12 December 2016

CANTIMBER BIOTECH INC.

Operations and Emissions Evaluation

Submitted to:
Port Alberni Port Authority
2750 Harbour Road
Port Alberni, BC
V9Y 7X2

Attention: David. A. McCormick, MBA
Director Public Relations & Business Development

REPORT

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1.0 INTRODUCTION

The Port Alberni Port Authority (PAPA) commissioned Golder to assist with the evaluation of operations and emissions for the Cantimber Biotech Inc. (Cantimber) facility at Port Alberni, BC. The evaluation comprised a site visit to the facility, design of a stack testing program, stack testing to characterize emissions from the facility, observations and monitoring during the facility operation and provision of key findings and associated recommendations.

The Cantimber facility ceased operations at the request of PAPA in June 2016, and therefore was not operational prior to the November stack test period. The facility was shut down after the stack test, and cannot commence operations until 10 January (as stipulated in the license agreement between PAPA and Cantimber).

A staged approach to the stack testing was taken, with testing of the carbonization stack and the activation stack occurring on 8 and 9 November respectively. The stack testing was undertaken between by A. Lanfranco and associates, and Golder representatives were present during the stack testing to observe the operation of the facility, and to undertake monitoring for fugitive emissions within and around the facility, and ambient monitoring within the nearby residential area.

This report provides key findings and recommendations around the following:

- observations made during the operation of facility
- stack test results
- meteorological and ambient air quality monitoring undertaken during the stack test period
- other regulatory considerations

2.0 FINDINGS AND RECOMMENDATIONS

2.1 Process Observations

The process is a batch operation with two distinct process stages – carbonization and activation. During the carbonization process the wood chips contained within the carbonization vessels undergo pre-heating at a temperature of 100-120 °C for 3-5 hours. Carbonization heating then occurs at a temperature of 100-500 °C for 2.5 to 3 hours. When the vessel reaches 500 °C, the vessel is removed from the heating stage and cooling begins. The vessel slowly cools to room temperature. Each carbonization vessel is heated by an individual furnace beneath each vessel. Syngas produced within the carbonization vessels is used as a fuel source in the carbonization furnaces in addition to cordwood. The exhaust gas from the carbonization furnace then goes into the east or west combustion chamber for secondary combustion.

At some points in the carbonization process, not all the syngas produced is needed in the carbonization furnaces, so syngas can also travel directly to the east or west combustion chamber (and hence this is the primary mechanism to combust this syngas). All gases produced in the pre-heating vessels are combusted solely in the east and west combustion chambers. As a result of the means by which the syngas can be generated and combusted, it appears that the rate of syngas fuel for the east and west combustion chambers varies over time. Therefore, in addition to the syngas, the two combustion chambers (east and west) are fuelled by bottled propane and manual charcoal addition. Flue gas from the east and west combustion chambers is directed through a cyclone and wet scrubber prior to discharge through the carbonization stack.

Following the carbonization process the charcoal is crushed and ground in preparation for the activation stage.

During the activation process the charcoal is automatically fed at a constant rate through an activation furnace with a fluidized bed combustion process and steam injection. Flue gas is fed through a heat exchanger, which supplies heat for use in steam production. Flue gas is directed through a cyclone, baghouse and wet scrubber prior to discharge through the activation stack.

2.1.1 Combustion Chambers (Carbonization Process)

The carbonization process is not a steady state process due to the batch nature of bringing different vessels in/out of the process, and syngas line. The 8 individual carbonization vessels are generally at different stages in the carbonization process, can be at different temperatures, and therefore be producing different amounts of syngas. This is expected to result in a variation in the composition of the syngas feeding into the east and west combustion chambers.

To keep the combustion chambers temperature above 875 °C charcoal was added manually, approximately twice an hour. The timing of the charcoal addition was entirely dependent on the chamber temperature, and was therefore not added on a regular time basis (e.g., every 30 minutes). The temperature in the chamber relied on the operator visually monitoring the temperature read out, and acting to add more charcoal when the temperature decreased close to 875 °C.

The temperature within the combustion chambers typically varied by around 100 °C over an hour, with the temperature quickly rising after the charcoal was added. Figure 1 shows the minute by minute correlation of the combustion temperatures and the total Volatile Organic Content (VOC) stack concentrations (reported as Total Hydrocarbons – THC) for one of the three stack tests. The other two stack runs showed similar data trends. The VOC concentrations did not vary significantly over the test run (24-29 ppm), and did not appear to directly correlate to the combustion chamber temperatures. The combustion chamber temperatures were maintained above 850°C, which is probably why the VOC concentrations remained fairly consistent (i.e., the control efficiency of the device was maintained above a reasonable level).

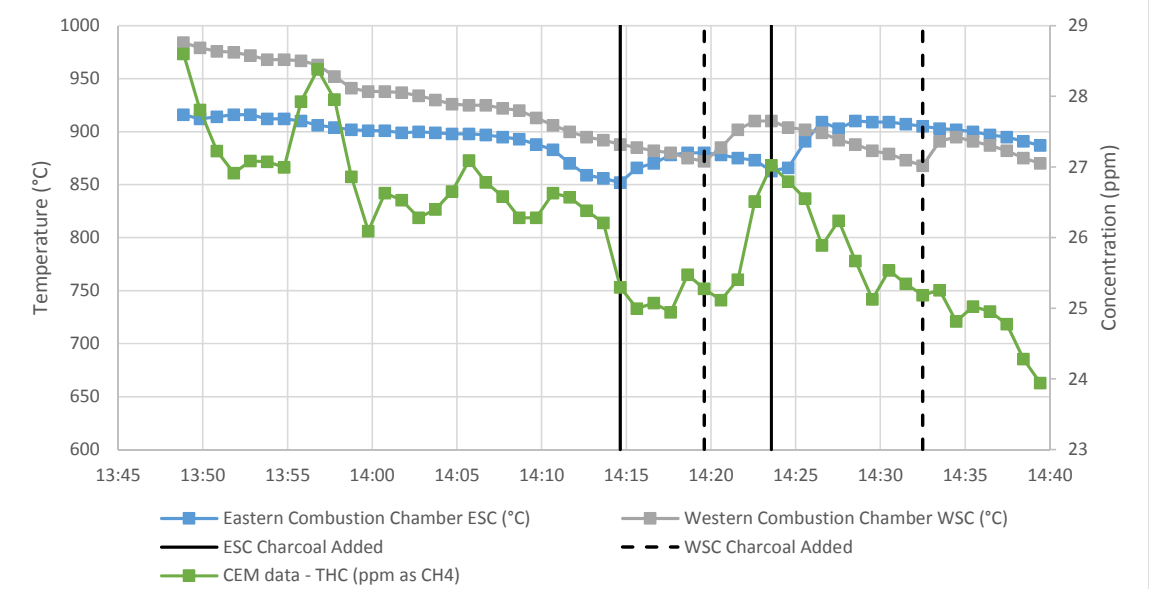

Figure 1: Carbonization Stack Run 2 Comparison of Combustion Chamber Temperature and VOC Concentration

2.1.2 Scrubber System (Carbonization and Activation Process)

Currently, when the solids content in the scrubber sump becomes too great, the sump water is released to the containment and is evaporated to the atmosphere. The containment may not be adequate, particularly during periods of significant rainfall. During the evaporation, any water soluble organic compounds collected by the scrubbers have the potential to be re-emitted to the atmosphere. During the site visit, an upgrade to the scrubber water system was discussed which includes capturing scrubber sump discharges within plastic containers, and subsequent removal off site for disposal. It is Golder's understanding that these upgrades are currently in process and will be in place prior to the re-start of operations.

Scrubbers operate on the principle of removing air emissions and collecting them in the scrubber solution, in this case water. As the water collects material it becomes more concentrated. A wet scrubber by nature will have water losses due to droplet carry-out and evaporation. Droplets that are emitted will dry and release any particulate that they carry. Therefore it is necessary to remove some scrubber water from the sump (blowdown) as the concentration of collected emissions goes up. There should be a mechanism/procedure in place to replace the scrubber water on a regular basis so the concentration of particulate in the scrubber water does not become too great. Currently the scrubbers have no means of regular blowdown to maintain a low particulate concentration.

2.1.3 Fugitive Emissions - Carbonization Process

The combustion chamber door, seals around the vessel lids, liquid seal around the vessel nose, furnace doors and syngas pipe connections to the furnaces were monitored for potential fugitive emissions as total VOCs using a ppbRAE. In addition, fugitive VOC levels were monitored at building openings and directly outside the facility buildings to the north, east and west (the facility is bounded to the south by an adjacent building so no measurements were possible directly to the south).

VOC concentrations around the vessel lids and seals typically ranged from 100 ppb to 10 ppm, with peak (instantaneous) readings up to 57 ppm. Concentrations around the combustion chamber (east and west) doors ranged from 150 ppb to 460 ppb.

During the monitoring a leak was detected near the fire door of eastern furnace #4, which was traced to the nearby syngas valve. Concentrations at the leak location were detected up to 40 ppm. A temporary seal was made to the leak at the time it was detected. Concentrations at the other syngas valves ranged from 200 ppb to 15 ppm.

VOC concentrations at building openings (large doors) and the area immediately surrounding the buildings were found to be 0 ppb, with the exception of the western side of the building, directly under the building vent, where concentrations ranged from 40 to 250 ppb. The concentration dropped down to 10 ppb a few meters away from the building vent indicting off site concentrations are not expected to be significant.

The measurements of fugitive emissions were limited to measuring total VOC concentrations, the volume (or flow rate) of the emissions was not measured given the practical difficulties in doing this. However, it is expected that the volume of fugitive emissions are relatively small. Currently there is no formal process, procedure or instrumentation available at the facility to check for equipment leaks and monitor the relative magnitude of fugitive emissions from various sources at the facility.

2.1.4 Fugitive Emissions – Activation Process

The furnace door, temperature probe locations on the top of the activation chamber, and welded sections of the top of the activation chamber were monitored for potential fugitive emissions using a ppbRAE to measure total VOC. During operation of the activation process, periodic monitoring for fugitive VOC levels was undertaken at building openings and directly outside the facility buildings to the north, east and west.

Monitored concentrations of total VOCs were consistently 0.0 ppb, therefore no sources of fugitive emissions were identified from the activation process. Similarly, concentrations of total VOC at process building openings, and directly outside facility buildings were found to be 0.0 ppb.

2.1.5 Activation Controls (Feed Rate and Temperature)

The activation system is generally more automated than the carbonization process. The two main operation variables identified that had the potential to affect emissions were the temperature and the feed rate.

Temperature is monitored at three points within the activation chamber. During the stack testing, the temperatures were observed to be fairly constant, typically only varying within a 15 °C range over an hour period.

The activation feed rate (displayed in cycles per second or hertz (Hz)) can be changed by the operator. This value in Hz relates to the rotational speed of the feeder that introduced the charcoal dust into the activation chamber, the higher the value the greater the feed rate. The feed rate was initially set at 4.6 and 4.2 Hz for the stack testing, however in discussions with Cantimber it was set at 5.0 Hz – the maximum that Cantimber would operate the process at, for the 3rd test run.

2.1.6 Water Discharges

Cooling water discharges were identified during the facility operation. The cooling water is non-contact water that is not in direct contact with the process gases.

- Cooling water from the carbonization process was periodically discharging from the cooling tank located directly outside the northern wall of the main process building. The temperature of the water discharge was estimated to be 50-70 °C. The water was discharged to a surface water drain.
- Cooling water from the activation process continually discharged from the cooling tower located adjacent to the northwest corner of the main process building. The temperature of the water discharge was estimated to be 30-40 °C. The water was discharged to a surface water drain (Photograph 1).

Photograph 1: Activation Process Cooling Tower and Water Discharge

2.1.7 Process Operation Recommendations

The following recommendations are provided on the process operations:

- The fuel source for the high temperature combustion chamber is changed to natural gas and is automated to avoid the current manual system of operation. It is unusual for a facility to rely on manual operation of an air emission control system.

- A low temperature audible alarm is installed on both high temperature combustion chambers, this is considered to be industry best practice.
- A datalogger is installed to record temperatures within both high temperature combustion chambers. This is considered to be an industry best practice and provides an automated record of combustion temperatures that can be inspected by the regulator. Readings should be taken and recorded no less frequent than once per minute. Records of the feed rate and temperature logs should be retained for inspection for no less than 2 years.
- The scrubber water disposal system should be upgraded to a contained system prior to the facilities resumed operation. Regular blowdown of scrubber water and replacement with fresh makeup water should be implemented.
- Regular fugitive emission surveys are undertaken on the carbonization process. Any leaks identified should be addressed immediately.
- Although fugitive emissions are not considered to specifically be an ambient air quality concern outside of the facility boundaries, an industrial hygiene assessment of worker exposure should be undertaken to ensure workers exposures are below exposure limits. This assessment should conform to WorkSafe BC requirements.
- Cooling water should be adequately cooled prior to discharge to surface water drains.

2.2 Stack Test Results

2.2.1 Daily Emission Rates

Table 1 provides a summary of the stack test results. A comparison is provided against the emission rates used as the basis of the dispersion modelling assessment undertaken by Levelton (Levelton 2015). These modelled values are hereafter referred to as the license levels, since they are included in the license between PAPA and Cantimber Biotech Inc. dated 1 May 2015. It should be noted that the basis of the modelling was both activation trains operational, whereas during the stack testing only one activation train was operational. In order to compare against license levels, emissions form the activation stack were multiplied by 2.

For the activation process, the feed rate was slightly different at 4.6, 4.2 and 5.0 Hz for stack runs 1, 2, and 3 respectively. For the activation stack results are presented for run 3, which had the highest activation process feed rate. The full stack test report is included in Appendix A.

Table 1: Comparison of Stack Test Results and License Levels

Parameter	Units	Carbonization Stack		Activation Stack		
		License Levels/Basis of Modelling	Stack Test (Average)	License Levels/Basis of Modelling (2 Activation Trains)	Stack Test (Run 3) (1 Activation Train)	Stack Test (Run 3, Emissions Multiplied by 2 to Represent 2 Activation Trains)
Emissions						
Total Particulate	Kg/day	-	0.72	-	0.048	0.096
PM_{10}[(a)]	Kg/day	-	0.38	-	0.048	0.096
$PM_{2.5}$[(b)]	Kg/day	2.08	0.12	3.47	0.030	0.060
Nitrogen Dioxide (NO_2)	Kg/day	4.15	2.88	2.77	2.4	**4.8**
Carbon Monoxide (CO)	Kg/day	2.08	**4.56**	4.15	**547.2**	**1094.4**
VOC (THC as CH_4)	Kg/day	-	0.96	-	3.12	6.24
Sulphur Dioxide (SO_2)	Kg/day	-	0.12	-	0.024	0.05
Phenol	Kg/day	-	0.009	-	0.004	0.01
Formaldehyde	Kg/day	-	0.59	-	0.02	0.04
Methanol	Kg/day	-	0.11	-	0.09	0.18
Stack Parameters						
Stack Temperature	°C	150	59	100	58	-
Flow Rate	Sm^3/hour	2500	1836	5000	1644	-
Velocity	m/s	11.4	5.6	30.4	7.3	-

Values in bold indicate mass emission rates higher than license levels.

a) Suspended particles with a nominal aerodynamic diameter of 10 µm or less.

b) Suspended particles with a nominal aerodynamic diameter of 2.5 µm or less.

- = Indicates no license emission level for comparison. During the stack test, the carbon monoxide concentrations within the activation stack exceeded the maximum range of the analyzer, and therefore concentrations were determined from a canister sample for each run.

2.2.2 Annual Emissions

Table 2 provides a summary of the emissions on an annual basis, based on the stack test data in Table 1 above, and assuming continuous 24 hour operation for 305 days per year, with 60 days shut down per year between November 10th and January 10th (as per the restriction within the license). To derive the total facility emissions in Table 2 below, the activation test data has been multiplied by 2 to account for both activation trains being operational.

For context, annual emissions have been compared to emissions from facilities within Port Alberni that reported air emissions for the 2015 calendar year to the National Pollutant Release Inventory (NPRI).

Table 2: Annual Emissions

Emission	Units	Carbonization Stack	Activation Stack (Run 3) (1 Activation Train)	Total Facility (2 Activation Trains)	Catalyst Paper Corporation – Port Alberni	Western Forest Products – Alberni Pacific Sawmill
Total Particulate	Tonnes/year	0.22	0.01	0.25	5	108
PM_{10}	Tonnes/year	0.12	0.01	0.15	4.1	4.8
$PM_{2.5}$	Tonnes/year	0.04	0.01	0.06	2.8	1.3
NO_2	Tonnes/year	0.88	0.73	2.34	359	-
CO	Tonnes/year	1.39	166.90	335.18	626	-
VOC	Tonnes/year	0.29	0.95	2.20	121	18
SO_2	Tonnes/year	0.04	0.01	0.05	179	-
Phenol	Tonnes/year	0.00	0.00	0.01	-	-
Formaldehyde	Tonnes/year	0.18	0.01	0.19	-	-
Methanol	Tonnes/year	0.03	0.03	0.09	18	-

- = Indicates no emissions reported to NPRI in 2015. This could mean either no emissions of this substance, or the NPRI emission reporting level for this substance was not met by the facility.

The stack test data, and comparison against license emission level, shows that:

- The mass emission rates of $PM_{2.5}$ from both stacks were low, and were below the license emission levels.
- Emissions of NO_2 from the carbonization stack were low, and were approximately 70% of the license emission levels. Emissions of NO_2 from the activation stack were approximately double the license emission levels at 4.8 Kg/day compared to the license emission level of 2.77 Kg/day.
- The measured emission rates of SO_2 from both stacks were low.
- Emissions of CO from the carbonization stack were approximately double the license emission levels. Emissions of CO from the activation stack were high, and were approximately 250 times higher than the license emission levels.

- Annual emissions of CO based on measured values are 335 tonnes/year (t/yr). This annual emission rate is approximately half of the annual CO emissions from the Catalyst Port Alberni facility of 626 t/yr.
- Total VOC emissions from both stacks were low. On an annual basis VOC emissions are 0.3 and 1.9 tonnes from the carbonization and activation trains respectively, which are significantly below the annual total VOC emissions of 121 and 18 tonnes reported by the other large facilities within Port Alberni.
- The concentrations of individual VOC species within both stacks are provided in Appendix A. The majority of VOC emissions were found to be below laboratory detection limits. Individual compounds that were present above laboratory detection limits were screened against the ambient air quality standards from Alberta and Ontario (in the absence of BC standards), where they existed. Comparing in-stack concentrations to ambient standards is generally not a direct comparison because in-stack concentrations are much higher than ambient concentrations, since, upon exiting the stack, emissions are dispersed. This approach was used to identify individual VOC emissions that require further assessment. This screening identified that Acrolein, Acrylonitrile, Benzene and Napthalene should be further assessed using modelling to confirm acceptable off site impacts.
- Naphthalene, a polyaromatic hydrocarbon (PAH) was detected within both the carbonization and activation stacks. This was the only PAH compound currently included in the stack test. Based on the presence of naphthalene, stack testing of speciated PAH's is recommended in the future.
- Measured stack temperatures are significantly lower than those used as the basis of the dispersion modelling (Levelton 2015). The lower temperatures will result in less thermal buoyancy, and therefore poorer dispersion of stack emissions.
- Measured volumetric flow rates, and consequently stack gas velocities are lower than those used as the basis for the dispersion modelling (Levelton 2015).

2.2.3 Stack Test Recommendations

The following recommendations are provided on the process operations:

- Given the significant differences between measured stack emissions, temperature and flow rates, the results and conclusions of the dispersion modelling assessment (Levelton 2015) are not considered to be representative of the facility. It is recommended that the modelling assessment is updated for $PM_{2.5}$, NO_2, and CO, and additionally the modelling is used to assess the off-site concentrations of individual VOCs detected, including Acrolein, Acrylonitrile, Benzene and Napthalene. Future modelling should use measured data from activation run 3, since this represents emissions from the highest process feed rate. Given the magnitude of the CO emissions, the modelling assessment should be undertaken to confirm that the level of emissions result in acceptable ambient concentrations of CO prior to the facility re-commencing operations.
- Given the presence of naphthalene, it is recommended that speciated stack testing for PAH compounds is undertaken in future to characterize the type and quantity of any other PAH's present in both stacks.

- Given the high concentrations of CO measured within the stack, monitoring for CO at the facility and associated procedures should be developed to reduce the risk of worker exposure to CO. This may include both worker related monitoring and monitoring of ambient gas levels with audible alarms at the facility. This monitoring and procedures should conform to WorkSafe BC requirements.
- Future stack sampling should consider the measured levels from this sampling effort, particularly the CO concentrations which were high, and plan appropriate health and safety procedures and controls.

2.3 Ambient Monitoring

Ambient monitoring was undertaken during the stack test as follows:

- wind monitoring in the vicinity of the Cantimber facility
- ambient continuous particulate monitoring at two locations within the adjacent residential area
- ambient daily Partisol particulate monitoring within the community on 2nd Avenue
- periodic observations within the neighbourhood during the stack testing to assess conditions and possible odours

Available data from the air quality and meteorological station located at Port Alberni elementary school was also considered in the interpretation of ambient monitoring data.

2.3.1 Wind monitoring

A meteorological station (Novalynx 110-WS-16) was located in the vicinity of the Cantimber facility, approximately 70 m NNE at UTM Easting 368,046 m, Northing 5,454,316 m. Wind speed and wind direction were recorded at a height of 2.4 m between 31 October and 15 November 2016.

Figure 2 shows a comparison of the wind rose at the Cantimber station compared to available data reported by the BC Ministry of Environment from the meteorological station located at Port Alberni elementary school. The wind rose depicts the relative frequency of wind direction on a 16-point compass, with north, east, south, and west directions going clockwise, whose value is listed adjacent to each of the compass points. Each ring on the wind rose represents a frequency of 2% of the total. The length of the shaded bars on each wind rose petal represents the frequency of wind recorded from a given direction within a certain speed range.

The comparison figure shows that the wind pattern is significantly different at the Cantimber facility located that at the elementary school, this is expected given the different locations and surrounding topographic features of each station. For the Cantimber station the dominant wind direction was from the southerly directions, with the highest wind speeds also recorded from these southerly directions. Data from the elementary school shows the dominant wind direction was from the east-northeast, with much lower wind speeds recorded than at the Cantimber station.

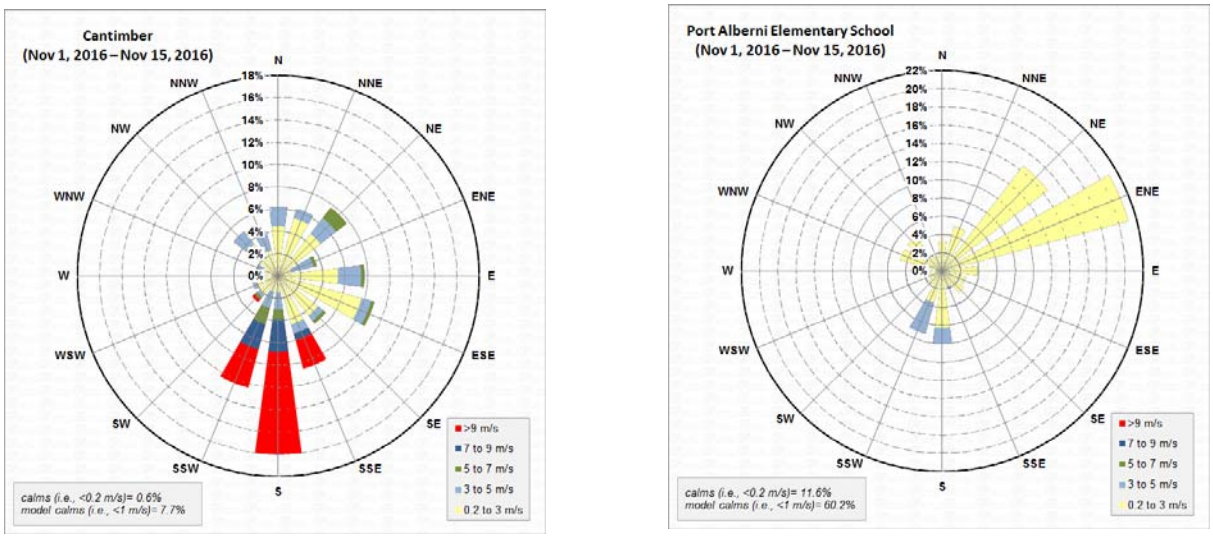

Figure 2: Cantimber and Port Alberni Elementary School Wind Rose Comparison 11:00, 1 November to 11:00, 15 November

Figure 3 shows the wind rose plot for the stack test period. During this period, the vast majority of the time the wind was from the south, or the south-south east, therefore the nearby community was not located downwind of the Cantimber facility during the stack test period.

