	375	78.9	3.7	5.20	4.16
PNP43	DEFAULT	Slaker Vent	502,048	5,141,735	229	67	215	41.5	1.3	1.95	0.98
PNP106	DEFAULT	NCG Incinerator	502,048	5,141,789	228	95	360	23.7	2.2	0.03	0.02
PNP250	DEFAULT	No. 1 Power Boiler	501,985	5,141,827	228	83	350	40.8	7.9	2.85	2.28
PNP253	DEFAULT	No. 2 Power Boiler	501,955	5,141,837	229	83	328	59.5	6.9	27.59	22.07
PNP781	DEFAULT	No. 4 Power Boiler	502,438	5,141,558	231	300	410	43.1	13.5	90.40	72.32
CPD29	DEFAULT	iL Tissue Machine Hood Exhaust	502,180	5,141,837	229	38	570	25.2	4.0	0.24	0.12
CPD52	DEFAULT	2L dust scrubber stack	502,295	5,141,972	231	30	95	40.2	5.7	2.63	1.32
CPD39	DEFAULT	2L tissue machine hood exhaust	502,274	5,141,961	231	77	420	21.9	5.6	0.99	0.49
CPD82	DEFAULT	Temporary boiler	502,213	5,141,890	231	20	766	24.5	4.5	0.94	0.75
CPD83	DEFAULT	Temporary boiler	502,218	5,141,892	230	17	542	20.4	6.2	0.94	0.75
CPD12	DEFAULT	3L Tissue Machine Dust Scrubber	502,251	5,141,866	231	88	500	22.0	3.8	1.40	0.70
PNP464	DEFAULT	Dry Additives Handling BH	501,817	5,141,815	228	68	-460	0.0	0.8	0.04	0.03
PNP465	DEFAULT	Dry Additives Handling BH	501,821	5,141,816	228	68	-460	0.0	0.8	0.04	0.03
PNP466	DEFAULT	Dry Additives Handling BH	501,825	5,141,818	228	68	-460	0.0	0.8	0.04	0.03
PNP513	DEFAULT	Pulp Dryer	501,732	5,141,709	228	66	370	0.0	3.5	0.77	0.39
PNP514	DEFAULT	Pulp Dryer	501,718	5,141,702	228	66	370	0.0	3.5	0.77	0.39
PNP1030	DEFAULT	No. 5 Recovery Saltcake	501,995	5,141,935	228	97	-460	0.0	0.5	1.50	0.75
PNP1119	DEFAULT	No. 4 Recovery Saltcake	502,006	5,141,872	228	1	-460	0.0	0.8	1.50	0.75
PNP47	DEFAULT	Lime Handling Baghouse	502,014	5,141,745	228	19	426	0.0	2.1	1.72	1.15
PNP324	DEFAULT	Backup Diesel Gen.	501,955	5,141,908	228	8	1011	216.5	0.5	0.11	0.09
PNP103	DEFAULT	Backup Diesel Gen.	501,905	5,141,618	229	8	1011	216.5	0.5	0.11	0.09
CPD28A	DEFAULT	1L Tissue Machine	502,282	5,141,935	231	47	-460	0.0	4.7	0.12	0.06
CPD2	DEFAULT	3L Tissue	502,279	5,141,889	231	73	-460	0.0	5.0	1.50	0.75
CPD56	DEFAULT	Valmet rewinder	502,328	5,141,991	231	35	-460	0.0	5.0	0.74	0.37

6.0 MODELING ANALYSIS, Revised Sept. 8, 2013

The pre-construction permit application checklist requires that the applicant submit a modeling protocol with the application. IFG submitted a protocol on May 9, 2013 and DEQ provided an approval letter, with comments, on May 29, 2013. The modeling presented in this report incorporates DEQ's comments in the protocol approval letter. Copies of the protocol and letter are included in **Appendix B to the July 22, 2013 permit application.** IFG has made some changes to the modeling parameters as described in the modeling protocol. For example, IFG is not using the AERMOD beta function for horizontal sources and is instead modeling horizontal sources as having low velocity. Ambient sources are modeled by setting the temperature in the model to 0 Kelvin, causing the model to assign the ambient temperature to the plume.

Modeling is included to demonstrate compliance with the significant impact levels (SILs), also presented in the Idaho Modeling Guideline as significant contribution levels (SCLs). Compliance with the SILs ensures compliance with the National Ambient Air Quality Standards (NAAQS).

Source and building locations have been loaded in the BEEST program, and verified by putting a Google Earth satellite program behind the modeling plot plan. **Figure 4** (revised) shows the entire modeling grid for the project and **Figure 5** (revised) shows the modeling grid overlain on a satellite photograph. **Figure 6** shows the SIL receptors as well as the sources and building. **Figure 7** shows the hot-spot receptors placed at 10 meter spacing around the peak impact receptor.

6.2 SIL Modeling Approach

IFG submitted a modeling protocol describing the procedures proposed for use in the modeling analysis. DEQ provided a detailed written response evaluating the protocol, including the following comment:

> *Comment 5: The emissions listed in Table B of the protocol indicates source IFG-CY5 will be removed. If this represents a reduction from what was previously analyzed and permitted, then credit for the reduction can be made in the SIL analysis by modeling the previously allowed emissions as a negative value. Revisions in the other sources from what was previously analyzed but be accounted for in the modeling analyses (both the SIL analysis and the NAAQS analyses).*

The protocol stated that IFG planned to remove cyclone IFG-CY5 as part of the permitting action. IFG has since decided to keep that source in the permit. As noted in the Introduction to the July 22, 2013 application, IFG ceased operation of the Profile and Specialties processes after purchasing the mill in 2011. The sources that were included in

the original plant-wide modeling have been included in the SIL modeling using negative emission rates to indicate that they have been removed. Changes in emissions from other IFG sources have also been included in the SIL modeling.

In response to the DEQ incompleteness letter, IFG is proposing a number of additional changes to the mill. The proposed plant changes will simplify the flow of wood residuals around the plant, reduce truck travel distance and will eliminate a number of point sources. An aerial photograph is also attached showing the remaining point sources at the mill. IFG has re-set the cyclone and baghouse numbering system for clarity. The proposed changes will also result in elimination or reduction of fugitive emission sources, which is not reflected in the modeling emission calculations.

The following is a summary of the changes at the mill in response to the incompleteness letter. Aerial photos of the facility are included as **Figure 8** and **Figure 9** showing the new locations of point sources at the mill. Sources that have been eliminated have been removed from **Figures 8** and **9** for clarity.

1. Add two additional dry kilns (as included in the current permit application). Use higher $PM_{2.5}$ emission factors, as discussed in the response to the incompleteness letter.
2. Move the truck bins from the current location to a location west of the planer building. Eliminate the truck bin cyclones (IFGCY6, IFGCY7 and IFGCY8) and the truck bin baghouse (IFGBH4).
3. Remove the three existing planer shavings material handling baghouses (IFGBH1, IFGBH2, IFGBH3). Add a planer shavings material handling cyclone on top of the truck bins at the new location. Route the emissions from the planer shavings cyclone to an emissions control baghouse (BH-1, modeled as SHAVEBH).
4. Add a material handling baghouse on the south side of the new sawmill to collect shavings and chips from the new sawline (BH-3, modeled as HEWSAWBH).
5. Eliminate the #4 splitter and the associated material handling cyclone (IFGCY1).
6. Route the emissions from the Bruks chipper cyclone (IFGCY2, now CY-3, non-emitting) to a new chip baghouse (BH-2, modeled as CHIPBH) located west of the sawmill building.
7. Re-entrain the material collected in the three sawmill cyclones (IFGCY3, IFGCY4a and IFGCY4b) transport either to an intermediate cyclone (vented to BH-2) or directly to the chip baghouse (BH-2).