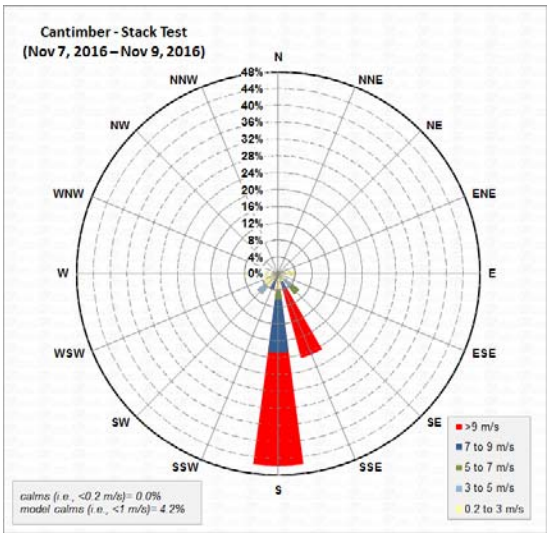

Figure 3: Cantimber Wind Rose Plot during Operation for Stack Test (17:00 November 7th to 17:00 November 9th)

2.3.2 Continuous Particulate Monitoring

Continuous particulate monitors were set up in the nearby residential area between 2 November, 17:00 and 14 November, midnight. Prior to this, both monitors were co-located with the continuous air quality monitor at Port Alberni elementary school for a day (1 November, midday – 2 November, 13:00). Monitoring was undertaken using DustTrak DRX monitors with the auto zero module activated every 12 hours. Data was recorded every 5 minutes.

When the DustTrak monitors were located at the elementary school, data were directly compared to the $PM_{2.5}$ data from the continuous monitor. The DustTrak monitors generally recorded higher hourly concentrations, ranging from -3 to 20 µg/m^3 difference over the 25 hour measurement period, with an average difference of 6.5 µg/m^3 for the DustTrak that was subsequently located at South Street/1Avenue (DustTrak 1) and average difference of 6.3 µg/m^3 for the DustTrak that was subsequently located at Stirling Street/1Avenue (DustTrak 2). The two different monitors are not expected to correlate exactly, in addition the monitor located at the elementary school is considered to be permanent 'reference' monitoring method, and therefore more accurate data that is generally acceptable in a regulatory context.

Data completeness for the DustTrak Monitors is summarized in Table 3. Data completeness during the stack test period (7 November through 9 November) was greater than 98% for both monitors.

Table 3: DustTrak Monitor Data Completeness

Date (November, 2016)	Overview of Cantimber Process Operations	Data Completeness (%)	
		DustTrak - South Street/1 Avenue	DustTrak - Stirling Street/1 Avenue
2 (17:00 – 24:00)	No operations	100	100
3	Start warm up of combustion chamber (8pm), charcoal and propane fuel sources	61	99
4	Combustion chamber warm up on charcoal and propane fuel sources	7	99
5		37	99
6		99	99
7	Start carbonization process for stack test (5pm)	98	99
8	Carbonization process operating – stack test	99	99
9	Activation process operating – stack test. Initiated shut down in the evening.	98	99
10	No operations	99	99
11		98	99
12		44	99
13		58	99
14		42	99

Figures 4 and 5 show the trends of the daily concentrations over the 2 to 15 November period from the DustTraks and the Port Alberni Elementary School monitor. All available data collected during the monitoring period is included in the figures, even though data completeness was not close to 100% for the daily period. Summary monitoring data is presented in a series of box-and-whisker plots. A simplified box-and-whisker plots are a type of bar chart that displays a variety of statistical data which allows for trend identification. The box on the figures represents the bounds of the middle (50th percentile) of the data points, with the top of the box representing the 75th percentile concentration and the bottom of the box representing the 25th percentile concentration. The blue diamond represents the average concentration. On the figures, the 'whiskers' extend up to the maximum, and down to the minimum daily concentration.

The DustTrak monitors generally recorded higher concentrations than the monitor at Port Alberni Elementary School, however on a daily basis they appear to track the same trends, with the exception of November 4th at the South Street/1Avenue location. Data completeness for this monitor on 4 November was poor, with only around an hour of monitoring data, which means this data is not a reliable indication of the daily average on this day.

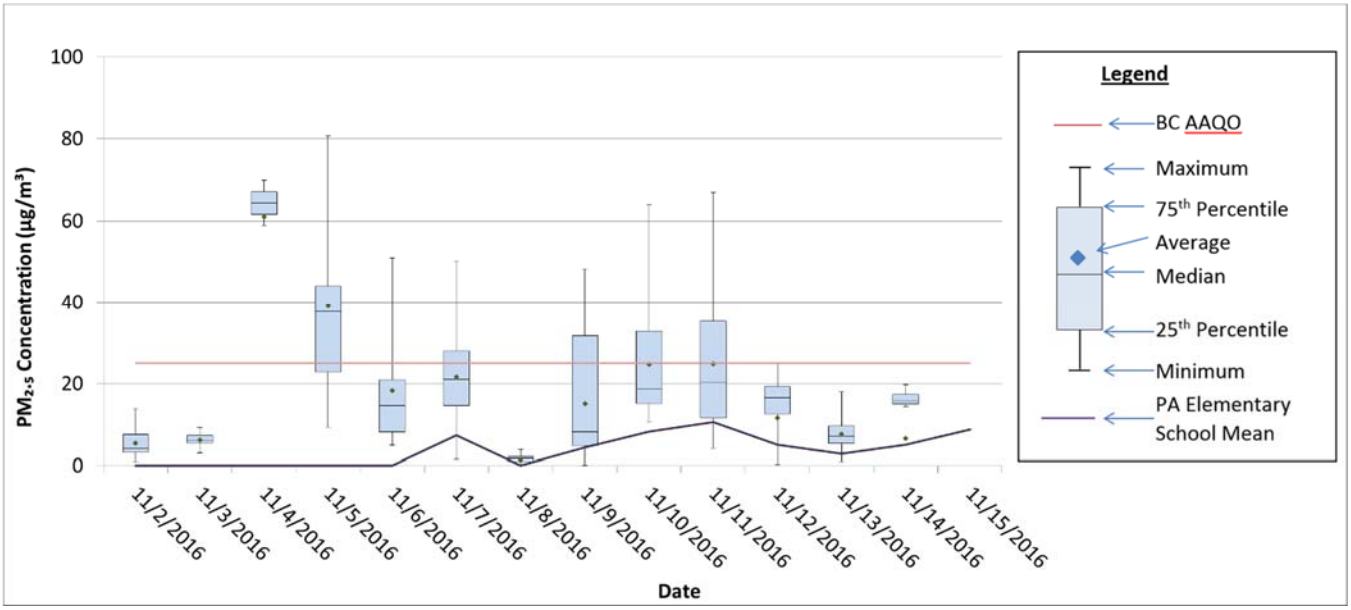

Figure 4: Daily Ambient Monitoring Data – DustTrak Located at South Street/1 Avenue

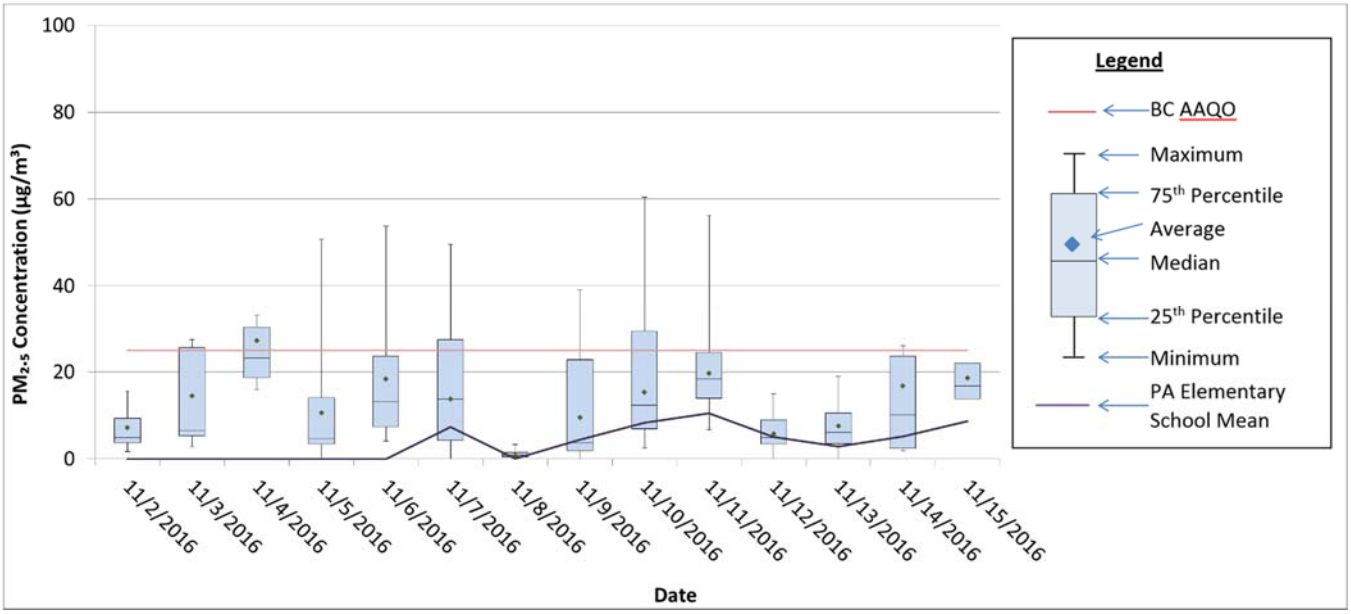

Figure 5: Ambient Monitoring Data - DustTrak Located at Stirling Street/1 Avenue

The hourly distribution of all the data from both monitors is shown in Figures 6 and 7. The figures show the $PM_{2.5}$ concentrations are greatest between 6pm and midnight, which is expected to correlate to the time of greatest use of wood stoves in the residential area. The hours of 21:00-23:00 at the South Street/1 Avenue monitor is the only period when ambient concentrations exceeded the BC 24-hour ambient air quality objective.

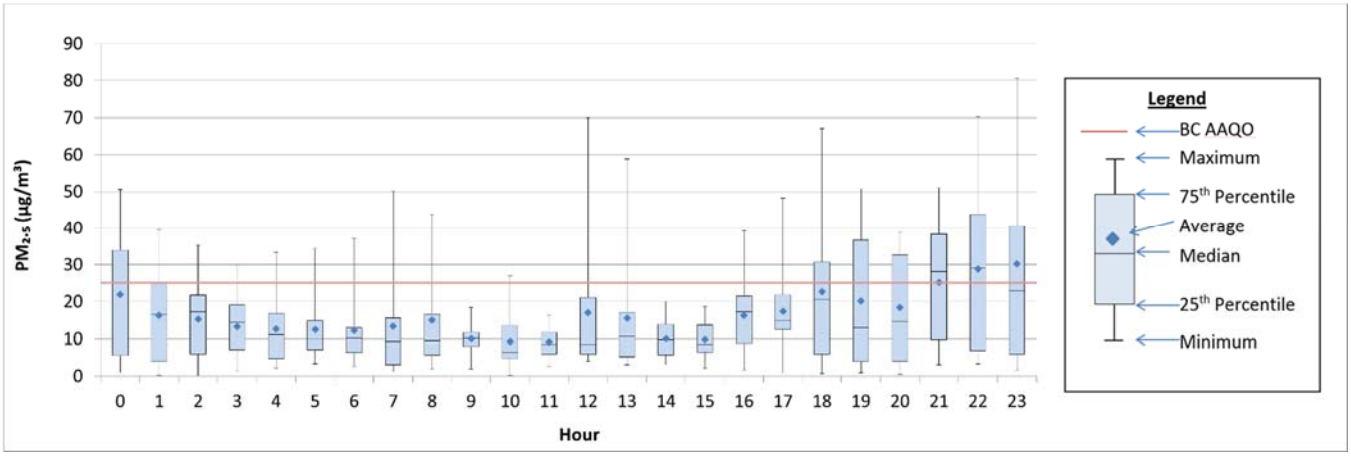

Figure 6: Hourly Concentration Distribution – DustTrak Located at South Street and 1 Avenue

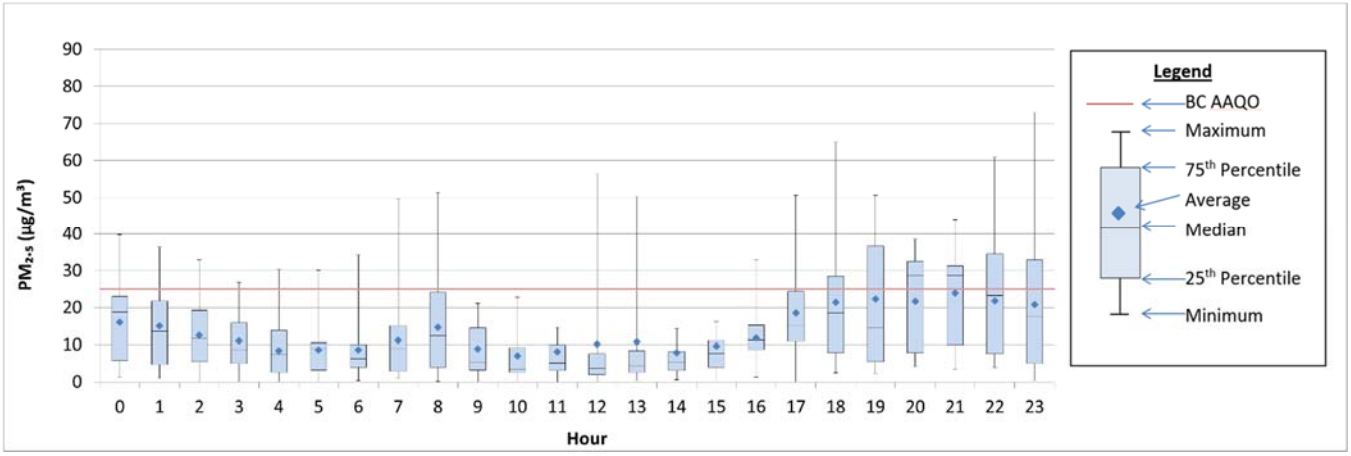

Figure 7: Hourly Concentration Distribution – DustTrak Located at Stirling Street and 1 Avenue

2.3.3 Partisol Monitoring by Cantimber

Daily particulate monitoring was undertaken throughout the stack test period by Cantimber using a Partisol sampler, and subsequent laboratory analysis. Based on the limited dataset, the daily data from the Partisol monitor correlated closely to the daily averages from the continuous monitor at the elementary school. Figure 8 provides a comparison of the daily averages between the Partisol, elementary school monitor and all available DustTrak data.

Figure 8: Daily Particulate Concentrations 2 to 12 November

Figure 8 shows that during the stack test period on 7, 8, and 9 November ambient concentrations of $PM_{2.5}$ were below BC ambient air quality objectives. With the exception of 4 November (which has been discussed in the previous section), the available daily data from the DustTrak monitors followed the same general daily trend as the Partisol and elementary school monitors. The DustTrak monitors consistently recorded higher concentrations than the Partisol and elementary school monitors.

2.3.4 Ambient Monitoring Recommendations

Recommendations relating to ambient monitoring are as follows:

- Given the significant difference in wind pattern between the Cantimber and elementary school station locations, the meteorological data from the elementary school location is not considered to be representative of the wind pattern at the Cantimber facility. Therefore it is recommended that a meteorological station is installed in the vicinity of the facility. This will provide information to use in the investigation of complaints and interpretation of ambient monitoring data. The specification and location of the meteorological station should be approved by a suitably qualified person.
- The current license conditions relating to continuous ambient monitoring should be updated based on the results of the recommended updated dispersion model assessment. Pending the results of the modeling, this would potentially include consideration of monitoring of other compounds in addition to $PM_{2.5}$.

2.4 Other Regulatory Considerations

Current regulatory conditions relating to air quality, including air emission levels and monitoring requirements relating to the facility, are outlined in the license between PAPA and Cantimber Biotech Inc. dated 1 May 2015. In summary, current air quality conditions include the following:

- Quarterly stack testing for $PM_{2.5}$ is required during the first year of operation on both stacks
- Stack sampling for NOx and CO is not required
- Continuous ambient $PM_{2.5}$ monitoring is required in the nearby adjacent residential area
- Process operations must cease between 10 November and 10 January

2.4.1 Regulatory Consideration Recommendations

Based on the findings of this study, the following additional recommendations are provided on regulatory considerations:

- The license is modified to incorporate the main aspects of a typical air emissions permit. This would generally include facility specific information on the processes undertaken at a facility, associated air pollution control systems, air emission limits, testing, monitoring, recordkeeping and reporting requirements, and complaint investigation requirements. This document would provide a clear basis for regulating air emissions from the facility.

- As well as requirements to collect and report data within a permit, conditions could be included in the permit that state the data/reports be interpreted by a suitably qualified person.
- The permit should include restrictions around the source of wood chips to ensure they are not in contact with saltwater, as this could potentially result in air emissions of dioxins and furans.
- The use of the current complaint log system, which the public can use to lodge complaints with the regulator (PAPA) is continued. Data captured in the complaint log would assist in the investigation and verification of any future complaints. This should be retained and available for inspection.
- The system of investigation and response to complaints by Cantimber should be continued, and this process should be formalized in the air emissions permit.
- Regular audits and inspections of the facility by a suitably qualified person should be undertaken, to verify compliance with 'permit' conditions and requirements. The inspection frequency may initially be high, but could be reduced in the future based on inspection results.
- The current license requirements for quarterly stack sampling should be updated based on the results of the recommended updated dispersion model assessment. Based on current data, quarterly stack testing for $PM_{2.5}$, NO_2 and CO is recommend during the first year of operation.

3.0 SUMMARY OF RECOMMENDATIONS

Table 4 provides a summary of recommendations. The recommendations shaded in grey should be completed prior to the facilities resumed operation.

Table 4: Summary of Recommendations

Tracking #	Recommendation
Process Operations	
1	The fuel source for the combustion chambers is changed to natural gas, and is automated.
2	A low temperature audible alarm is installed on both combustion chambers.
3	A datalogger is installed to record temperatures within both high temperature combustion chambers.
4	Regular fugitive emission surveys are undertaken on the carbonization process with an analyzer. Any leaks identified should be addressed immediately.
5	An industrial hygiene assessment of worker exposure should be undertaken to ensure workers exposures are below exposure limits. This assessment should conform to WorkSafe BC requirements.
6	The scrubber water disposal system should be upgraded to a contained system prior to the facilities resumed operation.
7	There should be a mechanism/procedure in place to replace the scrubber water as required to maintain efficiency of the particulate removal from exhaust gases.
8	Cooling water should be adequately cooled prior to discharge to surface drains.
Ambient Monitoring	
9	A meteorological station with a datalogger and web portal access to the data is installed in the proximity of the facility. The specification and location of the meteorological station should be approved by a suitably qualified person.
10	The current license requirements for continuous ambient monitoring should be updated based on the results of the recommended updated dispersion model assessment (recommendation #11). This would potentially include consideration of monitoring of additional compounds in addition to $PM_{2.5}$.
Stack Emissions	
11	The dispersion modelling is updated using the measured stack emissions, temperature and flow rates. The updated modelling should consider emissions of $PM_{2.5}$, NO_2, CO and individual VOCs including Acrolein, Acrylonitrile, Benzene and Napthalene. Given the magnitude of the CO emissions, the modelling assessment should be undertaken to confirm that the level of emissions result in acceptable ambient concentrations of CO prior to the facility re-commencing operations.
12	Speciated PAH testing is undertaken on both stacks in the near future.
13	Monitoring for CO at the facility and associated procedures should be developed to reduce the risk of worker exposure to CO. This may include both worker related monitoring and monitoring of ambient gas levels with audible alarms at the facility. This monitoring and procedures should conform to WorkSafe BC requirements.
14	Future stack sampling should consider the measured levels from this sampling effort, particularly the CO concentrations which were high, and plan appropriate health and safety procedures and controls.

Regulatory Considerations	
15	The license of operation is modified to incorporate the main aspects of a typical air emissions permit. This would generally include facility specific information on the processes undertaken, air pollution control systems conditions, air emission limits, monitoring and reporting requirements, complaint investigation requirements.
16	Data collected and reported under the permit should be interpreted by a suitable qualified person.
17	Use of the complaint log system is continued so that the public has a mechanism to file air quality complaints to the regulatory body (PAPA).
18	The system of investigation and follow up process to complaints received by Cantimber is continued, and this requirement is included in the air emissions permit.
19	Regular audits and inspection of the facility by a suitably qualified person, to verify compliance with 'permit' conditions and requirements. The inspection frequency may initially be high, but could be reduced in future based on compliance results.
20	Inclusion of a condition in the permit to avoid saltwater contact with the wood chip feedstock.
21	The current license requirements for quarterly stack sampling should be updated based on the results of the recommended updated dispersion model assessment. As a minimum, quarterly stack testing for $PM_{2.5}$, NO_2 and CO is recommend during the first year of operation.

4.0 LIMITATIONS

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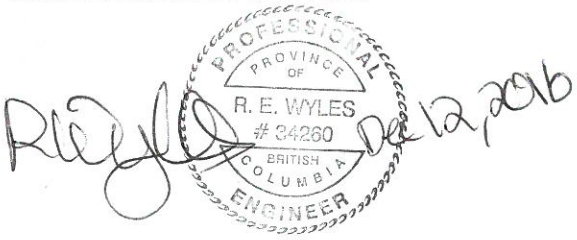

Rachel Wyles, MEng, PEng
Associate, Air Quality Engineer

Sean Capstick, PEng
Principal

RW/SC/it/rs

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REFERENCE

Levelton. 2015. Air Quality Assessment for the Cantimber Charcoal Manufacturing Facility. 21 January 2015.

APPENDIX A

Stack Test Report

EMISSIONS MONITORING SURVEY

Cantimber Biotech Inc.
Pt. Alberni, B.C.

Carbonization and Activation Stacks
November 2016 Survey

Prepared for:

Golder Associates Ltd.

Prepared by:

A. LANFRANCO & ASSOCIATES INC.

Surrey, B.C.

December 2016

CERTIFICATION

The field monitoring conducted for this survey was conducted by certified stack test technicians as required by the B.C. MOE stack testing code. The field crew consisted of:

Mr. C. Lanfranco (certified), Mr. D. Sampson (certified), and Mr. J. Burch (certified).

The report was prepared by Mr. M. Lanfranco and Mr. L. Agassiz using reporting principles and guidelines generally acceptable to B.C. MOE.

The field crew and A. Lanfranco and Associates Inc. certify that the test methods used were MOE/MV approved reference methods for the parameters investigated.

L. Agassiz, Certified Stack Test Technician

Report reviewed by:

M. Lanfranco
Managing Director

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APPENDICES

SUMMARY

The following tables present the average emission results for the listed parameters from Cantimber Biotech Inc.'s Carbonization Stack and Activation Stack from November 8-9, 2016. The individual test results can be seen in Tables 1 to 5 and in the appendix.

Parameter	Carbonization Stack (East)	Activation Stack (West)
Total Particulate (mg/Sm^3)	16.2	1.8
Total Particulate (mg/Sm^3 @ 8% O_2)	23.3	3.0
Particulate Emissions Rate (kg/hr)	0.03	0.003
Condensable Organics (mg/Sm^3)	0.6	0.0
PM_{10} (mass % of partic. <10 micron)	53.1%	100%
$PM_{2.5}$ (mass % of partic. <2.5 micron)	17.2%	62.7%
Phenol (mg/Sm^3)	0.2	0.1
Formaldehyde (mg/Sm^3)	13.5	0.8
Methanol (mg/Sm^3)	2.5	2.1
THC (mg/Sm^3)	20.5	51.5
NOx (mg/Sm^3)	63.0	58.8
SOx (mg/Sm^3)	2.6	0.4
CO (mg/Sm^3)	103	> 3180
CO (mg/Sm^3) from canisters	N/A	10200
THC (mg/Sm^3 @ 8% O_2)	29.5	84.7
NOx (mg/Sm^3 @ 8% O_2)	90.5	96.5
SOx (mg/Sm^3 @ 8% O_2)	3.8	0.65
CO (mg/Sm^3 @ 8% O_2)	149	> 5230
CO (mg/Sm^3 @ 8% O_2) from canisters	N/A	16800
Flowrate (Sm^3/min)	30.6	27.5

standard conditions of 20 deg C and 101.3 kPa

Note: Results for individual Volatile Organic Compounds can be found in Appendix 2 in the analytical report from ALS Environmental

1.0 INTRODUCTION

In November 2016, Golder Associates Ltd retained A. Lanfranco and Associates Inc. of Surrey, B.C. to conduct an emission survey at the Cantimber Biotech Inc facility located in Port Alberni, B.C. The purpose of the emission survey was to measure and report emission parameters and pollutants from the Carbonization and Activation Stacks. The parameters measured for both stacks include particulate matter with condensable particulate, PM 2.5, PM 10, Phenol, Formaldehyde, Methanol, Total Hydrocarbons (Organic Carbon), Nitrogen Oxides, Sulphur Oxides, Carbon Monoxide, Oxygen, Carbon Dioxide, flowrate, and moisture.

Normal operating parameters were maintained on the test days. Process information has been retained by Cantimber and Golder Associates.

This report documents the methods used and the results determined for the tests completed from November 8 to 9, 2016.

2.0 PROCESS DESCRIPTIONS

Cantimber Biotech Inc. project utilizes the abundant logging residue in the province of British Columbia as raw material. The main tree species are Douglas-fir, hemlock, red cedar and others. The project utilizes retort pyrolysis technology to produce clean and high quality charcoal. The project uses a fluidized based steam activation chamber to produce granular and powder pure physical method wood activated carbon, that can be further refined into pharmaceutical grade, food plant grade and chemical engineering grade raw material.

3.0 METHODOLOGY

All sampling and analytical methods used throughout this survey comply with procedures published in the B.C. "Field Sampling Manual, Source Testing Section" 2003 Edition, and the B.C. Air Analytical Manual, or with government approved sampling and analytical methods.