The proposed additional saw line will allow processing of smaller logs and will be housed in a new building which will be under negative air. The negative air system from the new sawline will be routed to the new baghouse, BH-3. The proposed production increase will result in small emission increases from the remaining sawmill cyclones which have been renamed CY-1, and CY-2A and CY-2B.

IFG is proposing to add two more kilns, essentially identical to the four existing kilns. The additional kilns have been included in the SIL modeling, and all six kilns have been included in the NAAQS modeling. The Lewiston mill was modeled in 2005 and every effort has been made to provide continuity with the previous analysis. The kiln PM_{10} emission factor used by IFG are slightly higher than the values used in 2005 site modeling due to changes in emission factors as provided by DEQ. $PM_{2.5}$ emissions were not modeled in 2005 so they have been added to the modeling analysis.

The number of kilns is increased from 4 to 6. The 2005 modeling used five sources to represent the emissions from each kiln. For the existing conditions, the potential kiln emissions were divided over 5 vents on 4 kilns, or a total of 20 sources. For the future conditions, the potential kiln emissions were divided over 5 vents on 6 kilns for a total of 30 sources. The kiln PM emissions calculations and modeled emission rates are demonstrated in detail in the attached spreadsheet.

6.3 Modeling Parameters

The dry kiln stack parameters from the 2005 modeling were reviewed and found to be appropriate for the current modeling. These parameters are a good representation of the kiln exhaust parameters, and the use of a point source allows for downwash. The kiln buildings are 28 feet high at the ridge, and the kilns are located on the slanting roof, just below the ridge. The kiln control booth building is located on the east end of the kiln building and has a higher roof line. Both kiln buildings and the control room have been included in the building downwash analysis for the new and existing kilns. The model uses 5 sources to represent the 20 vents on each kiln. Total exhaust area for the 5 sources is 22 ft^2 per kiln which roughly equals 1 ft^2 per vent. IFG has reviewed the exhaust flow rate from the dry kilns and determined that the values previously modeled were unrepresentatively low. The kilns are now modeled with a total from each kiln of 15,000 acfm, which is consistent with kiln operation. Kiln temperature is modeled at 200°F as this is the typical kiln temperature for exiting air under IFG operations.

PM_{10} and $PM_{2.5}$ emitting sources located at the Clearwater facility were included in the modeling based on source emissions and parameters included in the 2005 modeling demonstration. IFG verified the emission information with Clearwater's environmental department. The previous modeling did not include PM_{25} modeling, so $PM_{2.5}$ emissions have been estimated for each source. The Clearwater source emissions have been revised using the same $PM_{2.5}$ emission factors required by DEQ for IFG's sources. A revised listing of the Clearwater modeled sources is attached.

The modeled stack parameters for the existing and removed cyclones and baghouses at the IFG facility have been verified with IFG information. IFG source parameters are listed in Table 3. Modeled short term and annual emission rates for the SIL modeling are listed n Table 4. IFG potential emission rate used in the NAAQS modeling are listed in Table 5.

Table 3: IFG Source Parameters for SIL and NAAQS Modeling (revised Sept. 8, 2013)

Source	Model Source Name	Exhaust Type	Height (ft)	Dia. (ft)	Vel. (fps)	Temp. (F)
Existing Kilns	KILN1V1-KILN4V5	Vertical, heated	27	5.27	2.3	200
Proposed Kilns	IFGK5V1-IFGK6V5	Vertical, heated	27	5.27	2.3	200
Spec Gang Rip Cyc	CWCY1	Horiz., ambient	40	4.00	0.01 m/s(2)	Amb(1)
Spec Gang Rip Cyc	CWCY2	Horiz., ambient	40	2.99	0.01 m/s(2)	Amb(1)
Specialties GRECON	CWCY3	Horiz., ambient	40	2.99	0.01 m/s(2)	Amb(1)
Specialties NULOC	CWCY4	Horiz., ambient	40	2.99	0.01 m/s(2)	Amb(1)
Specialties Cyclone	CWCY6	Horiz., ambient	40	2.49	0.01 m/s(2)	Amb(1)
Profile Baghouse	CWBH4	Horiz., ambient	8.9	4.00	0.01 m/s(2)	Amb(1)
Profile Baghouse	CWBH5	Horiz., ambient	8.9	4.00	0.01 m/s(2)	Amb(1)
Profile Baghouse	CWBH6	Horiz., ambient	8.9	4.00	0.01 m/s(2)	Amb(1)
Profile Baghouse	CWBH7	Horiz., ambient	8.9	4.00	0.01 m/s(2)	Amb(1)
Sawmill Cyclone	IFGCY1	Horiz., ambient	40	3	0.01 m/s(2)	Amb(1)
Sawmill Cyclone	IFGCY2	Horiz., ambient	40	3	0.01 m/s(2)	Amb(1)
Sawmill Cyclone	IFGCY3	Horiz., ambient	40	2.5	0.01 m/s(2)	Amb(1)
Sawmill Cyclone	IFGCY4(3)	Vertical, amb.	40	3	0.01 m/s(2)	Amb(1)
Fuel Hog Cyclone	IFGCY5	Vertical, amb.	56	6.6	0.01 m/s(2)	Amb(1)
Surfacing Baghouse	IFGBH1	Vertical, amb.	43	4.3	41	Amb(1)
Surfacing Baghouse	IFGBH2	Vertical, amb.	18	4.3	44	Amb(1)
Surfacing Baghouse	IFGBH3	Vertical, amb.	43	4.3	47	Amb(1)
Bin Cyclone BH Baghouse	IFGBH4(4)	Vertical, amb.	40	10	0.01 m/s(2)	Amb(1)
Planer Shavings Cyclone Baghouse	SHAVEBH	Vertical, amb.	43	4.3	47	Amb(1)
Chip Cyclone Baghouse	CHIPBH	Horiz., ambient	40	3	0.01 m/s(2)	Amb(1)
New Sawline Baghouse	HEWSAWBH	Vertical, amb.	43	3.5	31	Amb(1)

(1) Model ambient sources with T=0 K, causing model to use ambient temperature for plume temperature.
(2) Model horizontal sources as vertical with minimal (0.01 m/s) velocity, so that momentum plume rise is minimized and downwash is calculated.
(3) Cyclones are in chip bunker, release height set to bunker height. IFGCY-4A and IFGCY-4B exhaust to a common stack.

Table 4: IFG Emissions for SIL Modeling (Revised Sept. 8, 2013)

Model Source Name	PM10 (tpy)	PM10 (lb/hr)	PM2.5 (tpy)	PM2.5 (lb/hr)
KILN1V1-KILN4V5	-0.96 (total)	0	-0.66 (total)	0
IFGK5V1-IFGK5V5 IFGK6V1-IFGK6V5	3.98 (total)	1.02 (total)	2.76 (total)	0.70 (total)
CWCY1, removed	-0.138	-0.069	-0.069	-0.034
CWCY2, removed	-0.029	-0.015	-0.015	-0.007
CWCY3, removed	-0.063	-0.032	-0.032	-0.016
CWCY4, removed	-0.345	-0.173	-0.173	-0.086
CWCY6, removed	-0.212	-0.106	-0.106	-0.053
CWBH4, removed	-5.068	-1.157	-3.396	-0.775
CWBH5, removed	-4.843	-1.106	-3.246	-0.741
CWBH6, removed	-3.942	-0.900	-2.641	-0.603
CWBH7, removed	-3.717	-0.849	-2.492	-0.567
IFGCY1, to be removed	-0.019	-0.008	-0.009	-0.004
IFGCY2 , routed to BH-2	-0.640	-0.146	-0.320	-0.073
IFGCY3(Now CY-1)(1)	0.009	0.006	0.002	0.000
IFGCY4(Now CY-2)(1)	0.050	0.037	0.014	0.000
IFGCY5	0.167	0.000	0.085	0.000
IFGBH1, to be removed	-4.055	-0.926	-2.717	-0.620
IFGBH2, to be removed	-4.280	-0.977	-2.868	-0.655
IFGBH3, to be removed	-4.616	-1.054	-3.092	-0.706
IFGBH4, to be removed	-8.109	-1.851	-5.433	-1.240
SHAVEBH, BH-1	1.599	0.440	1.073	0.295
CHIPBH, BH-2	0.013	0.003	0.009	0.002
HEWSAWBH, BH-3	1.988	0.454	1.332	0.304

(1) Sawmill cyclone annual emissions are increased due to production increase. Short-term PM10 emissions are increased due to changes in the hours of operation per day.

Table 5: IFG Emissions for NAAQS Modeling (Revised September 8, 2013)

Model Source Name	PM10 (tpy)	PM10 (lb/hr)	PM2.5 (tpy)	PM2.5 (lb/hr) (1)
IFGK1V1-IFGK6V5	11.99	0.102 each 3.06 total	8.23	0.070 each 2.10 total
IFGCY3	0.024	0.009	0.012	0.005
IFGCY4	0.147	0.055	0.073	0.027
IFGCY5	0.850	0.317	0.425	0.159
HEWSAWBH	1.988	0.454	1.332	0.304
CHIPBH	0.011	0.003	0.007	0.002
SHAVEBH	1.600	0.440	1.072	0.294

(1) Only PM2.5 24-hour NAAQS modeling was required.

6.4 Source and Building Location Data

Source and building locations were obtained from facility records and converted from NAD27 projection to the NAD83 projection using the CORPSCON program. Using the BEEST program, the converted source and building locations were found to line up well with the Google Earth satellite photograph as shown in **Figure 6**.

All buildings on the overall plant site were included in the BPIP modeling. The BPIP program was implemented using the BEEST program. Building downwash was calculated for the kiln vents using the existing kilns and future kilns. The existing kiln building and control room were traced from Google Earth and imported into the BEEST model. Similar buildings were created for the new kilns and control room.

6.5 Ambient Air Boundary and Receptor Network

The ambient air quality boundary for the IFG modeling is defined as the IFG property line shown on **Figure 2** and on **Figure 8**. The modeling was done in the BEEST program, which allows the AERMOD inputs to be overlain on Google Earth imagery. The IFG boundary was converted to UTM coordinates by tracing it on Google Earth then importing it into the BEEST program. The previous modeling included the boundary of the entire complex, and this boundary was used to help verify that the site placement was correct.

The IFG sawmill property is fenced at the public access points. The internal boundary with the other facilities is not fenced or marked. No unauthorized persons are expected to be present on the IFG property or at the other facilities near the IFG boundary. Fencing of the internal boundary between the facilities could create logistical and safety issues for the

workers. The access controls on the IFG property meet the level of facility control described in the Idaho Air Quality Modeling Guideline.

Fenceline receptors were added along the IFG boundary at a spacing of 25 meters. Grid receptors were added within the larger facility boundary outside the IFG boundary at 50 meter spacing. Preliminary modeling made it clear that the kiln impacts would not extend far from the IFG boundary receptors. Therefore, the receptor grid was reduced to expedite the SIL modeling. In addition to the SIL receptors, a 10-meter hotspot grid was added surrounding the peak impact modeled receptor. **Figure 4** shows the modeled kilns, buildings and receptors used in the SIL modeling.

The receptor elevations and hill heights were determined using the AERMAP program version listed in Table 3. Elevation data was obtained from the USGS website in seamless National Elevation Dataset (NED) files. To prepare the receptors for the revised modeling, NED files were downloaded spanning the modeling domain and processed using AERMAP. NED files are very large, and can be provided to DEQ on a CD if requested.

6.6 Meteorological Data and Background Concentrations

The processed met data was provided by DEQ in model-ready format. The data was collected in Lewiston in 1992-1995, and 1997. DEQ pre-processed the data and provided it to IFG for use in the modeling. This is an ideal situation because DEQ does not need to review the met data modeling submittal. DEQ provided 5 separate years of modeling data as well as a file with all five years combined.

When conducting cumulative NAAQS modeling, the sources not explicitly included in the model (e.g., mobile sources; small, stationary sources; some fugitive sources; and large, distant sources) are accounted for by adding a background concentration representative of the air quality in the area. Background concentrations are based on ambient air monitoring data collected in the area or from similar areas determined to be reasonably representative (Idaho Modeling Guideline).

Because the impact of the modeled changes at the facility exceeded the Idaho SIL levels, a suitable background value is needed for the NAAQS modeling. IFG proposed a background value in the modeling protocol, and DEQ responded with their preferred background values in the approval letter. The most appropriate data are 2003 data from the Sunset Park location between city center and the potlatch facility (1200 29th Street. 46.404722 -116.968889). Only 2003 $PM_{2.5}$ data are available, with a 24-hour 98th percentile value of 18.6 µg/m^3 and an annual value of 6.56 µg/m^3. PM_{10} data were available for May 1, 2006 through April 30, 2007, and the 2nd high 24- hour design value was 85 µg/m^3.

6.7 SIL Modeling Results

The SIL modeling results are presented in Table 6. SIL impacts are based on the highest annual or 24-hour impact during the five year met period. Detailed SIL modeling results are included in the spreadsheet file provided to DEQ.

Table 6: IFG Class II Significant Impact Modeling (revised Sep. 8, 2013)

Pollutant	Avg. Period	Modeled Conc. [(a)] ($\mu g/m^3$)	Class II SIL ($\mu g/m^3$)	Significant (Y/N)	Modeled Year of Peak
$PM_{2.5}$	24-hr	3.12	1.2[(b)]	Y	1994
	Annual	<0.0	0.3[(b)]	N	1992
PM_{10}	24-hr	4.65	5	N	1994
	Annual	<0.0	1	N	1997

[a] All concentrations are 1st-high for comparison to SILs.
[b] $PM_{2.5}$ SCL from the Idaho Modeling Guidance.

The SIL modeling results show annual impacts from the changes at the IFG facility do not exceed the applicable significance levels for PM10 or PM2.5. The modeled impacts do not exceed the SIL for the PM_{10} 24-hour averaging period. Modeled $PM_{2.5}$ impacts for the 24-hour averaging period exceeded the applicable significance levels, triggering the requirement for NAAQS modeling. The modeling input/output files (including BPIP and meteorological data, and intermediate files generated by AERMET, AERMAP, and AERMOD) have been provided to DEQ in electronic format.

6.8 NAAQS Modeling Results

The SIL modeling results were used to identify receptors at which IFG had an impact greater than the applicable SIL (or Idaho SCL). The identified receptors were used in the NAAQS modeling to determine ambient compliance. Hotspot receptors were added in a 10-m grid around the peak impact receptor.