3.1 Sampling Techniques

The table below outlines the methods followed for the sampling regime at Cantimber Biotech Inc.

Parameter	Reference Method
Sample and velocity traverse points	EPA Method 1
Velocity and flowrate	EPA Method 2
Gas molecular weight (O_2/CO_2)	EPA Method 3 & 3a
Fluegas Moisture	EPA Method 4
Particulate Matter	EPA Method 5
Condensable Particulate Matter	EPA Method 202
Nitrogen Oxides (NOx)	EPA Method 7e
Sulphur Oxides (SOx)	EPA Method 6c
Carbon Monoxide (CO)	EPA Method 10
Total Organic Carbon as CH_4	EPA Method 25a
Volatile Organic Compounds (VOC)	EPA TO-15
Formaldehyde	NCASI 98.01
Methanol	NCASI 98.01
Phenol	NCASI 98.01
Particle Sizing	*CCSEM

*Computer controlled scanning electron microscopy for PM 10 and 2.5

Sampling for particulate and condensable particulate (EPA Method 202) from both stacks was conducted using Apex/CAE sampling trains equipped with heated filter assemblies and a heated four-foot probe (Fig. 1). The impinger sections of the sampling trains were charged with D.I. water for moisture and condensable particulate collection. The EPA 202 optional back filter was not used for this test program.

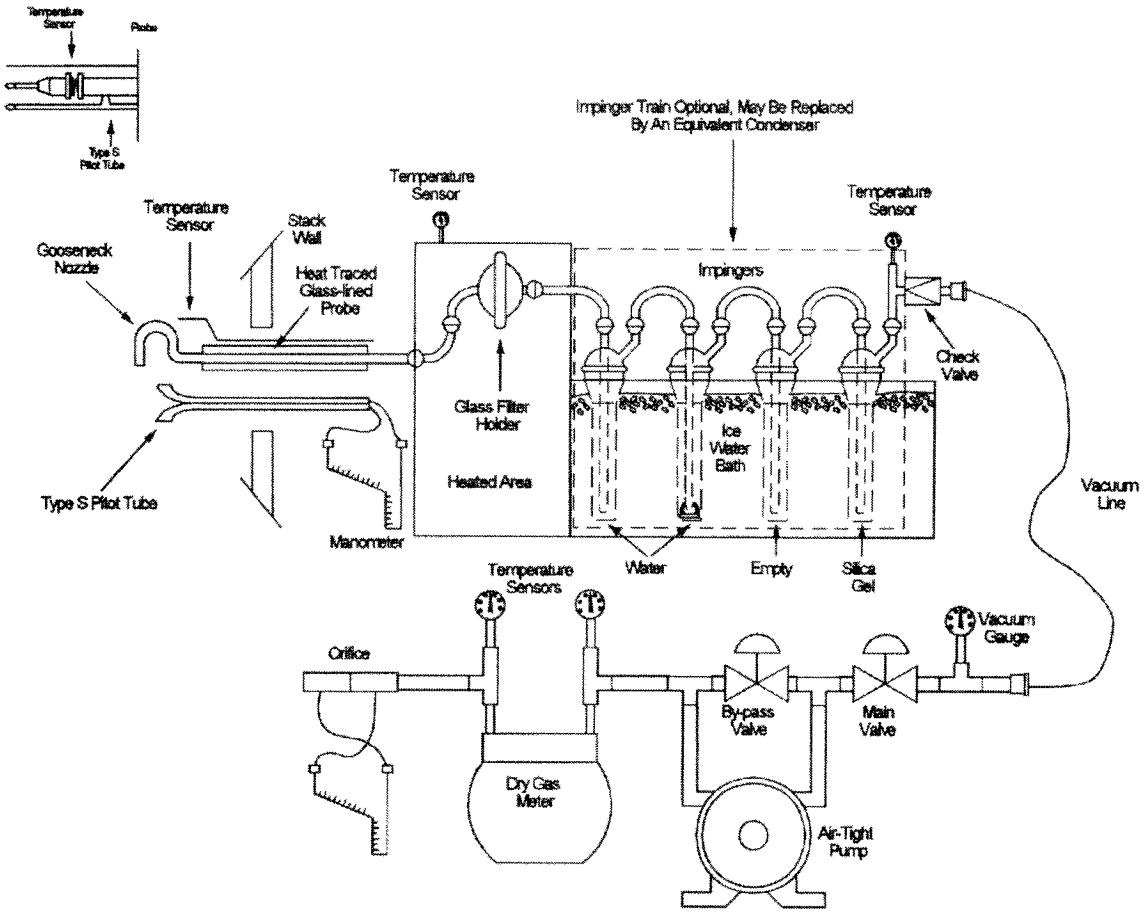


Figure 1: Method 202 Particulate Sampling Train (w/ 3 100 ml H_2O)

Cyclones were not used as part of the sampling apparatus.

Velocity measurements were made with S-type pitot tubes and oil manometers or Magnehelic gauges. Stack temperatures were monitored at each point by K-type thermocouples attached to the sampling probes. Oxygen and carbon dioxide measurements were made with Fyrite analysers (wet and electrochemical) and a sophisticated CEM system.

Orifice pressures recorded on the data sheets represent the orifice pressure for the beginning and end of each sample point.

Stack gas moisture content was determined by using the impinger condensed water vapour technique.

The sampling port location for both stacks did not meet ideal duct diameter criteria, thus the maximum 24-point (Fig. 2, 3/3a) sampling regime was used for these sources.
The sample ports were approximately 2.3 diameters downstream of the fans or nearest disturbance and more than two diameters upstream of the stack exits.

Samples for particulate/condensable organics were collected for 60 minute durations resulting in sample volumes of about 1.5 cubic meters (as sampled).

Isokinetic sampling rates were determined with programmable calculators using the Ko orifice constant procedure. The stacks were checked for cyclonic flow using methods outlined in the source test code. No cyclonic flow condition existed.

Phenol/Formaldehyde/Methanol

Phenol and formaldehyde were sampled using NCASI CI/WP 98.01 test methodology, using a independent small impinger train charged with distilled water. Samples were collected for 60 minutes at a sample rate of about 0.4-0.5 lpm. Sampling was conducted in triplicate.

Figure 2: Location of Traverse Points in Circular Stacks

(inches from inside w all to traverse point)

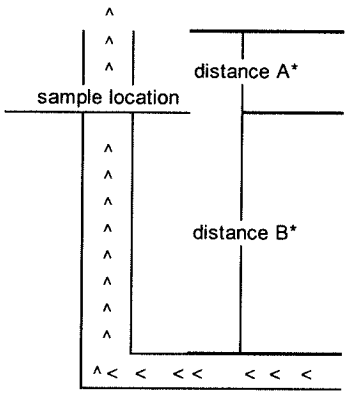
Client Stack I.D.: Cantimber Carbonization Stack

Diameter (inches)	72
Total Points	24
# of Ports Used	2
Points / Traverse	12

Diameters Upstream: > 0.5

Diameters Downstream: > 2

Point	Distance from Wall
1	1.5
2	4.8
3	8.5
4	12.7
5	18.0
6	25.6
7	46.4
8	54.0
9	59.3
10	63.5
11	67.2
12	70.5



* distance A : duct diameters upstream from flow disturbance
* distance B : duct diameters downstream from flow disturbance
< < < < : flow direction

Figure 3: Location of Traverse Points in Circular Stacks

(inches from inside w all to traverse point)

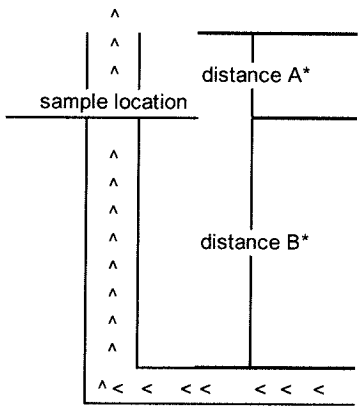
Client Stack I.D.: Cantimber Activation Stack

Diameter (inches)	15
Total Points	24
# of Ports Used	2
Points / Traverse	12

Diameters Upstream: > 0.5

Diameters Downstream: > 2

Point	Distance from Wall
1	0.3
2	1.0
3	1.8
4	2.7
5	3.8
6	5.3
7	9.7
8	11.3
9	12.3
10	13.2
11	14.0
12	14.7



* distance A : duct diameters upstream from flow disturbance
* distance B : duct diameters downstream from flow disturbance
< < < < : flow direction

Figure 3a: Location of Traverse Points in Circular Stacks

(percent of diameter from inside wall to traverse point)

Traverse Point Number on a Diameter	Number of Traverse Points on a Diameter					
	2	4	6	8	10	12
1	14.6%	6.7%	4.4%	3.2%	2.6%	2.1%
2	85.4%	25.0%	14.6%	10.5%	8.2%	6.7%
3		75.0%	29.6%	19.4%	14.6%	11.8%
4		93.3%	70.4%	32.3%	22.6%	17.7%
5			85.4%	67.7%	34.2%	25.0%
6			95.6%	80.6%	65.8%	35.6%
7				89.5%	77.4%	64.4%
8				96.8%	85.4%	75.0%
9					91.8%	82.3%
10					97.4%	88.2%
11						93.3%
12						97.9%

CEM System for THC, NO_x, SO_x, CO, CO_2 and O_2

Continuous emission monitoring (CEM) was conducted for NO_x, SO_2, CO ,THC, O_2 and CO_2 using A. Lanfranco and Associates Inc. CEM monitoring mobile laboratory. The analyzers were calibrated with EPA Protocol gas standards.

NO_x	API Chemiluminescence Monitor, Model 252 for $NO/NO_2/NO_x$ with ranges from 0 to 2000 ppm. Range 0 to 100 ppm was used for all tests.
$CO/CO_2/O_2$	California Analytical Model 300 Infrared Analyzer with ranges 0 to 2000 ppm CO, and 0 to 40% CO_2, and 0 to 25% O_2
THC	JUM Model , Hot FID Analyzer with ranges 0 to 100000 ppm
SO_2	Ametek Model 721-M Photometric Analyzer with ranges 0-2000 ppm

A diagram of the sampling, conditioning and analyzer system is provided in Figure 4. With this system, the stack gas sample is withdrawn from the source through a coarse filter and stainless steel probe. For all CEM analysis except THC, the stack sample is transported in a heated Teflon sample line to a gas conditioner (KWW Mak II) where condensed water is removed. The dried stack gas is

delivered to a stainless-steel manifold, which distributes (by external pumps) the dried stack gas to the individual analyzers. THC is measured on a hot /wet basis.

Samples for NO_x, SOx and THC as well as combustion gases (CO, O_2, CO_2) were collected and analyzed for three, one-hour test periods on each of the stacks.

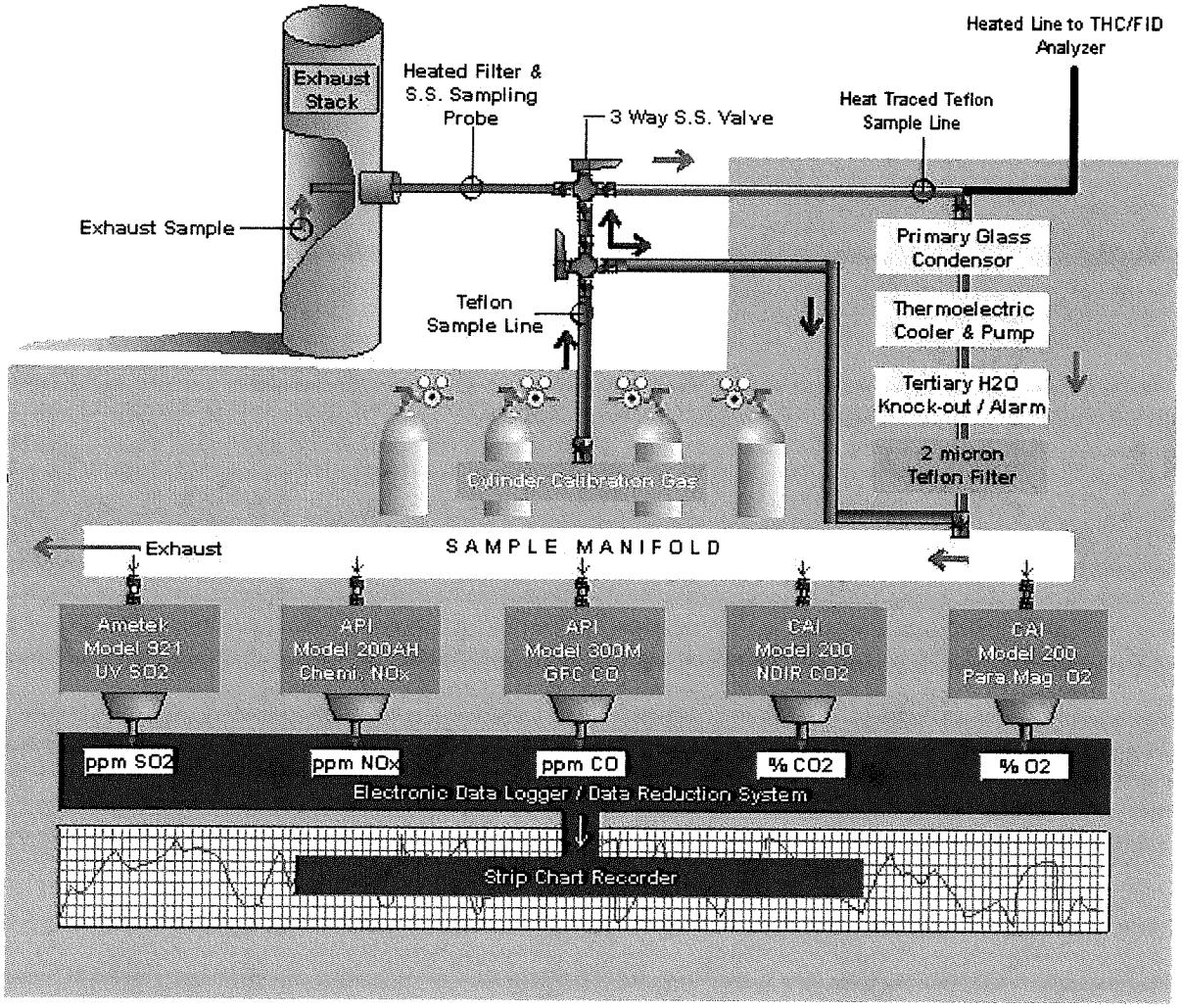


Figure 4 – CEM Measurement System Schematic

3.2 Analytical Techniques

Glass fibre filters used for this survey were Whatman GF/A 0.3 u glass microfibre filters. The filters were initially conditioned by one hour oven drying and desiccating to constant weight. Following sampling, the filters were removed from their holders (in a clean environment) with stainless steel tweezers, oven dried at 105°C for one hour and desiccated to constant weight. Any filter material adhering to the gasket was scraped with a stainless steel razor blade and deposited on the filter. The particulate collected on the filter was determined by the difference of initial and final weights, adjusted for blank values.

Moisture determinations were made by before and after test impinger weights or saturation values. Impinger contents from each test were saved for condensable (hexane extractable) analysis by Exova Laboratories in Surrey, B.C. The impingers used were rinsed using Hexane and de-ionized water to recover any oily residues from the impinger walls.

Probe washings were evaporated in tared pyrex beakers using oven drying at 105 °C for about eight hours and desiccation to constant weight. Probe and washings particulate was determined by difference of initial and final dish weights, adjusted for blank values.

Methanol, Phenol and formaldehyde were analysed according to the analytical methods stipulated in NCASI 98.01. Phenol was analysed by direct aqueous injection and GC analysis, while formaldehyde was analysed with the acetylacetone colorimetric procedure. Analysis was performed by Exova Laboratories in Surrey, B.C.

CEM results were calculated from the analyzer responses to stack gases, in comparison to the analyzer responses to known certified calibration gases.

3.3 Quality Assurance and Control

QA/QC of this survey was accomplished by the following mechanisms.

1. Pre and post-test leak checks to RM specs
2. Calibration of emission test equipment to RM specs
3. Cyclonic flow checks
4. CEM system zero and calibration drift and Bias determinations
5. Calibration error assessments
6. CEM calibrations using EPA Protocol and 1% calibration gases
7. 3 point initial calibration and calibration error checks
8. Analysis of all blank solutions and materials
9. Sample labelling, record-keeping, and chain-of-custody documentation

Reference materials, blanks were analysed to validate all laboratory analyses.

4.0 RESULTS

Emission results were calculated with a computer program utilizing formulae approved by BC MOE. The computer outputs were checked by hand calculation. Tables 1 through 5 present the individual and average test data for triplicate particulate/condensables tests from the two stacks.

In the following tables, particulate and flowrate are shown in actual, standard or corrected standard terms. The "std" particulate results are mg/m^3 at standard conditions of 20 °C and 101.3 KPa (dry).

The "actual" flowrate results are volumetric flowrate at stack conditions while the standard flowrates are flowrates corrected to 20 °C and 101.3 KPa (dry).

Point by point isokinetic rates are presented in Appendix 1.

CEM and manual gas sampling results for three, one hour periods are presented in the tables. Minutely averages and trend graphs for THC, CO_2, O_2, SO_x, NO_x, and CO are presented in Appendix 1.

Table 1: Cantimber Carbonization Stack

Parameter		Test 1	Test 2	Test 3	Average
Test Date		Nov.8, 2016	Nov.8, 2016	Nov.8, 2016	
Test Time		11:50-12:58	13:20-14:26	14:40-15:42	
Duration	(minutes)	60	60	60	60
Particulate including Condensable Organics	(mg/Sm^3)	18.9	11.6	18.2	16.2
Particulate including Condensable Organics	(mg/Sm^3 @ 8% O_2)	27.8	16.7	25.5	23.3
Particulate Front Half	(mg/Sm^3)	18.1	11.6	17.3	15.6
Particulate Back Half	(mg/Sm^3)	0.87	0.00	0.93	0.60
Particulate	(Kg/hr)	0.04	0.02	0.03	0.03
PM_{10}	(mass % of partic. <10 micron)				53.1%
$PM_{2.5}$	(mass % of partic. <2.5 micron)				17.2%
Phenol	(mg/Sm^3)	0.2	0.1	0.2	0.2
Formaldehyde	(mg/Sm^3)	13.4	13.5	13.6	13.5
Methanol	(mg/Sm^3)	1.4	2.4	3.7	2.5
Flowrate	(Sm^3/min)	31.1	30.3	30.4	30.6
Flowrate	(Am^3/min)	42.1	42.1	41.7	42.0
Temperature	(°C)	58.4	60.4	59.3	59.4
O_2	(vol % dry)	12.1	11.9	11.7	11.9
CO_2	(vol % dry)	8.81	8.96	9.07	8.94
H_2O	(vol %)	16.4	18.3	17.4	17.4
Isokinetic Variation	(%)	99.9	100	96.0	98.7

standard conditions of 20 deg C and 101.3kPa

Table 2: Carbonization Stack Gaseous Emissions

Parameter		Test 1	Test 2	Test 3	Average
Test Date		8-Nov-16	8-Nov-16	8-Nov-16	
Test Time		12:15 - 13:15	13:40 - 14:40	15:00 - 16:00	
Test Duration	(min)	60	60	60	60
Nitrogen Oxides as NO_2	(mg/Sm^3)	61.4	62.6	65.0	63.0
Nitrogen Oxides as NO_2	(mg/Sm^3 @ 8% O_2)	90.1	90.2	91.2	90.5
Nitrogen Oxides as NO_2	(kg/hr)	0.11	0.11	0.12	0.12
Total HC as CH_4	(mg/Sm^3)	22.5	21.5	17.5	20.5
Total HC as CH_4	(mg/Sm^3 @ 8% O_2)	33.0	30.9	24.6	29.5
Total HC as CH_4	(kg/hr)	0.04	0.04	0.03	0.04
Sulphur Dioxide	(mg/Sm^3)	2.7	4.0	1.2	2.6
Sulphur Dioxide	(mg/Sm^3 @ 8% O_2)	4.0	5.7	1.7	3.8
Sulphur Dioxide	(kg/hr)	0.005	0.007	0.002	0.005
Carbon Monoxide	(mg/Sm^3)	172	90.4	44.8	103
Carbon Monoxide	(mg/Sm^3 @ 8% O_2)	253	130	63.0	149
Carbon Monoxide	(kg/hr)	0.32	0.16	0.08	0.19

standard conditions of 20 deg C and 101.3kPa

Table 3: Cantimber Activation Stack

Parameter		Test 1	Test 2	Test 3	Average
Test Date		Nov.9, 2016	Nov.9, 2016	Nov.9, 2016	
Test Time		09:50-10:51	11:25-12:28	13:10-14:16	
Duration	(minutes)	60	60	60	60
Particulate including Condensable Organics	(mg/Sm^3)	1.09	2.95	1.36	1.80
Particulate including Condensable Organics	(mg/Sm^3 @ 8% O_2)	1.79	4.83	2.24	2.95
Particulate Front Half	(mg/Sm^3)	1.09	2.95	1.36	1.80
Particulate Back Half	(mg/Sm^3)	0.0	0.0	0.0	0.0
Particulate	(Kg/hr)	0.002	0.005	0.002	0.003
PM_{10}	(mass % of partic. <10 micron)				100%
$PM_{2.5}$	(mass % of partic. <2.5 micron)				62.7%
Phenol	(mg/Sm^3)	0.1	0.1	0.1	0.1
Formaldehyde	(mg/Sm^3)	1.0	0.8	0.5	0.8
Methanol	(mg/Sm^3)	1.7	2.1	2.3	2.1
Flowrate	(Sm^3/min)	28.2	27.0	27.4	27.5
Flowrate	(Am^3/min)	37.7	36.0	36.5	36.7
Temperature	(°C)	59.0	58.3	57.7	58.3
O_2	(vol % dry)	13.0	13.0	13.1	13.0
CO_2	(vol % dry)	7.37	7.30	7.09	7.25
H_2O	(vol %)	15.9	15.9	15.8	15.9
Isokinetic Variation	(%)	97.7	99.3	100	99.0

standard conditions of 20 deg C and 101.3kPa

Table 4: Activation Stack Gaseous Emissions

Parameter		Test 1	Test 2	Test 3	Average
Test Date		9-Nov-16	9-Nov-16	9-Nov-16	
Test Time		10:15 - 11:15	11:35 - 12:35	13:10 - 14:10	
Test Duration	(min)	60	60	60	60
Nitrogen Oxides as NO_2	(mg/Sm^3)	54.7	59.4	62.2	58.8
Nitrogen Oxides as NO_2	(mg/Sm^3 @ 8% O_2)	89.3	97.3	103	96.5
Nitrogen Oxides as NO_2	(kg/hr)	0.09	0.10	0.10	0.10
Total HC as CH_4	(mg/Sm^3)	30.1	46.7	77.7	51.5
Total HC as CH_4	(mg/Sm^3 @ 8% O_2)	49.1	76.5	128	84.7
Total HC as CH_4	(kg/hr)	0.05	0.08	0.13	0.08
Sulphur Dioxide	(mg/Sm^3)	0.50	0.38	0.31	0.40
Sulphur Dioxide	(mg/Sm^3 @ 8% O_2)	0.82	0.63	0.51	0.65
Sulphur Dioxide	(kg/hr)	0.001	0.001	0.001	0.001
Carbon Monoxide	(mg/Sm^3)	> 3170	> 3190	> 3190	> 3180
Carbon Monoxide	(mg/Sm^3 @ 8% O_2)	> 5180	> 5220	> 5280	> 5230
Carbon Monoxide	(kg/hr)	> 5.37	> 5.16	> 5.24	> 5.26
Carbon Monoxide from canisters	(mg/Sm^3)	6820	9940	13900	10200
Carbon Monoxide from canisters	(mg/Sm^3 @ 8% O_2)	11100	16300	23000	16800
Carbon Monoxide from canisters	(kg/hr)	11.5	16.1	22.8	16.8

standard conditions of 20 deg C and 101.3kPa

TABLE 5: GRAVIMETRIC RESULTS

	Filter Particulate (mg)	Probe and Washings Particulate (mg)	Condensable Particulate (mg)	Total Particulate (mg)
Carbonization Stack				
Test 1	17.8	2.9	1.0	21.7
Test 2	10.8	2.2	0.0	13.0
Test 3	18.3	0.3	1.0	19.6
Activation Stack				
Test 1	0.3	1.0	0.0	1.3
Test 2	0.4	3.0	0.0	3.4
Test 3	0.5	1.1	0.0	1.6

5.0 DISCUSSION OF RESULTS

Triplicate emission tests from the Carbonization and Activation stacks were conducted with Ministry of Environment or EPA approved techniques for particulate matter including condensable particulate, methane, THC, and volumetric flowrate, as well as phenol and formaldehyde.

During the testing period, Cantimber was operating the processes in a normal manner at normal production rates.

CEM data showed consistent results from both sources, with some variation that can be expected within normal operating conditions. The levels of CO on the Activation stack were higher than the largest scale of the CO analyzer can handle. Thus, the CO results from the canister analysis are taken as the accurate results.

There were no problems with sample collection or analysis and all samples were collected isokinetically (100 +/- 10%), where required. The results are in the anticipated ranges based on process loads and operating conditions and the tests were conducted by certified technicians using calibrated source test equipment. The results, therefore, are presented with confidence and are an accurate representation of emission characteristics for the process conditions maintained on the test dates.