In the modeling protocol review letter, it states that DEQ now allows use of the 5- year average of the 8th highest modeled value, consistent with draft EPA guidance (*Draft Guidance for $PM_{2.5}$ Permit Modeling*. Memorandum from Stephen D. Page, Director, Office of Air Quality Planning and Standards, EPA, March 4, 2013). The PM_{10} 24-hour standard is not to be exceed more than once per calendar year. When modeling five years of met data, compliance is demonstrated by showing that the highest 6th high impact at any receptor over the 5-year period does not exceed the standard. IFG has used spreadsheets to evaluate the modeling results and reduce the data and the spreadsheets have been provided to DEQ electronically.

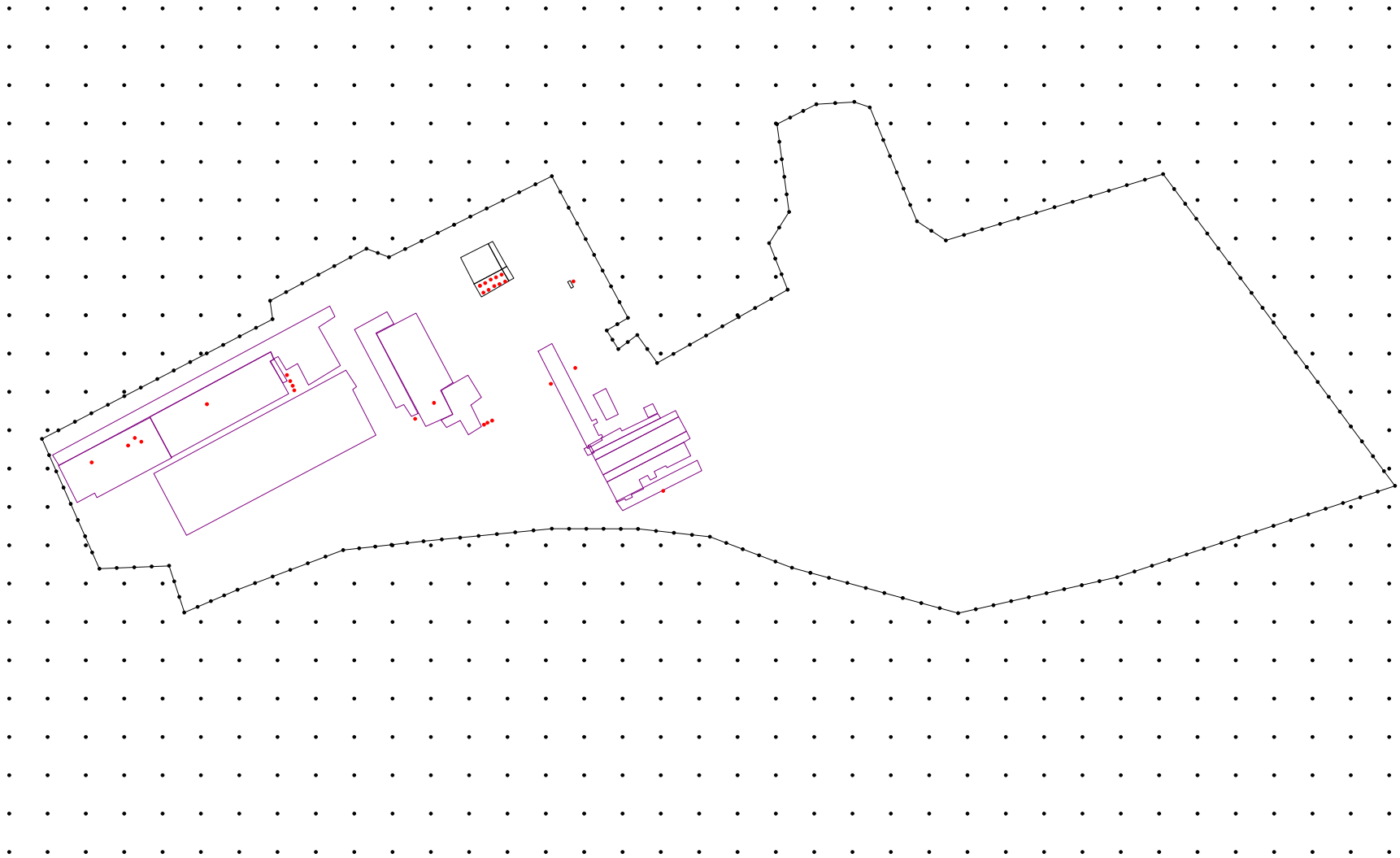
Table 7: NAAQS Compliance Demonstration (revised Sept. 8, 2013)

Pollutant	Source Group	Avg. Period	Modeled Conc. ($\mu g/m^3$)	Background Conc. ($\mu g/m^3$)	Ambient Conc. ($\mu g/m^3$)	NAAQS ($\mu g/m^3$)	% of NAAQS
$PM_{2.5}$(1)	IFG Kilns	24-hr	1.74(2)				
	IFG Other Sources	24-hr	4.02(2)				
	Clearwater Sources	24-hr	10.43(2)				
	All Sources	24-hr	12.46(1)	18.6	31.1	35	89%

(1) Compliance concentration is the highest 5 year average high-8th-high value for all receptors.
(2) Source group concentration is the high-8th-high value for 1994 at any SIL receptor.

The modeling results in Table 7 demonstrate that the proposed changes at the IFG facility will not cause or contribute to a violation of an ambient air quality standard. The modeled impacts combined with the background value show that the predicted impact from all the industrial sources in the area is 89% of the $PM_{2.5}$ 24-hour standard.

Figure 4, Revised: Modeling Sources, Buildings and Grid



Plant Changes including Kiln additions and cyclone removals

Scale: 1" = 203.6 Meters

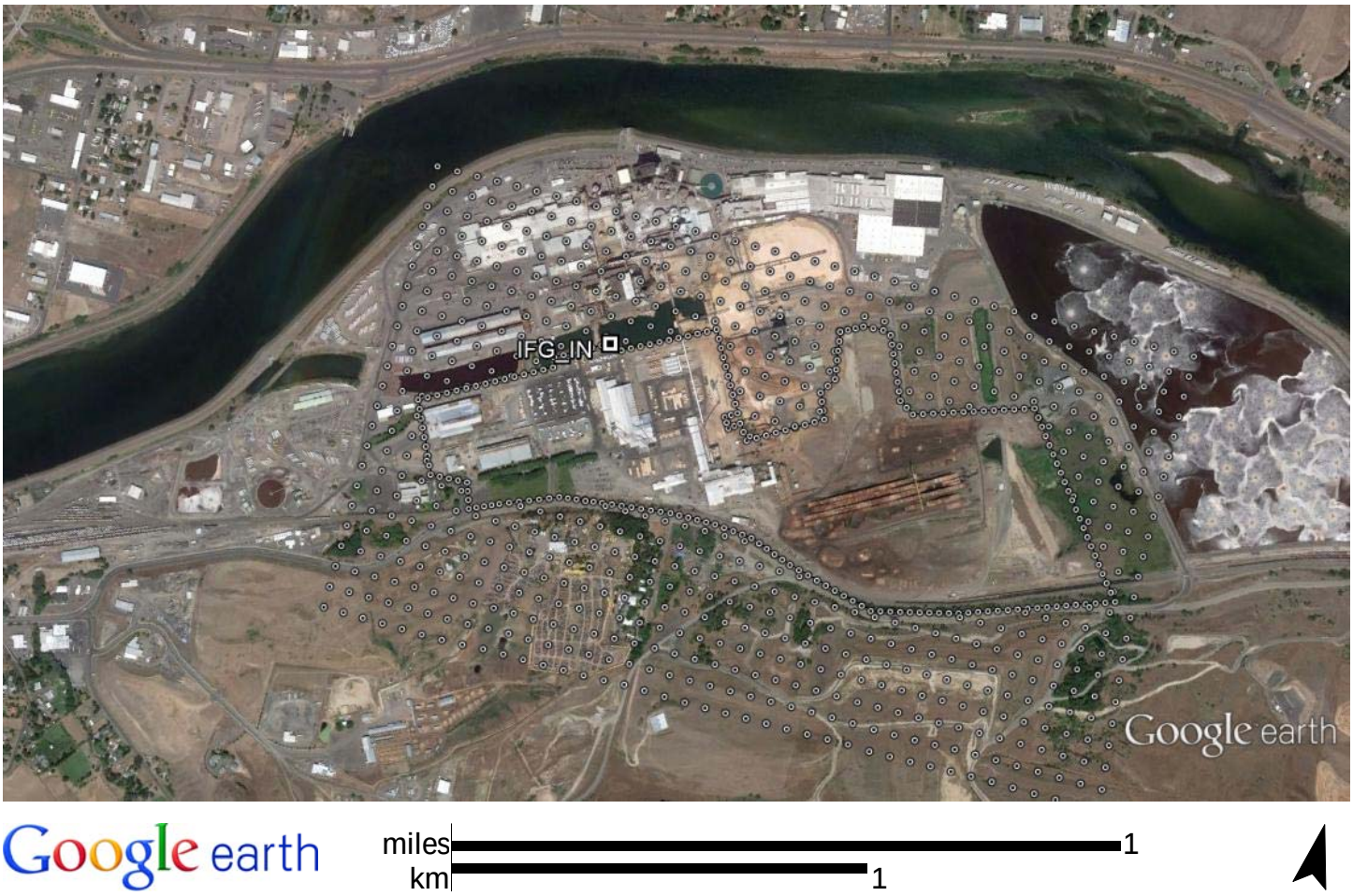


Figure 5, Revised: Grid and Fenceline Receptors

50 Meter Receptor Grid and 25 Meter Grid Spacing Along Fenceline

Figure 6, Revised: Significant Impact Receptors

SIL Receptors

All sources impacts on SIL receptors

Scale: 1" = 218.8 Meters

Figure 7: Hot Spot Receptors

All sources impacts on SIL receptors

Scale: 1" = 218.8 Meters

IFG - Lewiston

PM10 and PM2.5 Modeled Emission Rate Summary

IFG has made a number of changes to accompdate the emission factors assigned by DEQ in their August 19, 2013 letter.

The changes do not change the project, they simply reduce emissions from other sources due to the emissions increase from the DEQ emission factors.

	Previously Analyzed Emissions				Current Modeled Emissions			
	PM10 LT (ton/yr)	PM10 ST (lb/hr)	PM2.5 LT (ton/yr)	PM2.5 ST (lb/hr)	PM10 LT (ton/yr)	PM10 ST (lb/hr)	PM2.5 LT (ton/yr)	PM2.5 ST (lb/hr)
Point Sources								
Lumber Drying								
Kilns (KILN1V5 - KILN6-V5)	8.95	2.04	6.15	1.40	11.99	3.07	8.23	2.11
Cyclones								
CWCY1, was CY-1, Removed in 2012	0.138	0.069	0.069	0.034	0.000	0.000	0.000	0.000
CWCY2, was CY-2, Removed in 2012	0.029	0.015	0.015	0.007	0.000	0.000	0.000	0.000
CWCY3, was CY-3, Removed in 2012	0.063	0.032	0.032	0.016	0.000	0.000	0.000	0.000
CWCY4, was CY-4, Removed in 2012	0.345	0.173	0.173	0.086	0.000	0.000	0.000	0.000
CWCY6, was CY-6, Removed in 2012	0.212	0.106	0.106	0.053	0.000	0.000	0.000	0.000
IFGCY1, was CY-18, to be removed	0.016	0.008	0.008	0.004	0.000	0.000	0.000	0.000
CY-24, removed prior to 2012	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
IFGCY2, was CY-25, routed to baghouse	0.640	0.320	0.320	0.160	0.000	0.000	0.000	0.000
IFGCY3, was CY-26	0.024	0.012	0.012	0.006	0.024	0.009	0.012	0.005
IFGCY4, was CY-27A and CY-27B	0.147	0.073	0.073	0.037	0.147	0.055	0.073	0.027
IFGCY5, Fuel Hog Cyc., was PNP782(1)	0.680	0.340	0.340	0.170	0.850	0.340	0.425	0.170
Baghouses								
IFGBH1, BH-1, to be removed	4.055	0.926	2.717	0.620	0.000	0.000	0.000	0.000
IFGBH2, BH-2, to be removed	4.280	0.977	2.868	0.655	0.000	0.000	0.000	0.000
IFGBH3, BH-3, to be removed	4.618	1.054	3.094	0.706	0.000	0.000	0.000	0.000
CWBH4, BH-4, removed 2012	5.068	1.157	3.396	0.775	0.000	0.000	0.000	0.000
CWBH5, BH-5, removed 2012	4.843	1.106	3.245	0.741	0.000	0.000	0.000	0.000
CWBH6, BH-6, removed 2012	3.942	0.900	2.641	0.603	0.000	0.000	0.000	0.000
CWBH7, BH-7, removed 2012	3.717	0.849	2.490	0.569	0.000	0.000	0.000	0.000
IFGBH4, to be removed	8.109	1.851	5.433	1.240	0.000	0.000	0.000	0.000
Hew Saw Baghouse	0.000	0.000	0.000	0.000	1.988	0.454	1.332	0.304
Chip Cyclone Baghouse	0.000	0.000	0.000	0.000	0.010	0.003	0.007	0.002
Shavings Cyclone Baghouse	0.000	0.000	0.000	0.000	1.600	0.440	1.072	0.295
Point Source Totals	**49.877**	**12.011**	**33.180**	**7.887**	**16.605**	**4.367**	**11.155**	**2.909**

SIL Modeling

	PM10 LT (ton/yr)	PM10 ST (lb/hr)	PM2.5 LT (ton/yr)	PM2.5 ST (lb/hr)
KILN1V1-KILN4V5	-0.048	0.000	-0.033	0.000
KILN5V1-KILN6V5	0.400	0.102	0.274	0.070
CWCY1, was CY-1, Removed in 2012	-0.138	-0.069	-0.069	-0.034
CWCY2, was CY-2, Removed in 2012	-0.029	-0.015	-0.015	-0.007
CWCY3, was CY-3, Removed in 2012	-0.063	-0.032	-0.032	-0.016
CWCY4, was CY-4, Removed in 2012	-0.345	-0.173	-0.173	-0.086
CWCY6, was CY-6, Removed in 2012	-0.212	-0.106	-0.106	-0.053
IFGCY1, was CY-18, to be removed	-0.016	-0.008	-0.008	-0.004
CY-24, removed prior to 2012	0.000	0.000	0.000	0.000
IFGCY2, was CY-25, routed to baghouse	-0.640	-0.320	-0.320	-0.160
IFGCY3, was CY-26	0.000	-0.003	0.000	-0.002
IFGCY4, was CY-27A and CY-27B	0.000	-0.019	0.000	-0.009
IFGCY5, Fuel Hog Cyc., was PNP782(1)	0.170	0.000	0.085	0.000
IFGBH1, BH-1, to be removed	-4.055	-0.926	-2.717	-0.620
IFGBH2, BH-2, to be removed	-4.280	-0.977	-2.868	-0.655
IFGBH3, BH-3, to be removed	-4.618	-1.054	-3.094	-0.706
CWBH4, BH-4, removed 2012	-5.068	-1.157	-3.396	-0.775
CWBH5, BH-5, removed 2012	-4.843	-1.106	-3.245	-0.741
CWBH6, BH-6, removed 2012	-3.942	-0.900	-2.641	-0.603
CWBH7, BH-7, removed 2012	-3.717	-0.849	-2.490	-0.569
IFGBH4, to be removed	-8.109	-1.851	-5.433	-1.240
Hew Saw Baghouse	1.988	0.454	1.332	0.304
Chip Cyclone Baghouse	0.010	0.003	0.007	0.002
Shavings Cyclone Baghouse	1.600	0.440	1.072	0.295