APPENDIX 1

COMPUTER OUTPUTS OF MEASURED AND CALCULATED DATA AND CEM DATA

Client:	Cantimber	**Date:**	Nov.8, 2016
Jobsite:	Pt. Alberni, BC	**Run:**	1 Part/Cond
Source:	Carbonization Stack	**Run Time:**	11:50-12:58

Particulate Concentration:		**18.9 mg/dscm**	0.0083 gr/dscf
		14.0 mg/Acm	0.0061 gr/Acf
	Front Half:	18.1 mg/dscm	
	Back Half:	0.9 mg/dscm	
		27.8 mg/dscm (@ 8% O2)	0.0121 gr/dscf (@ 8% O2)
Emission Rate:		0.04 Kg/hr	0.078 lb/hr
Sample Gas Volume:		1.1460 dscm	40.472 dscf
Total Sample Time:		60.0 minutes	
Average Isokineticity:		99.9 %	

Flue Gas Characteristics

Moisture:	16.43	
Temperature	58.4 oC	137.2 oF
Flow	31.1 dscm/min	1098 dscf/min
	0.52 dscm/sec	18.3 dscf/sec
	42.1 Acm/min	1486 Acf/min
Velocity	6.152 m/sec	20.18 f/sec
Gas Analysis	12.10 % O2	8.81 % CO2
	29.893 Mol. Wt (g/gmole) Dry	27.939 Mol. Wt (g/gmole) Wet

*** Standard Conditions:** Metric: 20 deg C, 101.325 kPa
Imperial: 68 deg F, 29.92 in.Hg

Client:	Cantimber	**Date:**	Nov.8, 2016
Jobsite:	Pt. Alberni, BC	**Run:**	1 Part/Cond
Source:	Carbonization Stack	**Run Time:**	11:50-12:58

Control Unit (Y)	1.0194
Nozzle Diameter (in.)	0.3720
Pitot Factor	0.8450
Baro. Press. (in. Hg)	29.92
Static Press. (in. H2O)	0.05
Stack Height (ft)	40
Stack Diameter (in.)	15.0
Stack Area (sq.ft.)	1.227
Minutes Per Reading	2.5
Minutes Per Point	2.5
Port Length (inches)	3.0

Gas Analysis (Vol. %):

	CO2	O2
CEM AVG:	8.81	12.10
Average =	**8.81**	**12.10**

Condensate Collection:

Impinger 1 (grams)	116.0
Impinger 2 (grams)	40.0
Impinger 3 (grams)	4.0
Impinger 4 (grams)	9.0
Total Gain (grams)	**169.0**

Collection:

Filter (grams)	**0.0178**
Washings (grams)	**0.0029**
Impinger (grams)	**0.0010**
Total (grams)	**0.0217**

Traverse	Point	Time (min.)	Dry Gas Meter (ft3)	Pitot ^P (in. H2O)	Orifice ^H (in. H2O)	Dry Gas Temperature Inlet (oF)	Outlet (oF)	Stack (oF)	Wall Dist. (in.)	Isokin. (%)
		0.0	438.568							
1	1	2.5	440.230	0.100	1.53	68	68	121	1.0	103.9
	2	5.0	441.900	0.100	1.52	68	68	123	1.0	104.6
	3	7.5	443.500	0.100	1.46	68	68	127	1.8	100.5
	4	10.0	445.090	0.100	1.42	68	68	130	2.6	100.1
	5	12.5	446.680	0.100	1.42	68	68	132	3.7	100.3
	6	15.0	448.270	0.100	1.42	68	68	134	5.3	100.5
	7	17.5	449.860	0.100	1.41	68	68	136	9.7	100.6
	8	20.0	451.440	0.100	1.41	68	68	138	11.2	100.2
	9	22.5	453.030	0.100	1.41	69	69	138	12.3	100.6
	10	25.0	454.620	0.100	1.41	70	70	139	13.2	100.5
	11	27.5	456.210	0.100	1.41	70	70	139	14.0	100.5
	12	30.0	457.790	0.100	1.41	70	70	140	14.0	99.9
		0.0	457.790							
2	1	2.5	459.460	0.110	1.55	71	71	140	1.0	100.6
	2	5.0	461.130	0.110	1.55	71	71	140	1.0	100.6
	3	7.5	462.760	0.110	1.49	71	71	140	1.8	98.1
	4	10.0	464.390	0.110	1.49	71	71	140	2.6	98.1
	5	12.5	466.100	0.120	1.62	72	72	141	3.7	98.5
	6	15.0	467.810	0.120	1.62	73	73	142	5.3	98.4
	7	17.5	469.520	0.120	1.62	74	74	142	9.7	98.2
	8	20.0	471.230	0.120	1.63	74	74	142	11.2	98.2
	9	22.5	473.020	0.130	1.76	74	74	142	12.3	98.8
	10	25.0	474.810	0.130	1.76	75	75	142	13.2	98.6
	11	27.5	476.600	0.130	1.76	75	75	142	14.0	98.6
	12	30.0	478.330	0.120	1.63	75	75	142	14.0	99.2
			Average:	0.110	1.530	70.8	70.8	137.2		99.9

Client:	Cantimber	**Date:**	Nov.8, 2016
Jobsite:	Pt. Alberni, BC	**Run:**	2 - Part/Cond
Source:	Carbonization Stack	**Run Time:**	13:20-14:26

Particulate Concentration:		**11.6 mg/dscm**	0.0051 gr/dscf
		8.3 mg/Acm	0.0036 gr/Acf
	Front Half:	11.6 mg/dscm	
	Back Half:	0.0 mg/dscm	
		16.7 mg/dscm (@ 8% O2)	0.0073 gr/dscf (@ 8% O2)
Emission Rate:		0.02 Kg/hr	0.046 lb/hr
Sample Gas Volume:		1.1200 dscm	39.553 dscf
Total Sample Time:		60.0 minutes	
Average Isokineticity:		100.3 %	

Flue Gas Characteristics

Moisture:	18.27	
Temperature	60.4 oC	140.7 oF
Flow	30.3 dscm/min	1069 dscf/min
	0.50 dscm/sec	17.8 dscf/sec
	42.1 Acm/min	1488 Acf/min
Velocity	6.159 m/sec	20.21 f/sec
Gas Analysis	11.94 % O2	8.96 % CO2
	29.911 Mol. Wt (g/gmole) Dry	27.736 Mol. Wt (g/gmole) Wet

*** Standard Conditions:** Metric: 20 deg C, 101.325 kPa
Imperial: 68 deg F, 29.92 in.Hg

Client:	Cantimber	**Date:**	Nov.8, 2016
Jobsite:	Pt. Alberni, BC	**Run:**	2 - Part/Cond
Source:	Carbonization Stack	**Run Time:**	13:20-14:26

Control Unit (Y)	1.0194
Nozzle Diameter (in.)	0.3720
Pitot Factor	0.8450
Baro. Press. (in. Hg)	29.92
Static Press. (in. H2O)	0.05
Stack Height (ft)	40
Stack Diameter (in.)	15.0
Stack Area (sq.ft.)	1.227
Minutes Per Reading	2.5
Minutes Per Point	2.5
Port Length (inches)	3.0

Gas Analysis (Vol. %):

	CO2	O2
CEM AVG:	8.96	11.94
Average =	**8.96**	**11.94**

Condensate Collection:

Impinger 1 (grams)	150.0
Impinger 2 (grams)	26.0
Impinger 3 (grams)	2.0
Impinger 4 (grams)	9.8
Total Gain (grams)	**187.8**

Collection:

Filter (grams)	**0.0108**
Washings (grams)	**0.0022**
Impinger (grams)	**0.0000**
Total (grams)	**0.0130**

Traverse	Point	Time (min.)	Dry Gas Meter (ft3)	Pitot ^P (in. H2O)	Orifice ^H (in. H2O)	Dry Gas Temperature Inlet (oF)	Outlet (oF)	Stack (oF)	Wall Dist. (in.)	Isokin. (%)
		0.0	478.606							
1	1	2.5	480.180	0.100	1.36	76	76	141	1.0	100.4
	2	5.0	481.750	0.100	1.36	76	76	141	1.0	100.1
	3	7.5	483.320	0.100	1.36	76	76	140	1.8	100.0
	4	10.0	484.890	0.100	1.36	76	76	140	2.6	100.0
	5	12.5	486.460	0.100	1.36	76	76	140	3.7	100.0
	6	15.0	488.040	0.100	1.36	76	76	140	5.3	100.7
	7	17.5	489.620	0.100	1.36	76	76	140	9.7	100.7
	8	20.0	491.190	0.100	1.36	76	76	140	11.2	100.0
	9	22.5	492.760	0.100	1.36	76	76	140	12.3	100.0
	10	25.0	494.330	0.100	1.36	76	76	140	13.2	100.0
	11	27.5	495.900	0.100	1.36	76	76	140	14.0	100.0
	12	30.0	497.470	0.100	1.36	76	76	142	14.0	100.2
		0.0	497.470							
2	1	2.5	499.190	0.120	1.63	77	77	142	1.0	100.1
	2	5.0	500.920	0.120	1.63	78	78	143	1.0	100.6
	3	7.5	502.650	0.120	1.64	78	78	142	1.8	100.5
	4	10.0	504.380	0.120	1.64	78	78	141	2.6	100.4
	5	12.5	506.110	0.120	1.64	78	78	141	3.7	100.4
	6	15.0	507.840	0.120	1.64	78	78	141	5.3	100.4
	7	17.5	509.570	0.120	1.64	78	78	141	9.7	100.4
	8	20.0	511.300	0.120	1.65	79	79	141	11.2	100.2
	9	22.5	512.960	0.110	1.51	80	80	140	12.3	100.1
	10	25.0	514.630	0.110	1.51	81	81	140	13.2	100.6
	11	27.5	516.290	0.110	1.51	80	80	140	14.0	100.1
	12	30.0	517.953	0.110	1.51	80	80	140	14.0	100.3
			Average:	0.108	1.478	77.4	77.4	140.7		100.3

Client:	Cantimber	**Date:**	Nov.8, 2016
Jobsite:	Pt. Alberni, BC	**Run:**	3 - Part/Cond
Source:	Carbonization Stack	**Run Time:**	14:40-15:42

Particulate Concentration:		**18.2 mg/dscm**	0.0079 gr/dscf
		13.3 mg/Acm	0.0058 gr/Acf
	Front Half:	17.3 mg/dscm	
	Back Half:	0.9 mg/dscm	
		25.5 mg/dscm (@ 8% O2)	0.0112 gr/dscf (@ 8% O2)
Emission Rate:		0.03 Kg/hr	0.073 lb/hr
Sample Gas Volume:		1.0778 dscm	38.064 dscf
Total Sample Time:		60.0 minutes	
Average Isokineticity:		96.0 %	

Flue Gas Characteristics

Moisture:	17.36	
Temperature	59.3 oC	138.8 oF
Flow	30.4 dscm/min	1074 dscf/min
	0.51 dscm/sec	17.9 dscf/sec
	41.7 Acm/min	1474 Acf/min
Velocity	6.102 m/sec	20.02 f/sec
Gas Analysis	11.72 % O2	9.07 % CO2
	29.919 Mol. Wt (g/gmole) Dry	27.850 Mol. Wt (g/gmole) Wet

*** Standard Conditions:** Metric: 20 deg C, 101.325 kPa
Imperial: 68 deg F, 29.92 in.Hg

Client:	Cantimber	**Date:**	Nov.8, 2016
Jobsite:	Pt. Alberni, BC	**Run:**	3 - Part/Cond
Source:	Carbonization Stack	**Run Time:**	14:40-15:42

Control Unit (Y)	1.0194
Nozzle Diameter (in.)	0.3720
Pitot Factor	0.8450
Baro. Press. (in. Hg)	29.92
Static Press. (in. H2O)	0.05
Stack Height (ft)	40
Stack Diameter (in.)	15.0
Stack Area (sq.ft.)	1.227
Minutes Per Reading	2.5
Minutes Per Point	2.5
Port Length (inches)	3.0

Gas Analysis (Vol. %):

	CO2	O2
CEM AVG:	9.07	11.72
Average =	**9.07**	**11.72**

Condensate Collection:

Impinger 1 (grams)	146.0
Impinger 2 (grams)	14.0
Impinger 3 (grams)	0.0
Impinger 4 (grams)	9.9
Total Gain (grams)	**169.9**

Collection:

Filter (grams)	**0.0183**
Washings (grams)	**0.0003**
Impinger (grams)	**0.0010**
Total (grams)	**0.0196**

Traverse	Point	Time (min.)	Dry Gas Meter (ft3)	Pitot ^P (in. H2O)	Orifice ^H (in. H2O)	Dry Gas Temperature Inlet (oF)	Outlet (oF)	Stack (oF)	Wall Dist. (in.)	Isokin. (%)
		0.0	518.235							
1	1	2.5	519.810	0.100	1.37	78	78	139	1.0	99.0
	2	5.0	521.390	0.100	1.37	78	78	139	1.0	99.3
	3	7.5	522.970	0.100	1.37	78	78	139	1.8	99.3
	4	10.0	524.490	0.100	1.26	78	78	139	2.6	95.5
	5	12.5	526.010	0.100	1.26	78	78	138	3.7	95.4
	6	15.0	527.530	0.100	1.26	78	78	138	5.3	95.4
	7	17.5	529.050	0.100	1.26	77	77	139	9.7	95.7
	8	20.0	530.570	0.100	1.26	77	77	139	11.2	95.7
	9	22.5	532.090	0.100	1.26	78	78	138	12.3	95.4
	10	25.0	533.610	0.100	1.26	78	78	138	13.2	95.4
	11	27.5	535.130	0.100	1.26	77	77	139	14.0	95.7
	12	30.0	536.650	0.100	1.26	77	77	139	14.0	95.7
		0.0	536.650							
2	1	2.5	538.240	0.110	1.39	78	78	139	1.0	95.3
	2	5.0	539.830	0.110	1.39	78	78	139	1.0	95.3
	3	7.5	541.430	0.110	1.39	78	78	139	1.8	95.9
	4	10.0	543.090	0.120	1.52	78	78	139	2.6	95.3
	5	12.5	544.760	0.120	1.52	78	78	138	3.7	95.8
	6	15.0	546.430	0.120	1.52	78	78	139	5.3	95.9
	7	17.5	548.090	0.120	1.52	78	78	139	9.7	95.3
	8	20.0	549.760	0.120	1.52	78	78	139	11.2	95.9
	9	22.5	551.360	0.110	1.39	78	78	139	12.3	95.9
	10	25.0	552.960	0.110	1.39	79	79	139	13.2	95.7
	11	27.5	554.550	0.110	1.39	79	79	139	14.0	95.1
	12	30.0	556.152	0.110	1.39	79	79	139	14.0	95.8
			Average:	0.107	1.366	78.0	78.0	138.8		96.0

A. Lanfranco and Associates Inc.
METLab CEM Report

Client:	Cantimber	**O2 Correction:** 8		Moisture % =
Source:	Carbonization Stack	**Year:** 2016		16.43
Run:	1			

Date	Time	O2 (Vol. %)	CO2 (Vol. %)	CO (ppm)	THC (ppm as CH4)	SOx (ppm)	NOx (ppm)
08-Nov	1216	11.03	9.86	86.3	23.7	1.5	35.4
08-Nov	1217	11.24	9.69	88.8	23.6	1.4	35.6
08-Nov	1218	11.60	9.27	91.6	23.3	1.6	35.5
08-Nov	1219	11.71	9.20	92.7	23.2	1.6	35.4
08-Nov	1220	11.64	9.17	104.3	24.3	1.6	35.3
08-Nov	1221	11.52	9.24	150.4	28.7	1.5	35.2
08-Nov	1222	11.20	9.71	189.3	31.9	1.5	35.5
08-Nov	1223	11.01	9.72	209.4	33.2	1.4	36.4
08-Nov	1224	11.00	9.95	203.1	31.8	1.4	37.2
08-Nov	1225	11.10	9.78	191.9	30.8	1.3	37.9
08-Nov	1226	11.20	9.69	186.4	30.8	1.2	38.0
08-Nov	1227	11.30	9.54	183.0	30.8	1.1	37.5
08-Nov	1228	11.54	9.39	180.8	30.9	1.1	36.7
08-Nov	1229	11.63	9.25	174.2	30.2	1.0	35.8
08-Nov	1230	11.66	9.22	171.5	30.2	1.0	35.0
08-Nov	1231	11.69	9.17	172.0	30.0	1.0	34.2
08-Nov	1232	11.81	9.07	171.8	29.8	0.9	33.6
08-Nov	1233	12.00	8.96	169.0	30.8	0.9	33.1
08-Nov	1234	11.99	8.95	170.1	29.7	0.9	32.5
08-Nov	1235	11.81	9.17	171.8	29.7	0.8	32.2
08-Nov	1236	11.93	8.96	173.7	29.8	0.8	32.1
08-Nov	1237	11.86	9.08	172.2	29.8	0.7	31.9
08-Nov	1238	11.85	9.06	170.8	31.0	1.0	31.8
08-Nov	1239	11.87	9.11	170.0	30.7	1.6	31.6
08-Nov	1240	11.90	9.08	168.3	29.9	1.5	31.5
08-Nov	1241	11.41	9.48	166.2	30.0	1.5	33.6
08-Nov	1242	11.64	9.30	164.7	29.6	1.5	35.2
08-Nov	1243	11.70	9.24	162.9	29.1	1.5	34.7
08-Nov	1244	11.79	9.17	163.1	28.7	1.5	34.3
08-Nov	1245	11.83	9.10	161.2	29.0	1.5	33.7
08-Nov	1246	11.69	9.26	160.8	28.7	1.4	33.0
08-Nov	1247	11.71	9.25	158.4	28.6	1.4	32.7
08-Nov	1248	11.96	8.94	154.7	28.4	1.4	32.4
08-Nov	1249	11.97	8.99	154.8	28.6	1.3	32.2
08-Nov	1250	12.04	8.89	151.4	28.3	1.3	31.9
08-Nov	1251	12.10	8.86	149.0	28.1	1.2	31.3
08-Nov	1252	12.18	8.76	145.6	27.8	1.1	30.9
08-Nov	1253	12.27	8.66	144.1	27.9	1.0	30.6
08-Nov	1254	12.36	8.57	140.8	27.4	1.0	30.3
08-Nov	1255	12.41	8.51	139.4	27.0	0.9	29.8
08-Nov	1256	12.61	8.29	136.1	26.8	0.9	29.7
08-Nov	1257	12.53	8.37	137.2	27.1	0.9	29.1
08-Nov	1258	12.53	8.37	138.4	26.9	0.9	29.1
08-Nov	1259	12.56	8.35	136.8	26.9	0.9	28.7
08-Nov	1300	12.62	8.31	135.6	26.8	0.9	28.6
08-Nov	1301	12.71	8.19	133.5	27.3	0.9	28.6
08-Nov	1302	12.91	8.00	133.5	28.0	0.9	28.5
08-Nov	1303	12.92	8.00	132.0	27.8	0.8	28.3
08-Nov	1304	12.97	7.92	129.7	27.5	0.8	28.0
08-Nov	1305	12.74	8.21	129.9	27.0	0.7	28.1
08-Nov	1306	12.64	8.26	126.6	26.7	0.6	28.5
08-Nov	1307	12.65	8.24	124.0	26.5	0.6	28.9
08-Nov	1308	12.82	8.03	121.4	26.6	0.5	29.5
08-Nov	1309	12.91	7.95	120.6	27.1	0.4	29.5
08-Nov	1310	13.08	7.81	119.6	27.0	0.3	29.5
08-Nov	1311	13.16	7.74	118.4	26.7	0.3	29.1
08-Nov	1312	13.30	7.63	118.6	26.3	0.3	28.6
08-Nov	1313	13.37	7.56	117.1	26.2	0.3	28.0
08-Nov	1314	13.48	7.45	117.8	26.0	0.3	27.6
08-Nov	1315	13.54	7.38	118.4	25.4	0.3	27.2
	Average	12.1	8.81	147.9	28.2	1.0	32.1
	Minimum	11.0	7.38	86.3	23.2	0.3	27.2
	Maximum	13.5	9.95	209.4	33.2	1.6	38.0
	Mass Concentration (mg/m3 dry)	**n/a**	**n/a**	**172.4**	**22.5**	**2.7**	**61.4**
	mg/m3 dry @ 8% O2			**252.7**	**33.0**	**4.0**	**90.1**
	Range	*25.0*	*20.00*	*500.0*	*1000.0*	*200.0*	*300.0*
Calibration Summary		**O2**	**CO2**	**CO**	**THC**	**SOx**	**NOx**
Gas (Cert. Value)		**10.95**	**9.98**	**248.0**	**502.0**	**10.0**	**45.7**
Analyzer Initial Span		11.03	9.98	252.2	510.43	9.5	44.9
Analyzer Initial Zero		0.13	0.02	0.0	1.68	-0.4	0.2
Initial Gas Response		10.87	9.90	246.4	510.4	9.8	45.3
Final Gas Response		11.08	9.58	242.1	489.2	9.6	43.5
Initial Zero Response		0.13	0.05	1.5	1.7	0.1	1.2
Final Zero Response		0.04	0.06	2.4	2.8	-4.4	0.4
Error Summary							
Analyzer Cal. Error	(+/- 2% or 5% THC)	0.3%	0.0%	0.8%	1.7%	-0.3%	-0.3%
Initial Span System Bias	(+/- 5%)	-0.6%	-0.4%	-1.2%	0.0%	0.1%	0.1%
Final Span System Bias	(+/- 5%)	0.2%	-2.0%	-2.0%	-2.1%	0.0%	-0.5%
Initial Zero System Bias	(+/- 5%)	0.0%	0.2%	0.3%	0.0%	0.3%	0.3%
Final Zero System Bias	(+/- 5%)	-0.4%	0.2%	0.5%	0.1%	-2.0%	0.1%
Test Span Drift	(+/- 3%)	0.8%	-1.6%	-0.9%	-2.1%	-0.1%	-0.6%
Test Zero Drift	(+/- 3%)	-0.4%	0.1%	0.2%	0.1%	-2.3%	-0.3%

A. Lanfranco and Associates Inc.
METLab CEM Report

Client:	Cantimber	**O2 Correction:**	8		Moisture % =
Source:	Carbonization Stack	**Year:**	2016		18.27
Run:	2				

Date	Time	O2 (Vol. %)	CO2 (Vol. %)	CO (ppm)	THC (ppm as CH4)	SOx (ppm)	NOx (ppm)
08-Nov	1341	12.33	8.50	127.3	28.9	2.7	27.5
08-Nov	1342	11.16	9.73	132.7	28.2	2.6	32.9
08-Nov	1343	10.50	10.47	115.7	26.6	2.5	43.3
08-Nov	1344	10.52	10.37	101.9	25.9	2.4	45.7
08-Nov	1345	10.82	10.07	96.6	26.3	2.3	45.0
08-Nov	1346	10.44	10.47	108.2	27.6	2.3	43.8
08-Nov	1347	10.25	10.68	104.3	26.9	2.2	42.7
08-Nov	1348	10.17	10.75	88.6	26.1	2.1	41.5
08-Nov	1349	10.37	10.52	77.3	28.6	2.0	41.0
08-Nov	1350	10.55	10.35	69.5	27.8	2.0	40.2
08-Nov	1351	10.81	10.10	65.1	27.2	1.9	39.3
08-Nov	1352	11.06	9.87	61.5	26.9	1.9	38.2
08-Nov	1353	11.08	9.78	60.7	27.1	1.9	37.1
08-Nov	1354	11.32	9.59	61.1	27.1	1.8	36.2
08-Nov	1355	11.53	9.41	62.3	27.0	1.8	35.0
08-Nov	1356	11.55	9.35	66.4	27.9	1.8	34.0
08-Nov	1357	11.93	9.14	69.9	28.4	1.7	33.0
08-Nov	1358	11.88	8.96	73.2	28.0	1.7	32.3
08-Nov	1359	11.44	9.43	68.8	26.9	1.6	31.7
08-Nov	1400	11.55	9.41	65.5	26.1	1.6	31.8
08-Nov	1401	11.55	9.39	68.6	26.6	1.6	32.1
08-Nov	1402	11.62	9.25	68.6	26.5	1.6	32.5
08-Nov	1403	11.65	9.21	67.8	26.3	1.6	32.5
08-Nov	1404	11.75	9.14	69.9	26.4	1.6	32.3
08-Nov	1405	11.95	8.96	71.0	26.7	1.6	31.9
08-Nov	1406	12.17	8.74	75.4	27.1	1.6	31.6
08-Nov	1407	12.24	8.69	76.4	26.8	1.6	31.1
08-Nov	1408	12.33	8.54	76.8	26.6	1.6	30.3
08-Nov	1409	12.34	8.57	80.5	26.3	1.5	29.9
08-Nov	1410	12.24	8.68	83.2	26.3	1.5	29.7
08-Nov	1411	12.39	8.51	84.4	26.6	1.5	29.8
08-Nov	1412	12.23	8.73	96.0	26.6	1.5	30.1
08-Nov	1413	12.32	8.61	99.2	26.4	1.5	30.6
08-Nov	1414	12.51	8.42	95.8	26.2	1.4	30.2
08-Nov	1415	12.20	8.71	74.9	25.3	1.4	29.6
08-Nov	1416	12.11	8.81	65.5	25.0	1.4	29.1
08-Nov	1417	11.78	9.06	64.4	25.1	1.3	29.4
08-Nov	1418	12.11	8.83	65.4	24.9	1.3	30.3
08-Nov	1419	12.25	8.70	67.3	25.5	1.2	31.0
08-Nov	1420	12.33	8.57	68.8	25.3	1.2	31.1
08-Nov	1421	12.33	8.49	70.2	25.1	1.2	30.4
08-Nov	1422	12.48	8.54	70.3	25.4	1.1	29.9
08-Nov	1423	12.21	8.69	70.5	26.5	1.1	30.0
08-Nov	1424	12.35	8.52	73.0	27.0	1.1	30.3
08-Nov	1425	12.48	8.39	74.8	26.8	1.1	30.3
08-Nov	1426	12.41	8.46	76.5	26.6	1.0	30.3
08-Nov	1427	12.13	8.80	76.9	25.9	1.0	30.4
08-Nov	1428	12.31	8.58	76.1	26.2	1.0	31.2
08-Nov	1429	12.51	8.37	75.6	25.7	1.1	31.7
08-Nov	1430	12.50	8.37	75.7	25.1	1.0	32.1
08-Nov	1431	12.46	8.34	77.3	25.5	1.0	31.6
08-Nov	1432	12.63	8.24	77.0	25.3	0.9	30.6
08-Nov	1433	12.74	8.15	76.4	25.2	0.9	30.2
08-Nov	1434	12.91	7.96	75.2	25.3	0.8	29.3
08-Nov	1435	12.61	8.23	71.9	24.8	0.8	29.0
08-Nov	1436	12.76	8.12	70.2	25.0	0.8	28.8
08-Nov	1437	12.89	8.01	69.9	25.0	0.7	28.4
08-Nov	1438	13.26	7.64	67.1	24.8	0.8	28.3
08-Nov	1439	13.42	7.45	67.9	24.3	0.7	27.7
08-Nov	1440	13.55	7.33	68.1	23.9	0.7	26.8
	Average	11.9	8.96	77.6	26.3	1.5	32.7
	Minimum	10.2	7.33	60.7	23.9	0.7	26.8
	Maximum	13.5	10.75	132.7	28.9	2.7	45.7
	Mass Concentration (mg/m3 dry)	**n/a**	**n/a**	**90.4**	**21.5**	**4.0**	**62.6**
	mg/m3 dry @ 8% O2			**130.2**	**30.9**	**5.7**	**90.2**
	Range	*25.0*	*20.00*	*500.0*	*1000.0*	*100.0*	*300.0*