IDAHO FOREST GROUP, LEWISTON
Emission Inventory/Calculations
Production Information Supporting PTE Calculations

Lumber Production, Current Permit

Sawmill	351,009	mbdft/year
Dry Kilns	351,009	mbdft/year
Planer	351,009	mbdft/year
Logs Used	1,263,632	tons/year, based on std. ratio

Residuals Production. Based on specific equipment

	tons/year	Ratio from typical mill production	
Sawmill Chips to convey	263,000	0.75	GT chips/mbdft sawmill
Sawdust to convey	116,000	0.33	GT sawdust/mbdft sawmill
Fines to cyclones	5,033	from cyclone data	
Bark to fuel hog	105,000	0.3	GT bark/mbdft sawmill
Planer Chips	21,060	0.06	BDT chips/mbdft planer
Shavings	38,610	0.11	GT shavings/mbdft planer
Wood to Fuel Hog	7,200	estimated from production	

Sawmill and Planer	43,643	tons/year	to truck bins
LCP, When Operating	13,093	tons/year	to truck bins
	57,000	tons/year	to truck bins

Lumber Production, Proposed

Sawmill	470,000	mbdft/year, estimated based on dry kilns
Dry Kilns	470,000	mbdft/year, production level in permit
Planer	470,000	mbdft/year, estimated based on dry kilns
Logs Used	1,692,000	tons/year, based on std. ratio

Residuals Production. Based on specific equipment

	tons/year	Ratio from typical mill production	
Sawmill Chips to convey	353,000	0.75	GT chips/mbdft sawmill
Sawdust to convey	155,000	0.33	GT sawdust/mbdft sawmill
Fines to cyclones	21,498	from cyclone data	
Bark to fuel hog	141,000	0.3	GT bark/mbdft sawmill
Planer Chips	28,200	0.06	BDT chips/mbdft planer
Shavings	51,230	0.11	GT shavings/mbdft planer
Wood to Fuel Hog	10,000	estimated from production	

Total to Bins	72,728	tons/year	to truck bins
LCP, Now Closed	0	tons/year	to truck bins
	73,000	tons/year	to truck bins

LUMBER DRY KILN PARTICULATE EMISSIONS

Current Emissions, PM10 Prevously Analyzed

Current Annual Production PTE	351,009	Mbf/yr	
Max Daily PTE Production	962	Mbf/day	
PM10 Emission Factor:	0.051	lbs/Mbf	Based on USO Source Test, HF
Annual PM10 Emissions:	8.95	tons/year	PTE
Annual PM10 Emissions per Kiln	2.24	tons/year/kiln	annual rate, 4 kilns
Modeled Annual PM10:	0.511	lb/hr/kiln	annual rate, 4 kilns
	0.102	lb/hr/vent	KILN1V1-KILN4V5
Daily PM10 Emissions:	2.04	lb/hr	daily rate, 4 kilns
Modeled Daily PM10:	0.511	lb/hr/kiln	daily rate, 4 kilns
	0.102	lb/hr/vent	KILN1V1-KILN4V5
PM2.5 (not previously modeled)			
Emission Factor:	0.035	lbs/Mbf	Based on USO Source Test, HF
Annual PM2.5 Emissions:	6.15	tons/year	PTE
Annual PM2.5 Emissions per Kiln	1.54	tons/year/kiln	annual rate, 4 kilns
Modeled Annual PM2.5:	0.351	lb/hr/kiln	annual rate, 4 kilns
Modeled Annual PM2.5:	0.070	lb/hr/vent	KILN1V1-KILN4V5
Daily PM2.5 Emissions:	1.40	lb/hr	daily rate, 4 kilns
Modeled Daily PM2.5:	0.351	lb/hr/kiln	daily rate, 4 kilns
	0.070	lb/hr/vent	KILN1V1-KILN4V5

Proposed Emissions, Analyzed in FIA Modeling

Proposed Annual Production PTE	470,000	Mbf/yr	
Max Daily PTE Production	1,443	Mbf/day	

Daily compliance based on equipment potential, not limited by permit.

PM10 Emission Factor:	0.051	lbs/Mbf	Based on USO Source Test, HF
Annual PM10 Emissions:	11.99	tons/year	PTE
Annual PM10 Emissions per Kiln	2.00	tons/year/kiln	annual rate, 6 kilns
Modeled Annual PM10:	0.456	lb/hr/kiln	annual rate, 6 kilns
Modeled Annual PM10:	0.091	lb/hr/vent	KILN1V1-KILN6V5
Daily PM10 Emissions:	3.07	lb/hr	daily rate, 6 kilns
Modeled Daily PM10:	0.511	lb/hr/kiln	daily rate, 6 kilns
Modeled Daily PM10:	0.102	lb/hr/vent	KILN1V1-KILN6V5
PM25 Emission Factor:	0.035	lbs/Mbf	Based on USO Source Test, HF
Annual PM25 Emissions:	8.23	tons/year	PTE
Modeled Annual PM25:	1.37	tons/year/kiln	annual rate, 6 kilns
Modeled Annual PM25:	0.313	lb/hr/kiln	annual rate, 6 kilns
Modeled Annual PM25:	0.063	lb/hr/vent	KILN1V1-KILN6V5
Daily PM25 Emissions:	2.11	lb/hr	daily rate, 6 kilns
Modeled Daily PM2.5:	0.351	lb/hr/kiln	daily rate, 6 kilns
Modeled Daily PM2.5:	0.070	lb/hr/vent	KILN1V1-KILN4V5

Changes in Emissions, Analyzed in SIL (PA) Modeling

Model the changes and compare to the SCLs

Existing Kilns			
Modeled Annual PM10:	-0.011	lb/hr/vent	KILN1V1-KILN4V5
Modeled Daily PM10:	0.000	lb/hr/vent	KILN1V1-KILN4V5
Modeled Annual PM25:	-0.008	lb/hr/vent	KILN1V1-KILN4V5
Modeled Daily PM25:	0.000	lb/hr/vent	KILN1V1-KILN4V5
Proposed Kilns			
Modeled Annual PM10:	0.091	lb/hr/vent	KILN5V1-KILN6V5
Modeled Daily PM10:	0.102	lb/hr/vent	KILN5V1-KILN6V5
Modeled Annual PM25:	0.063	lb/hr/vent	KILN5V1-KILN6V5
Modeled Daily PM25:	0.070	lb/hr/vent	KILN5V1-KILN6V5

KILN VOLATILE ORGANIC COMPOUND (VOC) EMISSIONS

Using EPA VOC factors for temperatures greater than 200 F
Average Production 2008-2011: 17% cedar, 0% P.pine, 0% ESLP, 65% hem fir, 18% red fir-larch
VOC Emissions will be tracked to verify that emissions are below the permit limit of 249 tpy.

Annual Production Limit:	470,000	Mbf/yr	
Emission Factor:	1.147	lbs/Mbf	VOC Emissions based on
Emissions:	270	tons/year	mix shown below.

Wood Species:	% of Total	VOC (lb/Mbf)	Weighted (lb/Mbf)	Reference
Cedar	10%	0.14	0.014	U of Idaho, 1996
Hem Fir (use white fir)	65%	1.09	0.709	EPA Reg 10, Dec. 2012
Douglas Fir and larch	25%	1.70	0.424	EPA Reg 10, Dec. 2012
Ponderosa Pine	0%	3.81	0.000	EPA Reg 10, Dec. 2012
ESLP, use Lodgepole	0%	1.53	0.000	EPA Reg 10, Dec. 2012
Other (use ESLP)	0%	1.53	0.000	EPA Reg 10, Dec. 2012
Total	100%		**1.147**	

KILN HAZARDOUS AIR POLLUTANT (HAPS)

Total MBF processed	**351,009**		
% Douglas Fir	25%	87,752	*MBF/Yr by species*
% Hem-Fir	65%	228,156	
% Ponderosa Pine	0%	0	
% ESLP	0%	0	
% Cedar	10%	35,101	
% Other (name species**)**	0%	0	
	100%	351,009	

EMISSION FACTORS:	EPA 12/12, except cedar					
Pollutant	Total HAP	Methanol	Formal-dehyde	Acetal-dehyde	Propion-aldehyde	Acrolein
Douglas Fir	0.1913	0.1170	0.0043	0.0682	0.0007	0.0011
Hem Fir (HF, WW)	0.4956	0.4200	0.0163	0.0550	0.0018	0.0026
Ponderosa Pine	0.2029	0.1440	0.0092	0.0420	0.0032	0.0045
ESLP	0.1166	0.0628	0.0041	0.0420	0.0032	0.0045
Cedar	0.0678	0.0298	0.0016	0.0355	0.0003	0.0005

EMISSIONS — Emission lb/Yr

Species	Total HAP	Methanol	Formal-dehyde	Acetal-dehyde	Propion-aldehyde	Acrolein
Douglas Fir	16787	10267	377	5985	61	97
Western Hemlock	113074	95825	3719	12549	411	593
Ponderosa Pine	0	0	0	0	0	0
White Fir (white wood)	0	0	0	0	0	0
Cedar	2380	1046	56	1246	11	18
TOTAL, lb/yr	132,241	107,138	4,152	19,779	483	707
TOTAL, ton/yr	66.12	53.57	2.08	9.89	0.24	0.35

BAGHOUSES

Removed Baghouses

Source	rate (gr/cf)	Flow cfm	PM10 e.f. lb/hr	PM25 e.f.* lb/hr
BH-1, Surfacing Baghouse	0.003	36000	0.926	0.620
BH-2, Surfacing Baghouse	0.003	38000	0.977	0.655
BH-3, Surfacing Baghouse	0.003	41000	1.054	0.706
IFGBH4, truck bin baghouse	0.003	72000	1.851	1.240
BH-4, Specialties Baghouse	0.003	45000	1.157	0.775
BH-5, Profiles Baghouse	0.003	43000	1.106	0.741
BH-6, Profiles Baghouse	0.003	35000	0.900	0.603
BH-7, Specialties Baghouse	0.003	33000	0.849	0.569
Conversion of minutes to hours	60 min/hr			
Conversion of grains to lbs	7000 gr/lb			

* PM2.5 e.f. is set at 67% ofPM10 e.f.

Added Baghouses

Source/Pollutants	rate (gr/cf)	Flow cfm	PM10 e.f. lb/hr	PM25 e.f.* lb/hr
Hew Saw Baghouse	0.003	17655	0.454	0.304
Source/Pollutants	**PM10 ef (lb/ton)**	**reference(1)**	**PM2.5 ef (lb/ton)**	**reference**
Chip Cyclone Baghouse	0.001	AQ-EF02, chips	0.001	67% of PM10
Shavings Cyclone Baghouse	0.040	AQ-EF02, shavings	0.027	67% of PM10

(1) Based on Oregon DEQ Wood Product Emission Factors, for cyclones with baghouse control

BAGHOUSE EMISSIONS INCLUDED IN PREVIOUS PERMIT ANALYSIS

HOURS OF OPERATION 8760 HOURS PER YEAR
ANNUAL PLANER PRODUCTION 351,009 MBDFT/YR

Modeled Source Name/Status	Emissions Basis (hrs/yr)	Previously Analyzed Emissions (PM2.5 not modeled)			
		PM10 (ton/yr)	Daily PM10 (lb/hr)	PM2.5 (ton/yr)	PM2.5 (lb/hr)
IFGBH1, BH-1, to be removed	8,760	4.055	0.926	2.717	0.620
IFGBH2, BH-2, to be removed	8,760	4.280	0.977	2.868	0.655
IFGBH3, BH-3, to be removed	8,760	4.618	1.054	3.094	0.706
CWBH4, BH-4, removed 2012	8,760	5.068	1.157	3.396	0.775
CWBH5, BH-5, removed 2012	8,760	4.843	1.106	3.245	0.741
CWBH6, BH-6, removed 2012	8,760	3.942	0.900	2.641	0.603
CWBH7, BH-7, removed 2012	8,760	3.717	0.849	2.490	0.569
IFGBH4, to be removed	8,760	8.109	1.851	5.433	1.240

BAGHOUSE EMISSIONS INCLUDED IN THIS MODELING

HOURS OF OPERATION 8760 HOURS PER YEAR
ANNUAL PLANER PRODUCTION 470,000 MBDFT/YR

Modeled Source Name/Status	Emissions Basis (hrs/yr, ton/yr)	Currently Analyzed Emissions			
		PM10 (ton/yr)	Daily PM10 (lb/hr)	PM2.5 (ton/yr)	PM2.5 (lb/hr)
Hew Saw Baghouse	8,760	1.988	0.454	1.332	0.304
Chip baghouse, tons per year	20,826	0.010		0.007	
Chip baghouse, hours per year	6,240		0.003		0.002
Shavings Cyc/BH, tons per year	80,000	1.600		1.072	
Shavings Cyc/BH, hours per year	7,280		0.440		0.295

CYCLONE EMISSION FACTORS

Potlatch developed cyclone emission factors for PM. IFG is using those emissions factors where possible, with corresponding factors for PM10 and PM2.5.