Calibration Summary	**O2**	**CO2**	**CO**	**THC**	**SOx**	**NOx**
Gas (Cert. Value)	**10.95**	**9.98**	**248.0**	**502.0**	**10.0**	**45.7**
Analyzer Initial Span	11.03	9.98	252.2	510.43	9.5	44.9
Analyzer Initial Zero	0.13	0.02	0.0	1.68	-0.4	0.2
Initial Gas Response	11.08	9.58	242.1	489.2	9.6	43.5
Final Gas Response	10.98	9.75	233.2	505.6	9.3	43.0
Initial Zero Response	0.04	0.06	2.4	2.8	-4.4	0.4
Final Zero Response	0.34	0.07	0.3	-7.7	-2.8	0.3

Error Summary							
Analyzer Cal. Error	(+/- 2% or 5% THC)	0.3%	0.0%	0.8%	1.7%	-0.5%	-0.3%
Initial Span System Bias	(+/- 5%)	0.2%	-2.0%	-2.0%	-2.1%	0.1%	-0.5%
Final Span System Bias	(+/- 5%)	-0.2%	-1.2%	-3.8%	-0.5%	-0.3%	-0.6%
Initial Zero System Bias	(+/- 5%)	-0.4%	0.2%	0.5%	0.1%	-4.0%	0.1%
Final Zero System Bias	(+/- 5%)	0.8%	0.3%	0.1%	-0.9%	-2.4%	0.0%
Test Span Drift	(+/- 3%)	-0.4%	0.9%	-1.8%	1.6%	-0.4%	-0.2%
Test Zero Drift	(+/- 3%)	1.2%	0.1%	-0.4%	-1.0%	1.6%	0.0%

A. Lanfranco and Associates Inc.
METLab CEM Report

Client:	Cantimber	**O2 Correction:**	8	Moisture % =
Source:	Carbonization Stack	**Year:**	2016	17.36
Run:	3			

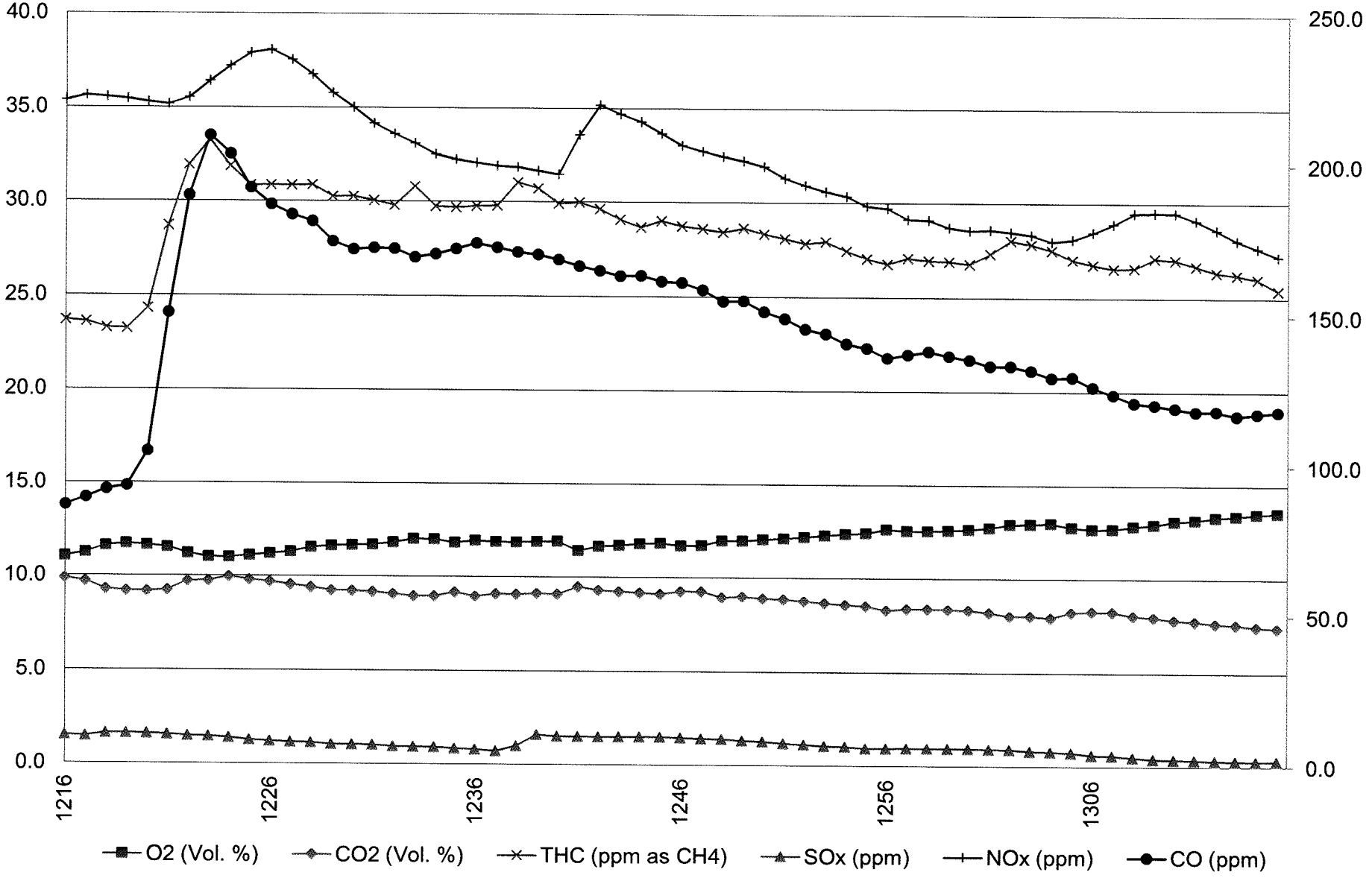
Date	Time	O2 (Vol. %)	CO2 (Vol. %)	CO (ppm)	THC (ppm as CH4)	SOx (ppm)	NOx (ppm)
08-Nov	1501	11.01	8.84	38.9	18.6	1.6	36.9
08-Nov	1502	10.61	9.19	43.3	19.0	1.4	36.9
08-Nov	1503	10.28	9.50	67.4	19.6	1.2	37.3
08-Nov	1504	10.24	9.57	72.2	19.2	1.0	37.4
08-Nov	1505	10.11	10.00	52.9	19.5	0.9	37.4
08-Nov	1506	10.19	10.36	45.3	19.5	1.0	37.3
08-Nov	1507	10.45	10.43	39.0	19.5	0.9	36.7
08-Nov	1508	10.62	10.20	34.8	19.6	0.8	36.5
08-Nov	1509	10.72	10.08	32.8	19.5	0.7	35.9
08-Nov	1510	11.00	9.87	32.5	19.9	0.7	35.6
08-Nov	1511	11.17	9.72	31.8	19.8	0.7	35.1
08-Nov	1512	11.30	9.58	32.8	20.2	0.7	34.5
08-Nov	1513	11.32	9.54	34.1	20.0	0.7	34.2
08-Nov	1514	11.52	9.36	35.7	19.6	0.6	33.7
08-Nov	1515	11.59	9.30	37.7	22.1	0.5	33.3
08-Nov	1516	11.64	9.19	40.3	19.2	0.5	32.9
08-Nov	1517	11.78	9.09	43.7	20.2	0.5	32.5
08-Nov	1518	11.94	8.94	46.6	20.3	0.5	32.1
08-Nov	1519	12.14	8.66	46.4	19.9	0.5	31.7
08-Nov	1520	11.69	9.21	47.0	19.5	0.4	31.5
08-Nov	1521	10.95	9.82	47.2	19.2	0.4	33.4
08-Nov	1522	10.93	9.81	47.7	18.9	0.4	40.0
08-Nov	1523	11.16	9.62	47.3	18.5	0.4	39.6
08-Nov	1524	11.42	9.42	48.9	18.7	0.4	38.7
08-Nov	1525	11.68	9.20	49.2	21.4	0.4	37.1
08-Nov	1526	12.00	8.94	49.6	20.6	0.3	35.4
08-Nov	1527	12.20	8.68	51.0	22.0	0.3	33.6
08-Nov	1528	12.35	8.56	51.2	21.5	0.3	32.4
08-Nov	1529	12.44	8.46	52.8	22.2	0.3	31.3
08-Nov	1530	12.45	8.41	52.6	22.8	0.2	30.7
08-Nov	1531	12.25	8.66	43.3	22.1	0.2	30.0
08-Nov	1532	12.41	8.49	38.3	21.2	0.2	30.4
08-Nov	1533	12.49	8.40	38.4	20.7	0.3	30.4
08-Nov	1534	12.52	8.38	35.7	21.0	0.3	30.3
08-Nov	1535	12.57	8.38	32.8	21.1	0.3	30.5
08-Nov	1536	12.41	8.46	32.4	22.6	0.2	30.3
08-Nov	1537	12.50	8.44	31.9	22.6	0.2	30.4
08-Nov	1538	12.26	8.60	32.1	23.0	0.2	30.4
08-Nov	1539	12.23	8.63	32.1	22.9	0.3	30.7
08-Nov	1540	12.55	8.39	32.8	23.3	0.3	31.1
08-Nov	1541	12.63	8.29	34.0	23.5	0.3	31.1
08-Nov	1542	12.45	8.39	33.2	23.4	0.3	30.8
08-Nov	1543	11.81	9.15	32.0	23.2	0.2	31.3
08-Nov	1544	11.24	9.59	31.2	23.0	0.2	38.3
08-Nov	1545	11.41	9.42	28.3	23.2	0.2	39.1
08-Nov	1546	11.65	9.22	27.0	23.6	0.3	38.5
08-Nov	1547	11.72	9.09	26.2	23.1	0.3	37.2
08-Nov	1548	11.93	8.98	26.2	23.2	0.2	35.6
08-Nov	1549	12.07	8.83	26.8	23.3	0.3	33.7
08-Nov	1550	12.18	8.74	27.3	23.3	0.3	32.6
08-Nov	1551	12.25	8.68	28.0	23.3	0.3	31.8
08-Nov	1552	12.37	8.59	29.9	24.6	0.2	31.1
08-Nov	1553	12.44	8.49	31.1	24.6	0.2	30.7
08-Nov	1554	12.44	8.44	31.2	24.6	0.2	30.3
08-Nov	1555	12.36	8.50	32.4	24.9	0.3	30.0
08-Nov	1556	12.11	8.72	33.5	25.4	0.3	30.3
08-Nov	1557	11.78	9.07	33.3	25.6	0.3	35.2
08-Nov	1558	11.46	9.30	32.2	25.5	0.3	37.6
08-Nov	1559	11.63	9.16	31.7	25.4	0.2	38.0
08-Nov	1600	11.91	8.87	31.6	25.5	0.2	37.8
	Average	11.7	9.07	38.5	21.7	0.4	33.9
	Minimum	10.1	8.29	26.2	18.5	0.2	30.0
	Maximum	12.6	10.43	72.2	25.6	1.6	40.0
	Mass Concentration (mg/m3 dry)	**n/a**	**n/a**	**44.8**	**17.5**	**1.2**	**65.0**
	mg/m3 dry @ 8% O2			**63.0**	**24.6**	**1.7**	**91.2**
	Range	*25.0*	*20.00*	*500.0*	*1000.0*	*200.0*	*300.0*
Calibration Summary		**O2**	**CO2**	**CO**	**THC**	**SOx**	**NOx**
Gas (Cert. Value)		**10.95**	**9.98**	**248.0**	**502.0**	**10.0**	**45.7**
Analyzer Initial Span		11.03	9.98	252.2	510.43	9.5	44.9
Analyzer Initial Zero		0.13	0.02	0.0	1.68	-0.4	0.2
Initial Gas Response		10.98	9.75	233.2	505.6	9.3	43.0
Final Gas Response		10.92	10.08	243.6	528.7	8.6	45.0
Initial Zero Response		0.34	0.07	0.3	-7.7	-2.8	0.3
Final Zero Response		-0.06	0.13	0.4	-1.9	-5.1	0.9
Error Summary							
Analyzer Cal. Error	(+/- 2% or 5% THC)	0.3%	0.0%	0.8%	1.7%	-0.3%	-0.3%
Initial Span System Bias	(+/- 5%)	-0.2%	-1.2%	-3.8%	-0.5%	-0.1%	-0.6%
Final Span System Bias	(+/- 5%)	-0.4%	0.5%	-1.7%	1.8%	-0.5%	0.0%
Initial Zero System Bias	(+/- 5%)	0.8%	0.3%	0.1%	-0.9%	-1.2%	0.0%
Final Zero System Bias	(+/- 5%)	-0.8%	0.6%	0.1%	-0.4%	-2.4%	0.2%
Test Span Drift	(+/- 3%)	-0.2%	1.7%	2.1%	2.3%	-0.3%	0.7%
Test Zero Drift	(+/- 3%)	-1.6%	0.3%	0.0%	0.6%	-1.1%	0.2%

Carbonization Stack - Run 1 (November 8, 2016)

CanTimber

METLab CEM Results

Note: CO is referenced to the right hand axis (0-250), all others on the left (0-40)



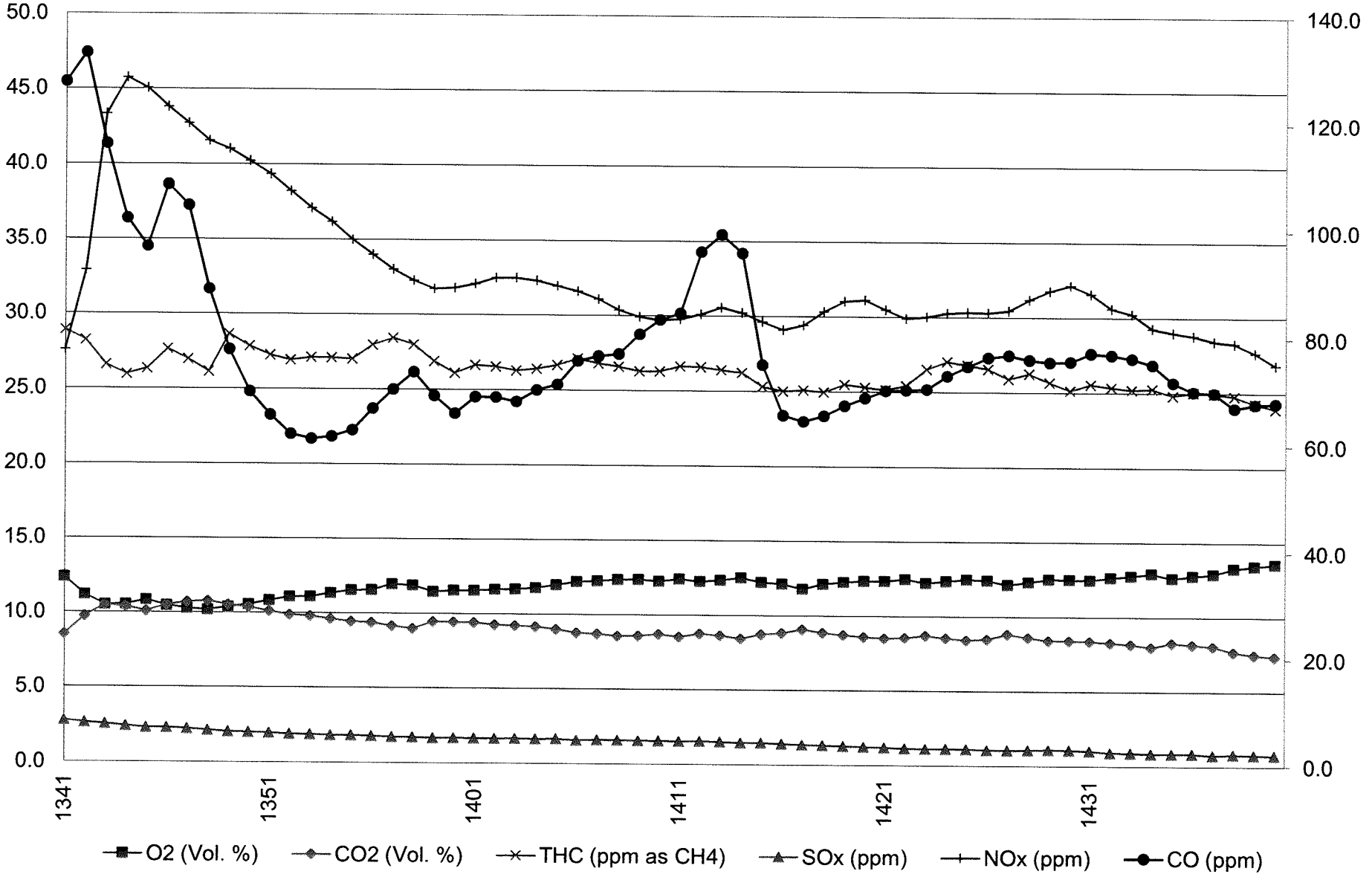
A. Lanfranco and Associates Inc.

Carbonization Stack - Run 2 (November 8, 2016)

Cantimber

METLab CEM Results

Note: CO is referenced to the right hand axis (0-140), all others on the left (0-40)



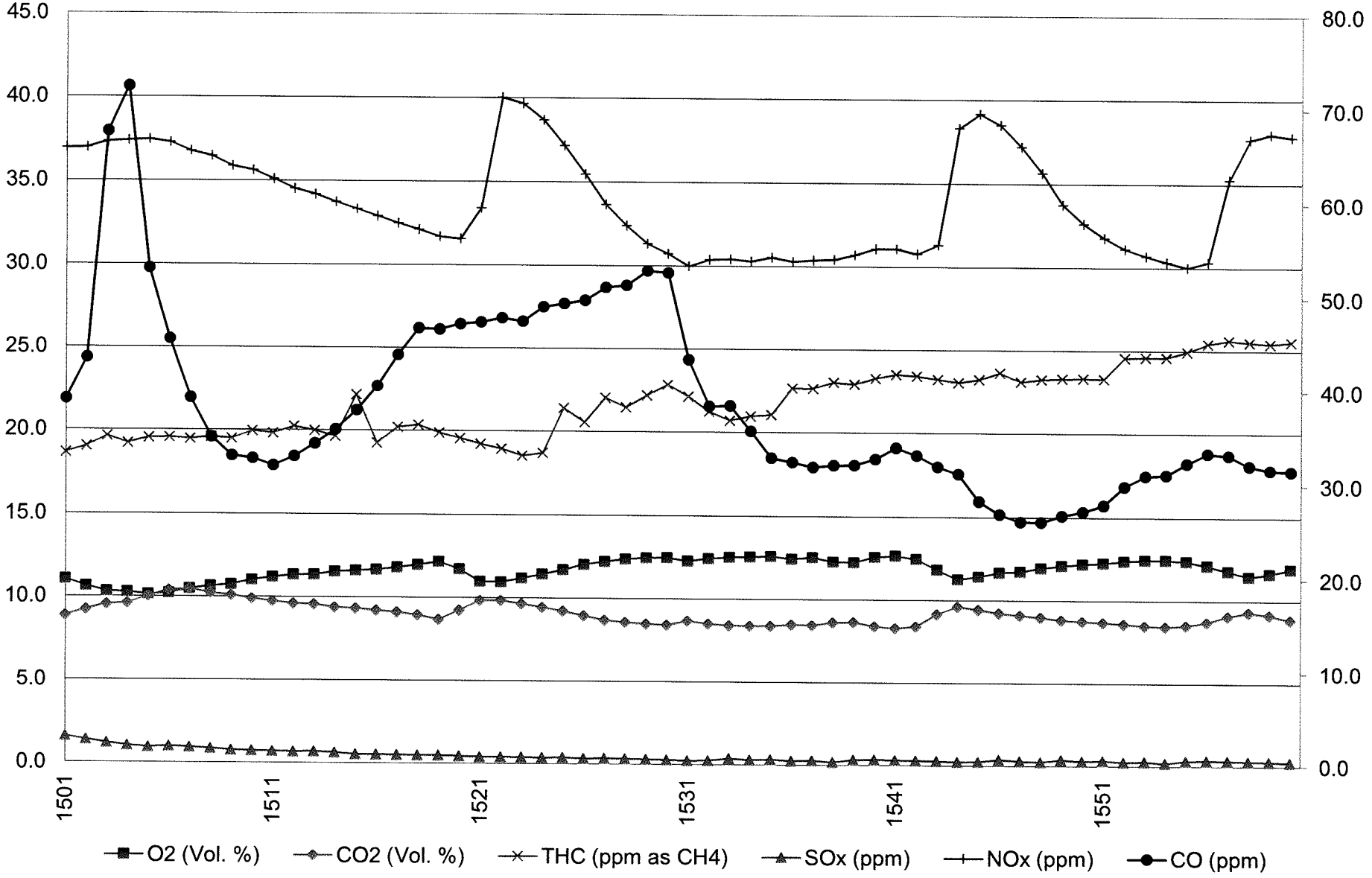
A. Lanfranco and Associates Inc.