Source	PM10 e.f. (lb/ton) (1)	PM2.5 e.f. (lb/ton) (2)	Status
CY-1, Specialties Gang Rip Cyclone	0.778	0.389	REMOVED
CY-2, Specialties Gang Rip Cyc.	0.164	0.082	REMOVED
CY-3, Specialties GRECON	0.164	0.082	REMOVED
CY-4, Specialties NULOC	0.522	0.261	REMOVED
CY-6, Specialties	0.164	0.082	REMOVED
CY-18, Surfacing, #4 Splitter	0.600	0.300	IFG-CY1
CY-24, Surfac., Brooks Chip., Fines	0.778	0.389	REMOVED IN PAST
CY-25, Surfac., Brooks Chip., Chips (3)	0.062	0.031	IFG-CY2
CY-26, Sawmill, All Machine Ctrs	0.165	0.082	IFG-CY3
CY-27A, Sawmill, All Machine Ctrs	0.780	0.390	IFG-CY4A
CY-27B, Sawmill, All Machine Ctrs	0.780	0.390	IFG-CY4B
CY-FH, Complex, Fuel Hog	0.170	0.085	IFG-CY5

Notes:

(1) Original note from Potlatch said: Calculated using cyclone and dust parameters per Rex. M. Robbins, Pollution Engineering, March, 1988 , with number of turns (Ne) calc. According to Wark and Warner, 1981

(2) Revised as required in DEQ August 19, 2013 lettter.

CYCLONE EMISSIONS INCLUDED IN PREVIOUS PERMIT ANALYSIS

HOURS OF OPERATION 4000 used inprevious analysis
ANNUAL SAWMILL PRODUCTION 351,009 MBDFT/YR

Modeled Source Name/Status	Current Throughput tons	Previously Analyzed Emissions (PM2.5 not modeled)			
		PM10 (ton/yr)	Daily PM10 (lb/hr)	PM2.5 (ton/yr)	PM2.5 (lb/hr)
CWCY1, was CY-1, Removed in 2012	354	0.138	0.069	0.069	0.034
CWCY2, was CY-2, Removed in 2012	354	0.029	0.015	0.015	0.007
CWCY3, was CY-3, Removed in 2012	773	0.063	0.032	0.032	0.016
CWCY4, was CY-4, Removed in 2012	1,324	0.345	0.173	0.173	0.086
CWCY6, was CY-6, Removed in 2012	2,582	0.212	0.106	0.106	0.053
IFGCY1, was CY-18, to be removed	53	0.016	0.008	0.008	0.004
CY-24, removed prior to 2012	0	0.000	0.000	0.000	0.000
IFGCY2, was CY-25, routed to baghouse	20,826	0.640	0.320	0.320	0.160
IFGCY3, was CY-26	296	0.024	0.012	0.012	0.006
IFGCY4, was CY-27A and CY-27B	376	0.147	0.073	0.073	0.037
IFGCY5, Fuel Hog Cyc., was PNP782(1)	8,000	0.680	0.340	0.340	0.170

(1) CW called this the Trash Hog, and it was modeled at a high emission rate, apparently in error. Values shown are what should have been modeled

CYCLONE EMISSIONS INCLUDED IN THIS MODELING

HOURS OF OPERATION 5356 hours per year, consistent with production inc.
ANNUAL SAWMILL PRODUCTION 470,000 MBDFT/YR

Modeled Source Name/Status	Current Throughput tons	Emissions Modeled for This Application			
		PM10 (ton/yr)	Daily PM10 (lb/hr)	PM2.5 (ton/yr)	PM2.5 (lb/hr)
CWCY1, was CY-1, Removed in 2012	0	0.000	0.000	0.000	0.000
CWCY2, was CY-2, Removed in 2012	0	0.000	0.000	0.000	0.000
CWCY3, was CY-3, Removed in 2012	0	0.000	0.000	0.000	0.000
CWCY4, was CY-4, Removed in 2012	0	0.000	0.000	0.000	0.000
CWCY6, was CY-6, Removed in 2012	0	0.000	0.000	0.000	0.000
IFGCY1, was CY-18, to be removed	0	0.000	0.000	0.000	0.000
CY-24, removed prior to 2012	0	0.000	0.000	0.000	0.000
IFGCY2, was CY-25, routed to baghouse(1)	20,826	0.000	0.000	0.000	0.000
IFGCY3, was CY-26	296	0.024	0.009	0.012	0.005
IFGCY4, was CY-27A and CY-27B	376	0.147	0.055	0.073	0.027
IFGCY5, was PNP782	10,000	0.850	0.340	0.425	0.170

(1) IFGCY2 routed to baghouse. IFGCY3 and -4 output re-routed to baghouse.

From: Miller, Jim <jdmiller@idfg.com>
Sent: Thursday, August 01, 2013 4:58 PM
To: William Rogers
Cc: Diane Lorenzen (dianelorenzen@optimum.net)
Subject: Public Information Meeting
Attachments: CCF08012013_00000.pdf

Hello Bill,
The Public Information Meeting was held per schedule (see attached).
Jim

Public Information Meeting for Permit to Construct

Host(s) Jim Miller **Date of Meeting** 8-1-13

Idaho Forest Group is hosting this Public Information Meeting in accordance with IDAPA 58.01.01.213.02 to seek a Permit to Construct to add additional lumber drying and sawing equipment at our Lewiston Sawmill operation. The proposed sawing equipment will enable the mill to process smaller diameter logs. The additional kilns will enable the mill to dry lumber more efficiently while maintaining product quality.

Name (please print clearly)	Contact Information
James Miller	Idaho Forest Group
Arrived at Meeting location at 1:50 8-1-13	
At 2:00 8/1/13 I declared the Meeting open.	
Roger Woods	IFG
Rick Northrup	IFG
At 2:15 I spoke with Amber Rand (IDEQ)	
to advise that no other public was in attendance.	
She concured that we could declare the Meeting	
closed.	
The Public Information Meeting was declared	
closed at 2:16. James Miller	

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The Lewiston Tribune
505 C St., P.O.Box 957
Lewiston, Idaho 83501
(208) 743-9411

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Idaho Forest Group is hosting a Public Information Meeting in accordance with IDAPA 58.01.01.213.02. to seek a Permit to Construct to add additional lumber drying and sawing equipment at our Lewiston Sawmill operation. The proposed sawing equipment will enable the mill to process smaller diameter logs. The additional kilns will enable the mill to dry lumber more efficiently while maintaining product quality. This Public Information Meeting will be held at the Lewiston Red Lion Hotel located at 621 21 Street on August 1, at 2:00 pm.

AFFIDAVIT OF PUBLICATION

Karen J. Lewis , being duly sworn, deposes and says, I am the Legal Clerk of the Tribune Publishing Company, a corporation organized and existing under and by virtue of the laws of the State of Idaho and under and by virtue of the laws of the State of Washington, publishers of the Lewiston Tribune, a newspaper of general circulation published at Lewiston, Nez Perce County, Idaho; That the said Lewiston Tribune is an established newspaper and has been published regularly and issued regularly at least once a day for more than 105 consecutive years next immediately preceding the first publication of this notice, and has been so published uninterrupted for said period; that the 82595 Idaho For attached hereto and which is made a part of this affadavit was published in the said Lewiston Tribune, 1 time(s). Publication being on 07/21 , or once a day for 1 consecutive day, the first publication thereof being on the 07/21/2013 , and the last publication thereof being on the 07/21/2013 , and said 82595 Idaho For was so published in the regular and entire issue of said newspaper and was not in a supplement thereof and was so published in every issue and number of the said paper, during the period and times of publication, as set forth , above.

Karen J. Lewis

State of Idaho
S.S.
County of Nez Perce

On this 23rd day of July in the year of 2013, before me, a Notary Public, personally appeared Karen J. Lewis , known or identified to me to be the person whose name subscribed to the within instrument, and being by me first duly sworn, declared that the statements therein are true, and acknowledged to me that he executed the same.

Carol L Peterson
Notary Public in and for the State of Idaho, residing at Lewiston, therein
Commission Expires 9-1-2017

CAROL L. PETERSON
NOTARY PUBLIC
STATE OF IDAHO