Carbonization Stack - Run 3 (Nov 8, 2016)

Cantimber

METLab CEM Results

Note: CO is referenced to the right hand axis (0-80), all others on the left (0-40)



A. Lanfranco and Associates Inc.

Client:	Cantimber	**Date:**	Nov.9, 2016
Jobsite:	Pt. Alberni, BC	**Run:**	1 Part/Cond
Source:	Activation Stack	**Run Time:**	09:50-10:51

Particulate Concentration:		**1.1 mg/dscm**	0.0005 gr/dscf
		0.8 mg/Acm	0.0004 gr/Acf
	Front Half:	1.1 mg/dscm	
	Back Half:	0.0 mg/dscm	
		1.8 mg/dscm (@ 8% O2)	0.0008 gr/dscf (@ 8% O2)
Emission Rate:		0.00 Kg/hr	0.004 lb/hr
Sample Gas Volume:		1.1880 dscm	41.955 dscf
Total Sample Time:		60.0 minutes	
Average Isokineticity:		97.7 %	
Flue Gas Characteristics			
	Moisture:	15.86	
	Temperature	59.0 oC	138.3 oF
	Flow	28.2 dscm/min	996 dscf/min
		0.47 dscm/sec	16.6 dscf/sec
		37.7 Acm/min	1333 Acf/min
	Velocity	5.518 m/sec	18.10 f/sec
	Gas Analysis	13.00 % O2	7.37 % CO2
		29.699 Mol. Wt (g/gmole) Dry	27.844 Mol. Wt (g/gmole) Wet

*** Standard Conditions:** Metric: 20 deg C, 101.325 kPa
Imperial: 68 deg F, 29.92 in.Hg

Client:	Cantimber	**Date:**	Nov.9, 2016
Jobsite:	Pt. Alberni, BC	**Run:**	1 Part/Cond
Source:	Activation Stack	**Run Time:**	09:50-10:51

Control Unit (Y)	1.0194
Nozzle Diameter (in.)	0.4020
Pitot Factor	0.8450
Baro. Press. (in. Hg)	30.11
Static Press. (in. H2O)	0.03
Stack Height (ft)	40
Stack Diameter (in.)	15.0
Stack Area (sq.ft.)	1.227
Minutes Per Reading	2.5
Minutes Per Point	2.5
Port Length (inches)	3.0

Gas Analysis (Vol. %):

	CO2	O2
CEM AVG:	7.37	13.00
Average =	**7.37**	**13.00**

Condensate Collection:

Impinger 1 (grams)	122.0
Impinger 2 (grams)	34.0
Impinger 3 (grams)	2.0
Impinger 4 (grams)	10.0
Total Gain (grams)	**168.0**

Collection:

Filter (grams)	**0.0003**
Washings (grams)	**0.0010**
Impinger (grams)	**0.0000**
Total (grams)	**0.0013**

Traverse	Point	Time (min.)	Dry Gas Meter (ft3)	Pitot ^P (in. H2O)	Orifice ^H (in. H2O)	Dry Gas Temperature Inlet (oF)	Outlet (oF)	Stack (oF)	Wall Dist. (in.)	Isokin. (%)
		0.0	557.570							
1	1	2.5	559.160	0.080	1.45	59	59	138	1.0	97.7
	2	5.0	560.750	0.080	1.45	59	59	138	1.0	97.7
	3	7.5	562.340	0.080	1.45	59	59	138	1.8	97.7
	4	10.0	563.930	0.080	1.45	59	59	137	2.6	97.6
	5	12.5	565.520	0.080	1.45	59	59	137	3.7	97.6
	6	15.0	567.300	0.100	1.81	59	59	137	5.3	97.8
	7	17.5	569.080	0.100	1.81	59	59	137	9.7	97.8
	8	20.0	570.860	0.100	1.81	60	60	138	11.2	97.7
	9	22.5	572.640	0.100	1.81	60	60	138	12.3	97.7
	10	25.0	574.430	0.100	1.81	61	61	138	13.2	98.0
	11	27.5	576.220	0.100	1.81	61	61	138	14.0	98.0
	12	30.0	578.010	0.100	1.81	62	62	138	14.0	97.9
		0.0	578.010							
2	1	2.5	579.610	0.080	1.46	63	63	139	1.0	97.6
	2	5.0	581.210	0.080	1.46	63	63	139	1.0	97.6
	3	7.5	582.310	0.080	1.46	63	63	139	1.8	67.1
	4	10.0	584.420	0.080	1.46	64	64	138	2.6	128.4
	5	12.5	586.030	0.080	1.46	64	64	138	3.7	97.9
	6	15.0	587.640	0.080	1.46	65	65	139	5.3	97.8
	7	17.5	589.250	0.080	1.46	66	66	139	9.7	97.7
	8	20.0	591.050	0.100	1.83	66	66	139	11.2	97.7
	9	22.5	592.850	0.100	1.83	66	66	139	12.3	97.7
	10	25.0	594.650	0.100	1.83	67	67	139	13.2	97.6
	11	27.5	596.260	0.080	1.47	68	68	139	14.0	97.3
	12	30.0	597.886	0.080	1.47	69	69	139	14.0	98.1
			Average:	0.088	1.607	62.5	62.5	138.3		97.7

Client:	Cantimber	**Date:**	Nov.9, 2016
Jobsite:	Pt. Alberni, BC	**Run:**	2 - Part/Cond
Source:	Activation Stack	**Run Time:**	11:25-12:28

Particulate Concentration:		**2.9 mg/dscm**	0.0013 gr/dscf
		2.2 mg/Acm	0.0010 gr/Acf
	Front Half:	2.9 mg/dscm	
	Back Half:	0.0 mg/dscm	
		4.8 mg/dscm (@ 8% O2)	0.0021 gr/dscf (@ 8% O2)
Emission Rate:		0.00 Kg/hr	0.011 lb/hr
Sample Gas Volume:		1.1533 dscm	40.729 dscf
Total Sample Time:		60.0 minutes	
Average Isokineticity:		99.3 %	
Flue Gas Characteristics			
	Moisture:	15.92	
	Temperature	58.3 oC	136.9 oF
	Flow	27.0 dscm/min	952 dscf/min
		0.45 dscm/sec	15.9 dscf/sec
		36.0 Acm/min	1272 Acf/min
	Velocity	5.264 m/sec	17.27 f/sec
	Gas Analysis	13.02 % O2	7.30 % CO2
		29.688 Mol. Wt (g/gmole) Dry	27.828 Mol. Wt (g/gmole) Wet

*** Standard Conditions:** Metric: 20 deg C, 101.325 kPa
Imperial: 68 deg F, 29.92 in.Hg

Client:	Cantimber	**Date:**	Nov.9, 2016
Jobsite:	Pt. Alberni, BC	**Run:**	2 - Part/Cond
Source:	Activation Stack	**Run Time:**	11:25-12:28

Control Unit (Y)	1.0194
Nozzle Diameter (in.)	0.4020
Pitot Factor	0.8450
Baro. Press. (in. Hg)	30.11
Static Press. (in. H2O)	0.03
Stack Height (ft)	40
Stack Diameter (in.)	15.0
Stack Area (sq.ft.)	1.227
Minutes Per Reading	2.5
Minutes Per Point	2.5
Port Length (inches)	3.0

Gas Analysis (Vol. %):

	CO2	O2
CEM AVG:	7.30	13.02
Average =	**7.30**	**13.02**

Condensate Collection:

Impinger 1 (grams)	130.0
Impinger 2 (grams)	20.0
Impinger 3 (grams)	4.0
Impinger 4 (grams)	9.8
Total Gain (grams)	**163.8**

Collection:

Filter (grams)	**0.0004**
Washings (grams)	**0.0030**
Impinger (grams)	**0.0000**
Total (grams)	**0.0034**

Traverse	Point	Time (min.)	Dry Gas Meter (ft3)	Pitot ^P (in. H2O)	Orifice ^H (in. H2O)	Dry Gas Temperature Inlet (oF)	Outlet (oF)	Stack (oF)	Wall Dist. (in.)	Isokin. (%)
		0.0	598.035							
1	1	2.5	599.550	0.070	1.30	71	71	138	1.0	97.2
	2	5.0	601.070	0.070	1.30	71	71	138	1.0	97.6
	3	7.5	602.590	0.070	1.30	71	71	138	1.8	97.6
	4	10.0	604.220	0.080	1.48	71	71	137	2.6	97.8
	5	12.5	605.850	0.080	1.48	71	71	137	3.7	97.8
	6	15.0	607.480	0.080	1.48	71	71	137	5.3	97.8
	7	17.5	609.110	0.080	1.48	71	71	137	9.7	97.8
	8	20.0	610.740	0.080	1.48	71	71	137	11.2	97.8
	9	22.5	612.370	0.080	1.48	71	71	137	12.3	97.8
	10	25.0	614.040	0.080	1.54	71	71	137	13.2	100.2
	11	27.5	615.710	0.080	1.54	71	71	137	14.0	100.2
	12	30.0	617.380	0.080	1.54	71	71	137	14.0	100.2
		0.0	617.380							
2	1	2.5	619.050	0.080	1.54	72	72	137	1.0	100.0
	2	5.0	620.720	0.080	1.54	72	72	137	1.0	100.0
	3	7.5	622.390	0.080	1.54	72	72	137	1.8	100.0
	4	10.0	624.260	0.100	1.94	73	73	136	2.6	100.0
	5	12.5	626.140	0.100	1.94	73	73	136	3.7	100.6
	6	15.0	627.820	0.080	1.55	73	73	136	5.3	100.4
	7	17.5	629.500	0.080	1.55	73	73	137	9.7	100.5
	8	20.0	631.180	0.080	1.55	74	74	137	11.2	100.3
	9	22.5	632.860	0.080	1.56	74	74	136	12.3	100.2
	10	25.0	634.540	0.080	1.56	75	75	136	13.2	100.0
	11	27.5	636.220	0.080	1.56	75	75	137	14.0	100.1
	12	30.0	637.904	0.080	1.56	75	75	137	14.0	100.3
			Average:	0.080	1.533	72.2	72.2	136.9		99.3

Client:	Cantimber	**Date:**	Nov.9, 2016
Jobsite:	Pt. Alberni, BC	**Run:**	3 - Part/Cond
Source:	Activation Stack	**Run Time:**	13:10-14:16

Particulate Concentration:		**1.4 mg/dscm**	0.0006 gr/dscf
		1.0 mg/Acm	0.0004 gr/Acf
	Front Half:	1.4 mg/dscm	
	Back Half:	0.0 mg/dscm	
		2.2 mg/dscm (@ 8% O2)	0.0010 gr/dscf (@ 8% O2)
Emission Rate:		0.00 Kg/hr	0.005 lb/hr
Sample Gas Volume:		1.1802 dscm	41.677 dscf
Total Sample Time:		60.0 minutes	
Average Isokineticity:		100.1 %	
Flue Gas Characteristics			
	Moisture:	15.83	
	Temperature	57.7 oC	135.8 oF
	Flow	27.4 dscm/min	966 dscf/min
		0.46 dscm/sec	16.1 dscf/sec
		36.5 Acm/min	1287 Acf/min
	Velocity	5.329 m/sec	17.48 f/sec
	Gas Analysis	13.10 % O2	7.09 % CO2
		29.659 Mol. Wt (g/gmole) Dry	27.813 Mol. Wt (g/gmole) Wet

*** Standard Conditions:** Metric: 20 deg C, 101.325 kPa
Imperial: 68 deg F, 29.92 in.Hg

Client:	Cantimber	**Date:**	Nov.9, 2016
Jobsite:	Pt. Alberni, BC	**Run:**	3 - Part/Cond
Source:	Activation Stack	**Run Time:**	13:10-14:16

Control Unit (Y)	1.0194
Nozzle Diameter (in.)	0.4020
Pitot Factor	0.8450
Baro. Press. (in. Hg)	30.11
Static Press. (in. H2O)	0.03
Stack Height (ft)	40
Stack Diameter (in.)	15.0
Stack Area (sq.ft.)	1.227
Minutes Per Reading	2.5
Minutes Per Point	2.5
Port Length (inches)	3.0

Gas Analysis (Vol. %):

	CO2	O2
CEM AVG:	7.09	13.10
Average =	**7.09**	**13.10**

Condensate Collection:

Impinger 1 (grams)	142.0
Impinger 2 (grams)	12.0
Impinger 3 (grams)	2.0
Impinger 4 (grams)	10.5
Total Gain (grams)	**166.5**

Collection:

Filter (grams)	**0.0005**
Washings (grams)	**0.0011**
Impinger (grams)	**0.0000**
Total (grams)	**0.0016**

Traverse	Point	Time (min.)	Dry Gas Meter (ft3)	Pitot ^P (in. H2O)	Orifice ^H (in. H2O)	Dry Gas Temperature Inlet (oF)	Outlet (oF)	Stack (oF)	Wall Dist. (in.)	Isokin. (%)
		0.0	638.100							
1	1	2.5	639.790	0.080	1.56	77	77	136	1.0	100.1
	2	5.0	641.480	0.080	1.56	77	77	136	1.0	100.1
	3	7.5	643.170	0.080	1.56	77	77	136	1.8	100.1
	4	10.0	644.860	0.080	1.56	77	77	136	2.6	100.1
	5	12.5	646.550	0.080	1.56	77	77	136	3.7	100.1
	6	15.0	648.240	0.080	1.56	77	77	136	5.3	100.1
	7	17.5	649.930	0.080	1.56	77	77	136	9.7	100.1
	8	20.0	651.620	0.080	1.56	77	77	136	11.2	100.1
	9	22.5	653.310	0.080	1.56	77	77	136	12.3	100.1
	10	25.0	655.000	0.080	1.56	78	78	136	13.2	99.9
	11	27.5	656.690	0.080	1.56	78	78	136	14.0	99.9
	12	30.0	658.380	0.080	1.56	78	78	136	14.0	99.9
		0.0	658.380							
2	1	2.5	660.080	0.080	1.57	79	79	136	1.0	100.3
	2	5.0	661.780	0.080	1.57	79	79	136	1.0	100.3
	3	7.5	663.480	0.080	1.57	79	79	136	1.8	100.3
	4	10.0	665.180	0.080	1.57	79	79	136	2.6	100.3
	5	12.5	666.870	0.080	1.57	79	79	136	3.7	99.7
	6	15.0	668.560	0.080	1.57	79	79	136	5.3	99.7
	7	17.5	670.460	0.100	1.96	79	79	136	9.7	100.4
	8	20.0	672.350	0.100	1.96	79	79	136	11.2	99.8
	9	22.5	674.250	0.100	1.96	80	80	135	12.3	100.1
	10	25.0	675.950	0.080	1.57	80	80	135	13.2	100.0
	11	27.5	677.650	0.080	1.57	80	80	135	14.0	100.0
	12	30.0	679.356	0.080	1.57	80	80	135	14.0	100.4
			Average:	0.083	1.614	78.3	78.3	135.8		100.1

A. Lanfranco and Associates Inc.
METLab CEM Report

Client: Cantimber **O2 Correction:** 8 Moisture % =
Source: Activation Stack **Year:** 2016 15.86
Run: 1

Date	Time	O2 (Vol. %)	CO2 (Vol. %)	CO (ppm)	THC (ppm as CH4)	SOx (ppm)	NOx (ppm)
09-Nov	1016	12.97	7.34	2722.1	33.3	0.1	30.0
09-Nov	1017	12.95	7.36	2722.1	33.6	0.2	29.7
09-Nov	1018	12.98	7.31	2721.1	34.4	0.1	29.6
09-Nov	1019	13.01	7.31	2722.1	33.7	0.2	29.6
09-Nov	1020	13.00	7.34	2722.1	30.5	0.3	29.7
09-Nov	1021	12.97	7.38	2721.1	30.3	0.2	29.6
09-Nov	1022	13.00	7.35	2721.1	31.8	0.2	29.4
09-Nov	1023	13.01	7.35	2721.1	32.2	0.1	29.1
09-Nov	1024	12.99	7.37	2721.1	31.8	0.2	29.1
09-Nov	1025	12.98	7.38	2722.1	32.7	0.1	29.3
09-Nov	1026	13.00	7.38	2721.1	32.1	0.2	29.4
09-Nov	1027	12.99	7.39	2721.1	32.0	0.3	29.1
09-Nov	1028	13.00	7.37	2721.1	32.1	0.2	29.1
09-Nov	1029	12.99	7.38	2721.1	32.0	0.2	29.2
09-Nov	1030	12.98	7.40	2721.1	32.4	0.2	29.1
09-Nov	1031	12.98	7.40	2721.1	35.2	0.2	29.0
09-Nov	1032	13.03	7.34	2721.1	34.4	0.1	29.0
09-Nov	1033	13.01	7.35	2721.1	35.3	0.2	29.1
09-Nov	1034	12.96	7.40	2721.1	35.6	0.1	29.2
09-Nov	1035	12.97	7.38	2721.1	35.7	0.2	29.3
09-Nov	1036	12.99	7.37	2721.1	36.8	0.3	29.3
09-Nov	1037	13.02	7.36	2721.1	35.9	0.2	29.4
09-Nov	1038	12.99	7.38	2721.1	35.3	0.2	29.4
09-Nov	1039	12.97	7.41	2721.1	36.9	0.1	29.3
09-Nov	1040	13.01	7.36	2721.1	38.5	0.2	29.3
09-Nov	1041	13.02	7.35	2721.1	36.8	0.3	29.3
09-Nov	1042	12.99	7.37	2721.1	35.7	0.2	29.3
09-Nov	1043	13.01	7.36	2721.1	37.7	0.1	29.3
09-Nov	1044	13.02	7.37	2721.1	35.2	0.2	29.3
09-Nov	1045	12.98	7.42	2721.1	36.7	0.3	29.2
09-Nov	1046	13.01	7.38	2721.1	37.6	0.2	29.1
09-Nov	1047	13.04	7.34	2721.1	38.0	0.2	29.0
09-Nov	1048	12.99	7.38	2721.1	35.8	0.2	29.0
09-Nov	1049	12.96	7.42	2721.1	35.9	0.2	28.9
09-Nov	1050	13.00	7.39	2721.1	34.9	0.1	28.9
09-Nov	1051	13.08	7.32	2721.1	36.8	0.2	28.8
09-Nov	1052	13.05	7.37	2721.1	39.5	0.1	28.6
09-Nov	1053	13.04	7.39	2721.1	36.1	0.2	28.4
09-Nov	1054	13.08	7.36	2721.1	37.6	0.3	28.2
09-Nov	1055	13.19	7.24	2721.1	46.2	0.2	27.9
09-Nov	1056	13.15	7.27	2721.1	46.2	0.1	27.7
09-Nov	1057	13.13	7.28	2721.1	46.0	0.2	27.6
09-Nov	1058	13.11	7.30	2721.1	45.8	0.3	27.5
09-Nov	1059	13.09	7.32	2721.1	42.8	0.2	27.5
09-Nov	1100	13.07	7.36	2721.1	43.3	0.2	27.4
09-Nov	1101	13.08	7.35	2721.1	43.4	0.2	27.3
09-Nov	1102	13.08	7.33	2721.1	41.6	0.2	27.3
09-Nov	1103	13.03	7.36	2721.1	40.6	0.3	27.1
09-Nov	1104	13.02	7.38	2721.1	41.9	0.2	27.2
09-Nov	1105	13.02	7.38	2721.1	42.5	0.3	27.4
09-Nov	1106	12.99	7.41	2721.1	41.3	0.2	27.5
09-Nov	1107	12.96	7.43	2721.1	40.8	0.2	27.5
09-Nov	1108	12.94	7.45	2721.1	42.3	0.2	27.5
09-Nov	1109	12.94	7.45	2721.1	43.9	0.2	27.5
09-Nov	1110	12.92	7.47	2721.1	43.0	0.1	27.4
09-Nov	1111	12.96	7.42	2721.1	44.4	0.2	27.4
09-Nov	1112	12.97	7.42	2721.1	45.5	0.1	27.4
09-Nov	1113	12.95	7.43	2721.1	45.0	0.2	27.5
09-Nov	1114	12.88	7.49	2721.1	45.6	0.3	27.3
09-Nov	1115	12.83	7.53	2721.1	45.4	0.2	27.5
	Average	13.0	7.37	2721.2	37.9	0.2	28.6
	Minimum	12.8	7.24	2721.1	30.3	0.1	27.1
	Maximum	13.2	7.53	2722.1	46.2	0.3	30.0
	Mass Concentration (mg/m3 dry)	n/a	n/a	**3170.6**	**30.1**	**0.5**	**54.7**
	mg/m3 dry @ 8% O2			**5178.5**	**49.1**	**0.8**	**89.3**
	Range	*25.0*	*20.00*	*2500.0*	*100.0*	*200.0*	*300.0*
Calibration Summary		**O2**	**CO2**	**CO**	**THC**	**SOx**	**NOx**
Gas (Cert. Value)		**10.95**	**9.98**	**248.0**	**44.1**	**10.0**	**45.7**
Analyzer Initial Span		11.00	10.04	248.0	43.2	10.0	45.2
Analyzer Initial Zero		0.00	0.03	2.7	0.72	-0.3	0.6
Initial Gas Response		10.99	9.92	244.6	43.2	10.2	44.9
Final Gas Response		11.08	9.93	243.6	44.1	6.4	43.0
Initial Zero Response		0.11	0.07	1.4	0.7	0.1	0.7
Final Zero Response		0.18	0.11	4.5	0.1	-3.0	0.6
Error Summary							
Analyzer Cal. Error	(+/- 2% or 5% THC)	0.2%	0.3%	0.0%	-2.0%	0.0%	-0.2%
Initial Span System Bias	(+/- 5%)	0.0%	-0.6%	-0.1%	0.0%	0.1%	-0.1%
Final Span System Bias	(+/- 5%)	0.3%	-0.5%	-0.2%	0.8%	-1.8%	-0.7%
Initial Zero System Bias	(+/- 5%)	0.4%	0.2%	-0.1%	0.0%	0.2%	0.0%
Final Zero System Bias	(+/- 5%)	0.7%	0.4%	0.1%	-0.6%	-1.3%	0.0%
Test Span Drift	(+/- 3%)	0.4%	0.0%	0.0%	0.8%	-1.9%	-0.6%
Test Zero Drift	(+/- 3%)	0.3%	0.2%	0.1%	-0.6%	-1.5%	0.0%

A. Lanfranco and Associates Inc.
METLab CEM Report

Client:	Cantimber	**O2 Correction:**	8	Moisture % =
Source:	Activation Stack	**Year:**	2016	15.92
Run:	2			

Date	Time	O2 (Vol. %)	CO2 (Vol. %)	CO (ppm)	THC (ppm as CH4)	SOx (ppm)	NOx (ppm)
09-Nov	1136	13.03	7.25	2738.1	60.8	0.3	29.4
09-Nov	1137	13.06	7.23	2738.1	58.9	0.2	29.5
09-Nov	1138	13.02	7.27	2738.1	54.8	0.2	29.5
09-Nov	1139	13.00	7.32	2738.1	56.9	0.2	29.5
09-Nov	1140	13.07	7.23	2738.1	59.0	0.2	29.5
09-Nov	1141	13.08	7.22	2738.1	59.2	0.2	29.5
09-Nov	1142	12.95	7.35	2738.1	59.2	0.2	29.6
09-Nov	1143	12.97	7.32	2738.1	58.5	0.2	29.7
09-Nov	1144	12.98	7.32	2738.1	59.8	0.1	29.8
09-Nov	1145	12.97	7.33	2738.1	54.5	0.1	29.9
09-Nov	1146	13.00	7.31	2738.1	53.8	0.1	30.1
09-Nov	1147	13.01	7.31	2738.1	55.5	0.2	30.2
09-Nov	1148	13.02	7.30	2738.1	54.4	0.2	30.3
09-Nov	1149	12.99	7.33	2738.1	54.1	0.2	30.3
09-Nov	1150	12.98	7.32	2738.1	56.8	0.2	30.2
09-Nov	1151	12.97	7.35	2738.1	57.7	0.2	30.3
09-Nov	1152	12.99	7.34	2738.1	57.2	0.1	30.2
09-Nov	1153	13.00	7.32	2738.1	58.9	0.1	30.2
09-Nov	1154	13.02	7.32	2738.1	59.4	0.1	30.3
09-Nov	1155	13.01	7.34	2738.1	57.2	0.1	30.1
09-Nov	1156	13.02	7.31	2738.1	55.2	0.1	30.1
09-Nov	1157	13.03	7.32	2738.1	51.5	0.1	30.0
09-Nov	1158	13.03	7.33	2738.1	51.9	0.1	29.8
09-Nov	1159	13.04	7.31	2738.1	51.2	0.1	29.7
09-Nov	1200	13.01	7.34	2738.1	51.0	0.1	29.5
09-Nov	1201	13.02	7.32	2738.1	51.0	0.0	29.4
09-Nov	1202	13.02	7.33	2738.1	51.7	0.2	29.5
09-Nov	1203	13.04	7.31	2738.1	54.9	0.2	29.7
09-Nov	1204	13.02	7.32	2738.1	51.9	0.2	30.2
09-Nov	1205	13.00	7.34	2738.1	55.0	0.2	30.7
09-Nov	1206	13.02	7.33	2738.1	54.1	0.1	31.1
09-Nov	1207	13.02	7.34	2738.1	56.0	0.1	31.3
09-Nov	1208	12.98	7.35	2738.1	52.6	0.1	31.3
09-Nov	1209	12.99	7.33	2738.1	52.5	0.2	31.3
09-Nov	1210	13.01	7.34	2738.1	54.1	0.2	31.1
09-Nov	1211	13.03	7.33	2738.1	56.1	0.2	30.9
09-Nov	1212	13.06	7.29	2738.1	55.8	0.2	30.9
09-Nov	1213	13.04	7.28	2738.1	54.4	0.1	31.1
09-Nov	1214	13.03	7.30	2738.1	57.2	0.1	31.3
09-Nov	1215	13.02	7.31	2738.1	56.9	0.1	31.4
09-Nov	1216	13.03	7.31	2738.1	58.3	0.1	31.5
09-Nov	1217	13.02	7.29	2738.1	59.5	0.2	31.6
09-Nov	1218	13.00	7.32	2738.1	59.1	0.2	32.0
09-Nov	1219	13.02	7.30	2738.1	62.0	0.2	32.2
09-Nov	1220	13.04	7.28	2738.1	64.1	0.2	32.4
09-Nov	1221	13.07	7.25	2738.1	64.5	0.1	32.5
09-Nov	1222	13.03	7.28	2738.1	60.8	0.1	32.5
09-Nov	1223	13.04	7.28	2738.1	64.2	0.1	32.5
09-Nov	1224	13.02	7.26	2738.1	73.6	0.1	32.5
09-Nov	1225	13.05	7.21	2738.1	71.9	0.1	32.7
09-Nov	1226	13.07	7.19	2738.1	69.5	0.1	33.1
09-Nov	1227	13.01	7.23	2738.1	70.7	0.1	33.5
09-Nov	1228	13.01	7.22	2738.1	72.0	0.1	33.7
09-Nov	1229	13.02	7.21	2738.1	70.5	0.1	33.7
09-Nov	1230	13.04	7.26	2738.1	65.0	0.0	33.5
09-Nov	1231	13.05	7.25	2738.1	65.0	0.2	33.3
09-Nov	1232	13.03	7.25	2738.1	63.3	0.2	33.0
09-Nov	1233	13.03	7.26	2738.1	63.0	0.2	32.8
09-Nov	1234	13.06	7.25	2738.1	65.4	0.2	32.6
09-Nov	1235	13.09	7.22	2738.1	68.0	0.1	32.5
	Average	13.0	7.30	2738.1	58.9	0.1	31.0
	Minimum	12.9	7.19	2738.1	51.0	0.0	29.4
	Maximum	13.1	7.35	2738.1	73.6	0.3	33.7
	Mass Concentration (mg/m3 dry)	n/a	n/a	3190.3	46.7	0.4	59.4
	mg/m3 dry @ 8% O2			5223.1	76.5	0.6	97.3
	Range	*25.0*	*20.00*	*2500.0*	*100.0*	*200.0*	*300.0*

Calibration Summary		**O2**	**CO2**	**CO**	**THC**	**SOx**	**NOx**
Gas (Cert. Value)		**10.95**	**9.98**	**248.0**	**44.1**	**10.0**	**45.7**
Analyzer Initial Span		11.00	10.04	248.0	43.2	10.0	45.2
Analyzer Initial Zero		0.00	0.03	2.7	0.72	-0.3	0.6
Initial Gas Response		11.08	9.93	243.6	44.1	6.4	43.0
Final Gas Response		11.13	9.87	243.1	42.1	6.1	41.6
Initial Zero Response		0.28	0.11	4.5	0.1	-3.0	0.6
Final Zero Response		0.18	0.09	2.9	-0.1	-3.3	0.3

Error Summary							
Analyzer Cal. Error	(+/- 2% or 5% THC)	0.2%	0.3%	0.0%	-2.0%	0.0%	-0.2%
Initial Span System Bias	(+/- 5%)	0.3%	-0.5%	-0.2%	0.8%	-1.8%	-0.7%
Final Span System Bias	(+/- 5%)	0.5%	-0.9%	-0.2%	-1.1%	-1.9%	-1.2%
Initial Zero System Bias	(+/- 5%)	1.1%	0.4%	0.1%	-0.6%	-1.3%	0.0%
Final Zero System Bias	(+/- 5%)	0.7%	0.3%	0.0%	-0.8%	-1.5%	-0.1%
Test Span Drift	(+/- 3%)	0.2%	-0.3%	0.0%	-2.0%	-0.1%	-0.5%
Test Zero Drift	(+/- 3%)	-0.4%	-0.1%	-0.1%	-0.2%	-0.2%	-0.1%

A. Lanfranco and Associates Inc.
METLab CEM Report

Client:	Cantimber	**O2 Correction:**	8		Moisture % =
Source:	Activation Stack	**Year:**	2016		15.83
Run:	3				

Date	Time	O2 (Vol. %)	CO2 (Vol. %)	CO (ppm)	THC (ppm as CH4)	SOx (ppm)	NOx (ppm)
09-Nov	1311	13.07	7.15	2739.7	86.6	0.1	32.6
09-Nov	1312	13.10	7.13	2739.7	85.2	0.1	32.9
09-Nov	1313	13.10	7.13	2739.7	86.7	0.1	33.0
09-Nov	1314	13.11	7.13	2739.7	87.9	0.1	33.2
09-Nov	1315	13.12	7.13	2739.7	89.0	0.1	33.4
09-Nov	1316	13.10	7.14	2739.7	86.4	0.1	33.6
09-Nov	1317	13.10	7.15	2739.7	84.6	0.1	33.8
09-Nov	1318	13.11	7.15	2739.7	87.9	0.1	33.8
09-Nov	1319	13.12	7.13	2739.7	89.6	0.1	33.8
09-Nov	1320	13.09	7.15	2739.7	86.6	0.0	34.0
09-Nov	1321	13.07	7.16	2739.7	87.9	0.1	34.1
09-Nov	1322	13.10	7.12	2739.7	91.6	0.1	34.1
09-Nov	1323	13.12	7.10	2739.7	91.9	0.1	34.2
09-Nov	1324	13.15	7.09	2739.7	94.3	0.2	34.2
09-Nov	1325	13.13	7.10	2739.7	91.0	0.1	34.4
09-Nov	1326	13.10	7.13	2739.7	90.9	0.2	34.4
09-Nov	1327	13.11	7.11	2739.7	94.2	0.1	34.3
09-Nov	1328	13.13	7.10	2739.7	94.4	0.2	34.2
09-Nov	1329	13.15	7.09	2739.7	94.9	0.2	34.0
09-Nov	1330	13.11	7.12	2739.7	93.7	0.1	34.0
09-Nov	1331	13.10	7.12	2739.7	93.8	0.1	33.9
09-Nov	1332	13.12	7.10	2739.7	96.1	0.1	33.7
09-Nov	1333	13.13	7.10	2739.7	93.3	0.1	33.5
09-Nov	1334	13.11	7.11	2739.7	90.0	0.1	33.4
09-Nov	1335	13.10	7.12	2739.7	95.7	0.0	33.3
09-Nov	1336	13.11	7.10	2739.7	95.7	0.1	33.2
09-Nov	1337	13.13	7.08	2739.7	98.3	0.1	33.2
09-Nov	1338	13.11	7.09	2739.7	97.9	0.1	33.1
09-Nov	1339	13.07	7.11	2739.7	96.2	0.2	33.2
09-Nov	1340	13.08	7.10	2739.7	96.6	0.2	33.2
09-Nov	1341	13.12	7.07	2739.7	99.2	0.1	33.0
09-Nov	1342	13.13	7.06	2739.7	104.2	0.1	32.9
09-Nov	1343	13.09	7.08	2739.7	102.0	0.1	32.8
09-Nov	1344	13.08	7.08	2739.7	100.2	0.1	32.7
09-Nov	1345	13.10	7.07	2739.7	107.0	0.1	32.7
09-Nov	1345	13.08	7.07	2739.7	103.8	0.2	32.8
09-Nov	1346	13.11	7.05	2739.7	102.6	0.2	32.8
09-Nov	1347	13.11	7.06	2739.7	105.9	0.1	32.9
09-Nov	1348	13.09	7.07	2739.7	111.3	0.1	32.8
09-Nov	1349	13.06	7.11	2739.7	102.6	0.2	32.7
09-Nov	1350	13.08	7.11	2739.7	105.9	0.2	32.4
09-Nov	1351	13.09	7.07	2739.7	111.3	0.2	32.2
09-Nov	1352	13.10	7.05	2739.7	104.8	0.2	32.2
09-Nov	1353	13.07	7.09	2739.7	102.9	0.1	32.1
09-Nov	1354	13.08	7.09	2739.7	103.0	0.0	31.9
09-Nov	1355	13.08	7.09	2739.7	105.4	0.1	31.6
09-Nov	1356	13.11	7.07	2739.7	105.2	0.1	31.2
09-Nov	1357	13.08	7.09	2739.7	102.6	0.2	30.9
09-Nov	1358	13.07	7.09	2739.7	101.0	0.2	30.7
09-Nov	1359	13.08	7.09	2739.7	100.0	0.2	30.4
09-Nov	1400	13.10	7.07	2739.7	102.2	0.2	30.2
09-Nov	1401	13.12	7.05	2739.7	105.2	0.1	30.0
09-Nov	1402	13.14	7.04	2739.7	105.0	0.1	29.8
09-Nov	1403	13.11	7.04	2739.7	101.9	0.0	29.7
09-Nov	1404	13.09	7.04	2739.7	101.9	0.1	29.7
09-Nov	1405	13.11	7.04	2739.7	103.9	0.1	29.7
09-Nov	1406	13.10	7.05	2739.7	103.9	0.1	29.6
09-Nov	1407	13.13	7.02	2739.7	107.7	0.1	29.5
09-Nov	1408	13.14	6.99	2739.7	112.0	0.1	29.4
09-Nov	1409	13.11	7.01	2739.7	104.5	0.1	29.6
	Average	13.1	7.09	2739.7	98.0	0.1	32.5
	Minimum	13.1	6.99	2739.7	84.6	0.0	29.4
	Maximum	13.1	7.16	2739.7	112.0	0.2	34.4
	Mass Concentration (mg/m3 dry)	n/a	n/a	**3192.2**	**77.7**	**0.3**	**62.2**
	mg/m3 dry @ 8% O2			**5280.2**	**128.5**	**0.5**	**102.9**
	Range	*25.0*	*20.00*	*2500.0*	*100.0*	*200.0*	*300.0*

Calibration Summary		**O2**	**CO2**	**CO**	**THC**	**SOx**	**NOx**
Gas (Cert. Value)		**10.95**	**9.98**	**248.0**	**44.1**	**10.0**	**45.7**
Analyzer Initial Span		11.00	10.04	248.0	43.2	10.0	45.2
Analyzer Initial Zero		0.00	0.03	2.7	0.72	-0.3	0.6
Initial Gas Response		11.11	9.87	243.1	42.1	6.1	41.6
Final Gas Response		11.13	9.96	248.3	42.6	6.1	42.4
Initial Zero Response		0.24	0.09	2.9	-0.1	-3.3	0.5
Final Zero Response		0.28	0.15	10.1	1.0	-3.2	1.0

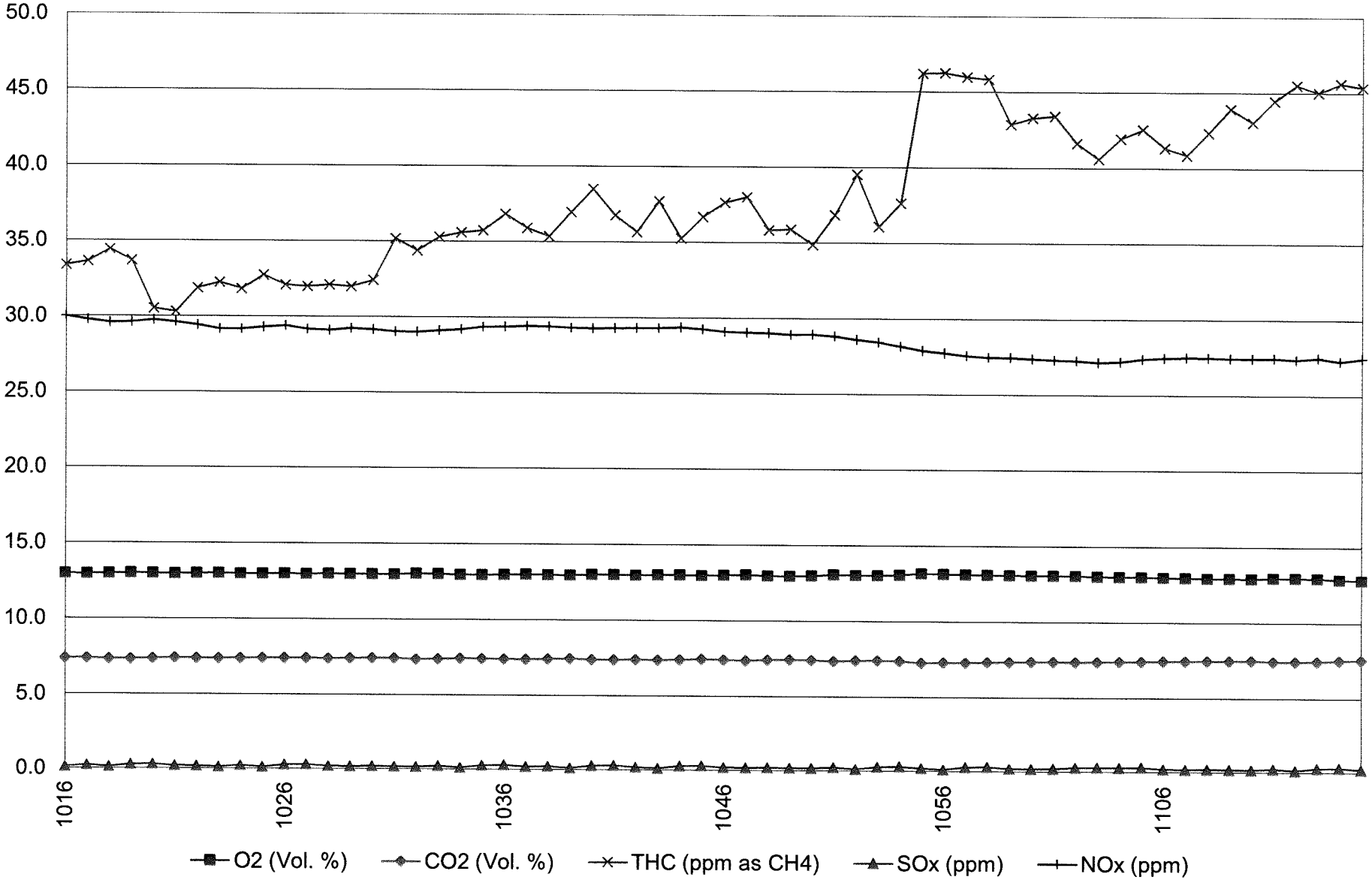
Error Summary							
Analyzer Cal. Error	(+/- 2% or 5% THC)	0.2%	0.3%	0.0%	-2.0%	0.0%	-0.2%
Initial Span System Bias	(+/- 5%)	0.4%	-0.9%	-0.2%	-1.1%	-1.9%	-1.2%
Final Span System Bias	(+/- 5%)	0.5%	-0.4%	0.0%	-0.6%	-1.9%	-0.9%
Initial Zero System Bias	(+/- 5%)	1.0%	0.3%	0.0%	-0.8%	-1.5%	0.0%
Final Zero System Bias	(+/- 5%)	1.1%	0.6%	0.3%	0.3%	-1.5%	0.1%
Test Span Drift	(+/- 3%)	0.1%	0.5%	0.2%	0.5%	0.0%	0.3%
Test Zero Drift	(+/- 3%)	0.2%	0.3%	0.3%	1.0%	0.0%	0.2%

Activation Stack - Run 1 (November 9, 2016)

CanTimber

METLab CEM Results

Note: Minutely data for CO is not shown, because CO concentrations were above the max scale of analyzer



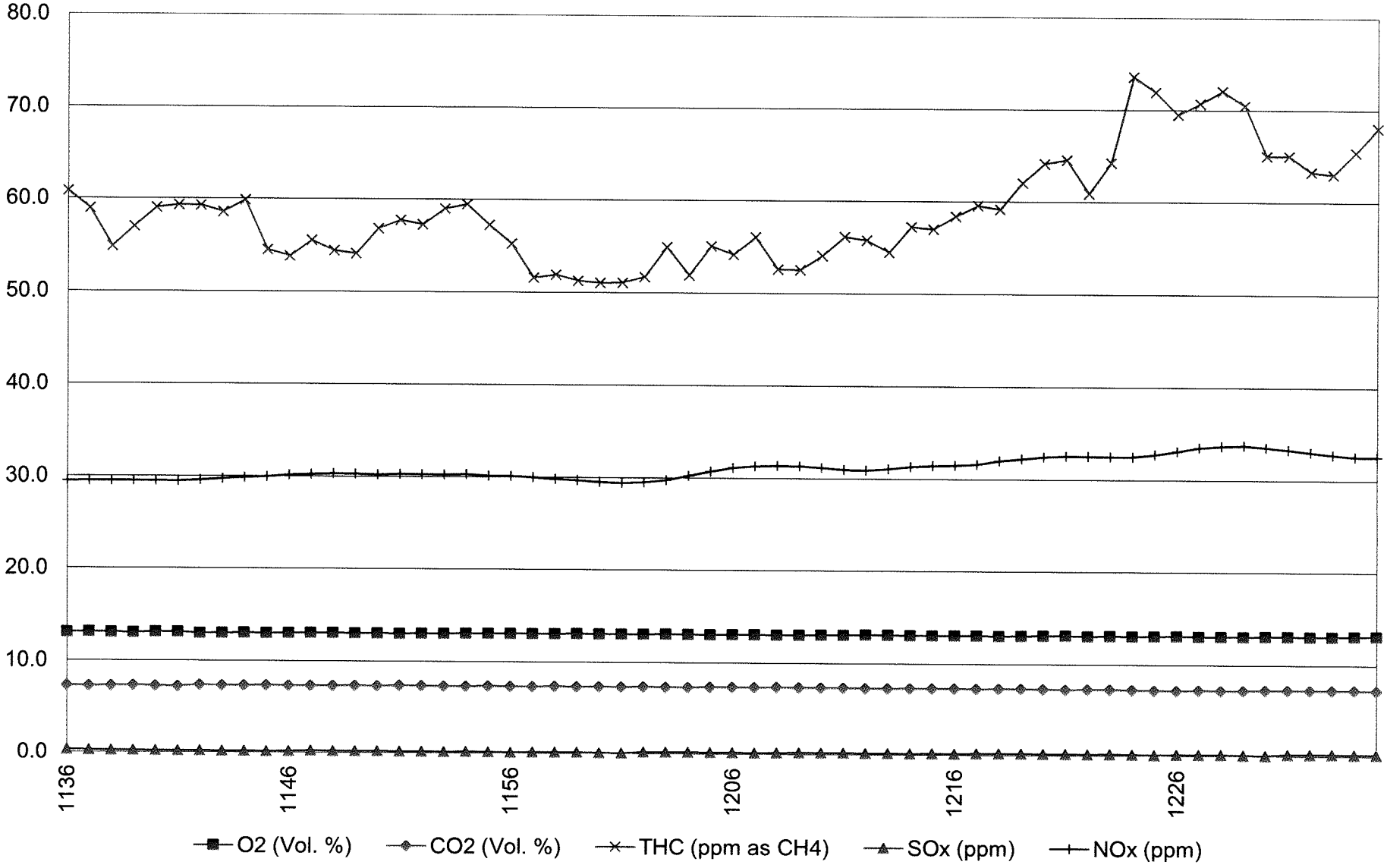
A. Lanfranco and Associates Inc.

Activation Stack - Run 2 (November 9, 2016)

Cantimber

METLab CEM Results

Note: Minutely data for CO is not shown, because CO concentrations were above the max scale of analyzer



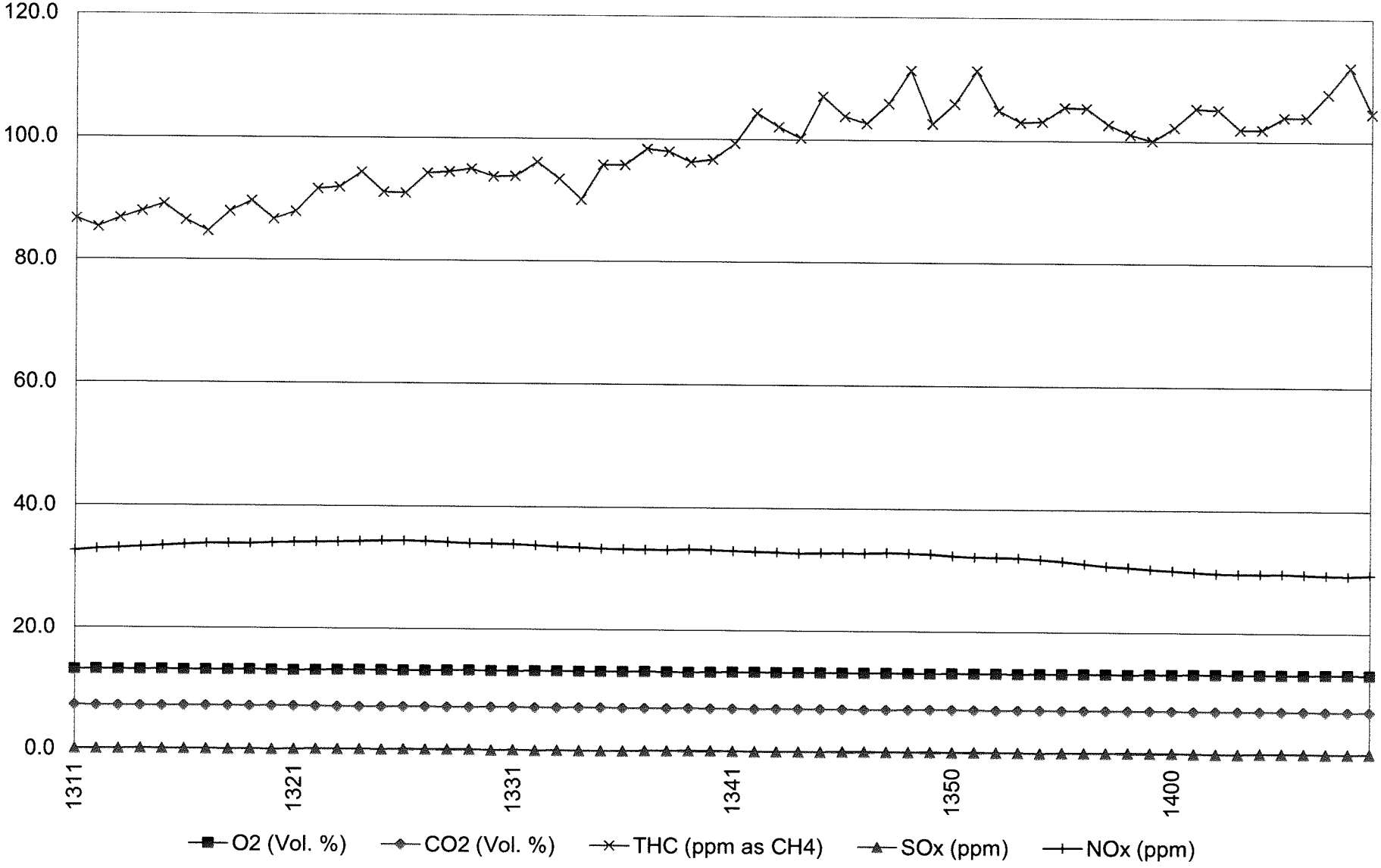
A. Lanfranco and Associates Inc.

Activation Stack - Run 3 (Nov 9, 2016)

Cantimber

METLab CEM Results

Note: Minutely data for CO is not shown, because CO concentrations were above the max scale of analyzer



A. Lanfranco and Associates Inc.

APPENDIX 2

ANALYTICAL DATA

Exova
#104, 19575-55 A Ave.
Surrey, British Columbia
V3S 8P8, Canada

T: +1 (604) 514-3322
F: +1 (604) 514-3323
E: Surrey@exova.com
W: www.exova.com

Exova

Report Transmission Cover Page

Bill To:	A. Lanfranco & Associates	Project:		Lot ID:	**1171690**
Report To:	A. Lanfranco & Associates	ID:	Cantimber	Control Number:	C0074715
	#101, 9488 - 189 Street	Name:	Activation/Carbonization	Date Received:	Nov 10, 2016
	Surrey, BC, Canada	Location:	Pt.Alberni	Date Reported:	Nov 14, 2016
	V4N 4W7	LSD:		Report Number:	2147720
Attn:	Mark Lanfranco	P.O.:	Credit card on file		
Sampled By:		Acct code:			
Company:					

Contact & Affiliation	Address	Delivery Commitments
Mark Lanfranco A. Lanfranco & Associates Inc.	#101, 9488 - 189 Street Surrey, British Columbia V4N 4W7 Phone: (604) 881-2582 Fax: (604) 881-2581 Email: mark.lanfranco@alanfranco.com	On [Lot Verification] send (COA) by Email - Multiple Reports By Agreement On [Report Approval] send (COC, Test Report) by Email - Merge Reports On [Lot Creation] send (COR) by Email - Single Report

Notes To Clients:

Exova
#104, 19575-55 A Ave
Surrey, British Columbia
V3S 8P8, Canada

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Exova

Analytical Report

Bill To:	A. Lanfranco & Associates	Project:		Lot ID:	**1171690**
Report To:	A. Lanfranco & Associates	ID:	Cantimber	Control Number:	C0074715
	#101, 9488 - 189 Street	Name:	Activation/Carbonization	Date Received:	Nov 10, 2016
	Surrey, BC, Canada	Location:	Pt.Alberni	Date Reported:	Nov 14, 2016
	V4N 4W7	LSD:		Report Number:	2147720
Attn:	Mark Lanfranco	P.O.:	Credit card on file		
Sampled By:		Acct code:			
Company:					

		Reference Number	1171690-1	1171690-2	1171690-3	
		Sample Date	Nov 08, 2016	Nov 08, 2016	Nov 08, 2016	
		Sample Time	NA	NA	NA	
		Sample Location				
		Sample Description	Blank / 20°C	Carbonization Stack Run-1 / 20°C	Carbonization Stack Run-2 / 20°C	
		Matrix	Water	Water	Water	
Analyte		**Units**	**Results**	**Results**	**Results**	Nominal Detection Limit
Aggregate Organic Constituents						
Oil and Grease	Total	mg/sample	1	2	1	1
Volume	Sample volume	mL	485	465	485	
pH adjustment	required prior to O&G extraction		Yes	Yes	Yes	

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Exova

Analytical Report

Bill To:	A. Lanfranco & Associates	Project:		Lot ID:	**1171690**
Report To:	A. Lanfranco & Associates	ID:	Cantimber	Control Number:	C0074715
	#101, 9488 - 189 Street	Name:	Activation/Carbonization	Date Received:	Nov 10, 2016
	Surrey, BC, Canada	Location:	Pt.Alberni	Date Reported:	Nov 14, 2016
	V4N 4W7	LSD:		Report Number:	2147720
Attn:	Mark Lanfranco	P.O.:	Credit card on file		
Sampled By:		Acct code:			
Company:					

		Reference Number	1171690-4	1171690-5	1171690-6	
		Sample Date	Nov 08, 2016	Nov 09, 2016	Nov 09, 2016	
		Sample Time	NA	NA	NA	
		Sample Location				
		Sample Description	Carbonization Stack Run-3 / 20°C	Activation Stack Run-1 / 20°C	Activation Stack Run-2 / 20°C	
		Matrix	Water	Water	Water	
Analyte		**Units**	**Results**	**Results**	**Results**	Nominal Detection Limit
Aggregate Organic Constituents						
Oil and Grease	Total	mg/sample	2	1	1	1
Volume	Sample volume	mL	460	465	455	
pH adjustment	required prior to O&G extraction		Yes	Yes	Yes	

Exova
#104, 19575-55 A Ave
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V3S 8P8, Canada

T: +1 (604) 514-3322
F: +1 (604) 514-3323
E: Surrey@exova.com
W: www.exova.com

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Analytical Report

Bill To:	A. Lanfranco & Associates	Project:		Lot ID:	**1171690**
Report To:	A. Lanfranco & Associates	ID:	Cantimber	Control Number:	C0074715
	#101, 9488 - 189 Street	Name:	Activation/Carbonization	Date Received:	Nov 10, 2016
	Surrey, BC, Canada	Location:	Pt.Alberni	Date Reported:	Nov 14, 2016
	V4N 4W7	LSD:		Report Number:	2147720
Attn:	Mark Lanfranco	P.O.:	Credit card on file		
Sampled By:		Acct code:			
Company:					

Reference Number	1171690-7
Sample Date	Nov 09, 2016
Sample Time	NA
Sample Location	
Sample Description	Activation Stack Run-3 / 20°C
Matrix	Water

Analyte		Units	Results	Results	Results	Nominal Detection Limit
Aggregate Organic Constituents						
Oil and Grease	Total	mg/sample	<1			1
Volume	Sample volume	mL	460			
pH adjustment	required prior to O&G extraction		Yes			

Approved by:

Mathieu Simoneau
Operations Manager

Data have been validated by Analytical Quality Control and Exova's Integrated Data Validation System (IDVS).
Generation and distribution of the report, and approval by the digitized signature above, are performed through a secure and controlled automatic process.

Exova
#104, 19575-55 A Ave
Surrey, British Columbia
V3S 8P8, Canada

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Exova

Methodology and Notes

Bill To:	A. Lanfranco & Associates	Project:		Lot ID:	**1171690**
Report To:	A. Lanfranco & Associates	ID:	Cantimber	Control Number:	C0074715
	#101, 9488 - 189 Street	Name:	Activation/Carbonization	Date Received:	Nov 10, 2016
	Surrey, BC, Canada	Location:	Pt.Alberni	Date Reported:	Nov 14, 2016
	V4N 4W7	LSD:		Report Number:	2147720
Attn:	Mark Lanfranco	P.O.:	Credit card on file		
Sampled By:		Acct code:			
Company:					

Method of Analysis

Method Name	Reference		Method	Date Analysis Started	Location
Oil and Grease in water (Surrey)	BCELM	*	Oil & Grease in Water - Direct Hexane Extraction, Oil & Grease	10-Nov-16	Exova Surrey

** Reference Method Modified*

References

BCELM	B.C. Environmental Laboratory Manual

Comments:

Please direct any inquiries regarding this report to our Client Services group.
Results relate only to samples as submitted.

EXOVA testing, calibrating, advising

www.exova.com ED 120-02

Invoice to:
Company: A. Lanfranco + Associates
Address:
Attention: Mark Lanfranco
Phone: 604-881-2582
Cell:
Fax:
E-mail: Mark.lanfranco@alanfranco.com
Agreement ID:
Copy of report:

Report To:
Company:
Address:
Attention: SAME
Phone:
Cell:
Fax:
E-mail 1:
E-mail 2:
Copy of invoice:

Report Results / Regulatory Requirement

E-Mail		HCDWQG	
Mail		Ab Tier 1	
Online		SPIGEC	
Fax		BCCSR	
PDF		Other (list below)	
Excel			
QA/QC			

Project Information
Project ID: Cartimber
Project Name: Activation/Carbonization
Project Location: Ft. Albern.
Legal Location:
PO/AFE#:
Proj. Acct. Code:
Quote #

Sample Custody (please print)
Sampled by:
Company:

This section for Lab use only
Date/Time stamp: 10-11-2016 12:02

RUSH Priority
- Emergency (contact lab for turnaround and pricing)
- Priority 1-2 working days (100% surcharge)
- Urgent 2-3 working days (50% surcharge)

When "ASAP" is requested, turn around will default to a 100% RUSH priority, with pricing and turn around time to match. Please contact the lab prior to submitting RUSH samples. If not all samples require RUSH, please indicate in the special instructions.

Date Required: Signature:

Special Instructions/Comments (please include contact information including ph. # if different from above):

Please report mg/per Sample
oil + grease By hexane extraction

	Site I.D.	Sample Description	Depth start (cm)	Depth end (m)	Date/Time Sampled	Matrix	Sampling Method	Number of Containers: oil + Grease	Enter tests above (√ relevant samples below)
1		BLANK			Nov. 8+9/16			1	✓
2									
3		Carbonization Stack Run-1			Nov. 8/16			1	✓
4		Carbonization Stack Run-2			"			1	✓
5		Carbonization Stack Run-3			"			1	✓
6									
7		Activation Stack Run-1			Nov. 9/16			1	✓
8		Activation Stack Run-2			"			1	✓
9		Activation Stack Run-3			"			1	✓
10									
11									
12									
13									
14									
15									

Indicate in the space allotted any deficiencies by the corresponding number.

1. Indicate any samples that were not packaged well
2. Indicate any samples not received in Exova supplies
3. Indicate any samples that were not clearly labeled
4. Indicate any samples not received within the required hold time or temp.
5. Indicate any missing or extra samples
6. Indicate any samples that were received broken
7. Indicate any samples where sufficient volume was not received
8. Indicate any samples received in an inappropriate container

Submission of this form acknowledges acceptance of Exova's Standard Terms and Conditions (http://www.exova.com/about/terms-and-conditions/)

Please indicate any potentially hazardous samples

Page ____ of ____ Control # C 0074715

Lot: 1171690 COC

Shipping: COD Y/ N
and size of coolers
Temp. received: 20 C
Delivery Method: Hand
Waybill:
Received by:

ED 120-02

2655 Park Center Dr., Suite A
Simi Valley, CA 93065
T: +1 805 526 7161
F: +1 805 526 7270
www.alsglobal.com

LABORATORY REPORT

November 29, 2016

Mark Lanfranco
A. Lanfranco and Associates Inc.
Unit 101 - 9488 189 St.
Surrey, BC V4N 4W7

RE: Cantimber

Dear Mark:

Enclosed are the results of the samples submitted to our laboratory on November 11, 2016. For your reference, these analyses have been assigned our service request number P1605283.

All analyses were performed according to our laboratory's NELAP and DoD-ELAP-approved quality assurance program. The test results meet requirements of the current NELAP and DoD-ELAP standards, where applicable, and except as noted in the laboratory case narrative provided. For a specific list of NELAP and DoD-ELAP-accredited analytes, refer to the certifications section at www.alsglobal.com. Results are intended to be considered in their entirety and apply only to the samples analyzed and reported herein.

If you have any questions, please call me at (805) 526-7161.

Respectfully submitted,

ALS | Environmental

Kelly Horiuchi
By Kelly Horiuchi at 3:21 pm, Nov 29, 2016

Kelly Horiuchi
Laboratory Director

2655 Park Center Dr., Suite A
Simi Valley, CA 93065
T: +1 805 526 7161
F: +1 805 526 7270
www.alsglobal.com

Client: A. Lanfranco and Associates Inc. Service Request No: P1605283
Project: Cantimber

CASE NARRATIVE

The samples were received intact under chain of custody on November 11, 2016 and were stored in accordance with the analytical method requirements. Please refer to the sample acceptance check form for additional information. The results reported herein are applicable only to the condition of the samples at the time of sample receipt.

Fixed Gases Analysis

Three of the samples were analyzed for fixed gases (hydrogen, oxygen, nitrogen, carbon monoxide, methane and carbon dioxide) according to modified EPA Method 3C (single injection) using a gas chromatograph equipped with a thermal conductivity detector (TCD). This procedure is described in laboratory SOP VOA-EPA3C. This method is included on the laboratory's DoD-ELAP scope of accreditation, however it is not part of the NELAP accreditation.

Volatile Organic Compound Analysis

All of the samples were analyzed for volatile organic compounds in accordance with EPA Method TO-15 from the Compendium of Methods for the Determination of Toxic Organic Compounds in Ambient Air, Second Edition (EPA/625/R-96/010b), January, 1999. This procedure is described in laboratory SOP VOA-TO15. The analytical system was comprised of a gas chromatograph / mass spectrometer (GC/MS) interfaced to a whole-air preconcentrator. The method was modified for three of the samples to include the use of helium as a diluent gas in place of zero-grade air for container pressurization. When necessary, analytical sample volumes were adjusted by a correction factor for containers pressurized with helium. A summary sheet has been included listing the affected samples. This method is included on the laboratory's NELAP and DoD-ELAP scope of accreditation. Any analytes flagged with an X are not included on the NELAP or DoD-ELAP accreditation.

The spike recovery of carbon disulfide in the Laboratory Control Sample (LCS) was outside the laboratory generated control criteria. The recovery error equates to a potential high bias. However, the recovery in question was within the method criteria, therefore the data quality has not been significantly affected. No corrective action was taken.

The containers were cleaned, prior to sampling, down to the method reporting limit (MRL) reported for this project. Please note, projects which require reporting below the MRL could have results between the MRL and method detection limit (MDL) that are biased high.

2655 Park Center Dr., Suite A
Simi Valley, CA 93065
T: +1 805 526 7161
F: +1 805 526 7270
www.alsglobal.com

ALS Environmental - Simi Valley

CERTIFICATIONS, ACCREDITATIONS, AND REGISTRATIONS

Agency	Web Site	Number
Arizona DHS	http://www.azdhs.gov/lab/license/env.htm	AZ0694
PJLA (DoD ELAP)	http://www.pjlabs.com/search-accredited-labs	65818 (Testing)
Florida DOH (NELAP)	http://www.doh.state.fl.us/lab/EnvLabCert/WaterCert.htm	E871020
Maine DHHS	http://www.maine.gov/dhhs/mecdc/environmental-health/water/dwp-services/labcert/labcert.htm	2016036
Minnesota DOH (NELAP)	http://www.health.state.mn.us/accreditation	977273
New Jersey DEP (NELAP)	http://www.nj.gov/dep/oqa/	CA009
New York DOH (NELAP)	http://www.wadsworth.org/labcert/elap/elap.html	11221
Oregon PHD (NELAP)	http://public.health.oregon.gov/LaboratoryServices/EnvironmentalLaboratoryAccreditation/Pages/index.aspx	4068-003
Pennsylvania DEP	http://www.depweb.state.pa.us/labs	68-03307 (Registration)
Texas CEQ (NELAP)	http://www.tceq.texas.gov/field/qa/env_lab_accreditation.html	T104704413-16-7
Utah DOH (NELAP)	http://www.health.utah.gov/lab/labimp/certification/index.html	CA016272016-6
Washington DOE	http://www.ecy.wa.gov/programs/eap/labs/lab-accreditation.html	C946

Analyses were performed according to our laboratory's NELAP and DoD-ELAP approved quality assurance program. A complete listing of specific NELAP and DoD-ELAP certified analytes can be found in the certifications section at www.alsglobal.com, or at the accreditation body's website.

Each of the certifications listed above have an explicit Scope of Accreditation that applies to specific matrices/methods/analytes; therefore, please contact the laboratory for information corresponding to a particular certification.

ALS ENVIRONMENTAL

DETAIL SUMMARY REPORT

Client: A. Lanfranco and Associates Inc. Service Request: P1605283
Project ID: Cantimber

Date Received: 11/11/2016
Time Received: 09:55

Client Sample ID	Lab Code	Matrix	Date Collected	Time Collected	Container ID	Pi1 (psig)	Pfl (psig)	TO-15 - VOC Cans	3C Modified - Fxd Gases Can
Carbonization Stack Run-1	P1605283-001	Air	11/8/2016	12:56	SC01769	-1.80	3.54	X	
Carbonization Stack Run-2	P1605283-002	Air	11/8/2016	14:00	SC00282	-1.85	3.55	X	
Carbonization Stack Run-3	P1605283-003	Air	11/8/2016	15:07	SC00929	-2.44	3.53	X	
Activation Stack Run-1	P1605283-004	Air	11/9/2016	11:28	SC00403	-1.30	3.64	X	X
Activation Stack Run-2	P1605283-005	Air	11/9/2016	12:46	SC02019	-1.78	3.88	X	X
Activation Stack Run-3	P1605283-006	Air	11/9/2016	14:12	SC01693	-1.70	3.62	X	X

ALS ENVIRONMENTAL

Sample Volume Correction for Helium Pressurization for SCAN Analysis

Sample ID	Pi	Pf	Sample Volume (L)	Adjusted Volume (L)
P1605283-004	-1.30	3.64	0.240	0.266
P1605283-005	-1.78	3.88	0.550	0.615
P1605283-006	-1.70	3.62	1.000	1.11

Validation Date: 10/13/09

Air - Chain of Custody Record & Analytical Service Request

2655 Park Center Drive, Suite A
Simi Valley, California 93065
Phone (805) 526-7161
Fax (805) 526-7270

Requested Turnaround Time in Business Days (Surcharges) please circle
1 Day (100%) 2 Day (75%) 3 Day (50%) 4 Day (35%) 5 Day (25%) 10-Day-Standard

ALS Project No: ~~P160~~ 5283

Company Name & Address (Reporting Information): A. Lanfranco & Associates

Project Name: Cantimber

Project Number:

ALS Contact:

Project Manager: Mark Lanfranco

Phone: 604 881 2582 Fax: 604 881 2581

P.O. # / Billing Information: Mark @ 101 9488 189th St Surrey, B.C Canada - V4N 4W7

Email Address for Result Reporting: Mark.lanfrancoe@alanfranco.com

Sampler (Print & Sign): Carter Lanfranco -

Client Sample ID	Laboratory ID Number	Date Collected	Time Collected	Canister ID (Bar code # - AC, SC, etc.)	Flow Controller ID (Bar code # - FC #)	Canister Start Pressure "Hg	Canister End Pressure "Hg/psig	Sample Volume	Analysis Method: TO-15	Analysis Method: EPA 3c	Comments e.g. Actual Preservative or specific instructions
Carbonization Stack Run-1	1	Nov. 8/16	11:56-12:56	SC01769	OA01693	-30	-5		✓	✗	EPA 3c
Carbonization Stack Run-2	2	"	13:00-14:00	SC00282	OA01164	-27	-3		✓	✗	or Activation
Carbonization Stack Run-3	3	"	14:07-15:07	SC00929	OA00572	-29	-5		✓	✗	Stack only
Activation Stack Run-1	4	Nov. 9/16	10:28-11:28	SC00403	OA01516	-31	-5		✓	✓	
Activation Stack Run-2	5	"	11:46-12:46	SC02019	OA01829	-29	-5		✓	✓	
Activation Stack Run-3	6	"	13:12-14:12	SC01693	OA01141	-29	-4		✓	✓	

Report Tier Levels - please select

Tier I - Results (Default in not specified) ____ Tier III (Results + QC & Calibration Summaries) ____

Tier II (Results + QC Summaries ____ Tier IV (Date Validation Package) 10% Surcharge ____

EDD required YES / No

Type: ____ Units: ____

Chain of Custody Seal: (Circle) INTACT BROKEN ABSENT

Project Requirements (MRLs, QAPP)

Relinquished by: (Signature)	Date:	Time:	Received by: (Signature)	Date:	Time:
	Nov. 10/16	15:00			
Relinquished by: (Signature) FEDEX	Date:	Time:	Received by: (Signature)	Date: 11/11/16	Time: 0955

Cooler / Blank Temperature ____ °C

ALS Environmental
Sample Acceptance Check Form

Client: A. Lanfranco and Associates Inc. Work order: P1605283
Project: Cantimber
Sample(s) received on: 11/11/16 Date opened: 11/11/16 by: ADAVID

Note: This form is used for all samples received by ALS. The use of this form for custody seals is strictly meant to indicate presence/absence and not as an indication of compliance or nonconformity. Thermal preservation and pH will only be evaluated either at the request of the client and/or as required by the method/SOP.

		Yes	No	N/A
1	Were **sample containers** properly marked with client sample ID?	☒	☐	☐
2	Did **sample containers** arrive in good condition?	☒	☐	☐
3	Were **chain-of-custody** papers used and filled out?	☒	☐	☐
4	Did **sample container labels** and/or tags agree with custody papers?	☒	☐	☐
5	Was **sample volume** received adequate for analysis?	☒	☐	☐
6	Are samples within specified holding times?	☒	☐	☐
7	Was proper **temperature** (thermal preservation) of cooler at receipt adhered to?	☐	☐	☒
8	Were **custody seals** on outside of cooler/Box/Container?	☐	☒	☐
	Location of seal(s)? _____ Sealing Lid?	☐	☐	☒
	Were signature and date included?	☐	☐	☒
	Were seals intact?	☐	☐	☒
9	Do containers have appropriate **preservation**, according to method/SOP or Client specified information?	☐	☐	☒
	Is there a client indication that the submitted samples are **pH** preserved?	☐	☐	☒
	Were **VOA vials** checked for presence/absence of air bubbles?	☐	☐	☒
	Does the client/method/SOP require that the analyst check the sample pH and if necessary alter it?	☐	☐	☒
10	**Tubes:** Are the tubes capped and intact?	☐	☐	☒
11	**Badges:** Are the badges properly capped and intact?	☐	☐	☒
	Are dual bed badges separated and individually capped and intact?	☐	☐	☒

Lab Sample ID	Container Description	Required pH *	Received pH	Adjusted pH	VOA Headspace (Presence/Absence)	Receipt / Preservation Comments
P1605283-001.01	6.0 L Source Can					
P1605283-002.01	6.0 L Source Can					
P1605283-003.01	6.0 L Source Can					
P1605283-004.01	6.0 L Source Can					
P1605283-005.01	6.0 L Source Can					
P1605283-006.01	6.0 L Source Can					

Explain any discrepancies: (include lab sample ID numbers): _____

RSK - MEEPP, HCL (pH<2); RSK - CO2, (pH 5-8); Sulfur (pH>4)

ALS ENVIRONMENTAL

RESULTS OF ANALYSIS

Client: **A. Lanfranco and Associates Inc.**
Client Sample ID: **Activation Stack Run-1**
Client Project ID: **Cantimber**

ALS Project ID: P1605283
ALS Sample ID: P1605283-004

Test Code: EPA Method 3C Modified
Instrument ID: HP5890 II/GC1/TCD
Analyst: Adam McAfee
Sample Type: 6.0 L Summa Canister
Test Notes:
Container ID: SC00403

Date Collected: 11/9/16
Date Received: 11/11/16
Date Analyzed: 11/15/16
Volume(s) Analyzed: 0.10 ml(s)

Initial Pressure (psig): -1.30 Final Pressure (psig): 3.64

Canister Dilution Factor: 1.37

CAS #	Compound	Result %, v/v	MRL %, v/v	Data Qualifier
1333-74-0	**Hydrogen**	**0.743**	0.14	
7782-44-7	**Oxygen***	**14.4**	0.14	
7727-37-9	**Nitrogen**	**77.3**	0.14	
630-08-0	**Carbon Monoxide**	**0.586**	0.14	
74-82-8	Methane	ND	0.14	
124-38-9	**Carbon Dioxide**	**7.00**	0.14	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.
MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.
* = The oxygen result may include argon due to coelution. Ambient air includes 0.93% argon.

ALS ENVIRONMENTAL

RESULTS OF ANALYSIS

Client: **A. Lanfranco and Associates Inc.**
Client Sample ID: **Activation Stack Run-2**
Client Project ID: **Cantimber**

ALS Project ID: P1605283
ALS Sample ID: P1605283-005

Test Code: EPA Method 3C Modified
Instrument ID: HP5890 II/GC1/TCD
Analyst: Adam McAfee
Sample Type: 6.0 L Summa Canister
Test Notes:
Container ID: SC02019

Date Collected: 11/9/16
Date Received: 11/11/16
Date Analyzed: 11/15/16
Volume(s) Analyzed: 0.10 ml(s)

Initial Pressure (psig): -1.78 Final Pressure (psig): 3.88

Canister Dilution Factor: 1.44

CAS #	Compound	Result %, v/v	MRL %, v/v	Data Qualifier
1333-74-0	**Hydrogen**	**1.14**	0.14	
7782-44-7	**Oxygen***	**14.1**	0.14	
7727-37-9	**Nitrogen**	**76.7**	0.14	
630-08-0	**Carbon Monoxide**	**0.854**	0.14	
74-82-8	Methane	ND	0.14	
124-38-9	**Carbon Dioxide**	**7.17**	0.14	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.
MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.
* = The oxygen result may include argon due to coelution. Ambient air includes 0.93% argon.

ALS ENVIRONMENTAL

RESULTS OF ANALYSIS

Client: **A. Lanfranco and Associates Inc.**
Client Sample ID: **Activation Stack Run-3**
Client Project ID: **Cantimber**

ALS Project ID: P1605283
ALS Sample ID: P1605283-006

Test Code: EPA Method 3C Modified
Instrument ID: HP5890 II/GC1/TCD
Analyst: Adam McAfee
Sample Type: 6.0 L Summa Canister
Test Notes:
Container ID: SC01693

Date Collected: 11/9/16
Date Received: 11/11/16
Date Analyzed: 11/15/16
Volume(s) Analyzed: 0.10 ml(s)

Initial Pressure (psig): -1.70 Final Pressure (psig): 3.62

Canister Dilution Factor: 1.41

CAS #	Compound	Result %, v/v	MRL %, v/v	Data Qualifier
1333-74-0	**Hydrogen**	**1.75**	0.14	
7782-44-7	**Oxygen***	**14.2**	0.14	
7727-37-9	**Nitrogen**	**75.9**	0.14	
630-08-0	**Carbon Monoxide**	**1.19**	0.14	
74-82-8	Methane	ND	0.14	
124-38-9	**Carbon Dioxide**	**6.99**	0.14	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.
MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.
* = The oxygen result may include argon due to coelution. Ambient air includes 0.93% argon.

ALS ENVIRONMENTAL

RESULTS OF ANALYSIS

Client: **A. Lanfranco and Associates Inc.**
Client Sample ID: **Method Blank**
Client Project ID: **Cantimber**

ALS Project ID: P1605283
ALS Sample ID: P161115-MB

Test Code: EPA Method 3C Modified
Instrument ID: HP5890 II/GC1/TCD
Analyst: Adam McAfee
Sample Type: 6.0 L Summa Canister
Test Notes:

Date Collected: NA
Date Received: NA
Date Analyzed: 11/15/16
Volume(s) Analyzed: 0.10 ml(s)

CAS #	Compound	Result %, v/v	MRL %, v/v	Data Qualifier
1333-74-0	Hydrogen	ND	0.10	
7782-44-7	Oxygen*	ND	0.10	
7727-37-9	Nitrogen	ND	0.10	
630-08-0	Carbon Monoxide	ND	0.10	
74-82-8	Methane	ND	0.10	
124-38-9	Carbon Dioxide	ND	0.10	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.
MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.
* = The oxygen result may include argon due to coelution. Ambient air includes 0.93% argon.

ALS ENVIRONMENTAL

LABORATORY CONTROL SAMPLE SUMMARY

Client: **A. Lanfranco and Associates Inc.**
Client Sample ID: **Lab Control Sample**
Client Project ID: **Cantimber**

ALS Project ID: P1605283
ALS Sample ID: P161115-LCS

Test Code: EPA Method 3C Modified
Instrument ID: HP5890 II/GC1/TCD
Analyst: Adam McAfee
Sample Type: 6.0 L Summa Canister
Test Notes:

Date Collected: NA
Date Received: NA
Date Analyzed: 11/15/16
Volume(s) Analyzed: NA ml(s)

CAS #	Compound	Spike Amount ppmV	**Result ppmV**	**% Recovery**	ALS Acceptance Limits	Data Qualifier
1333-74-0	Hydrogen	50,000	**50,400**	**101**	94-105	
7782-44-7	Oxygen*	50,000	**52,600**	**105**	97-108	
7727-37-9	Nitrogen	50,000	**52,800**	**106**	89-113	
630-08-0	Carbon Monoxide	50,000	**52,000**	**104**	98-108	
74-82-8	Methane	50,000	**50,200**	**100**	94-111	
124-38-9	Carbon Dioxide	50,000	**49,900**	**100**	94-104	

* = The oxygen result may include argon due to coelution. Ambient air includes 0.93% argon.

ALS ENVIRONMENTAL

RESULTS OF ANALYSIS

Client: **A. Lanfranco and Associates Inc.**
Client Sample ID: **Carbonization Stack Run-1**
Client Project ID: **Cantimber**

ALS Project ID: P1605283
ALS Sample ID: P1605283-001

Test Code: EPA TO-15
Instrument ID: Tekmar AUTOCAN/Agilent 5973inert/6890N/MS9
Analyst: Simon Cao
Sample Type: 6.0 L Summa Canister
Test Notes:
Container ID: SC01769

Date Collected: 11/8/16
Date Received: 11/11/16
Date Analyzed: 11/15/16
Volume(s) Analyzed: 0.10 Liter(s)

Initial Pressure (psig): -1.80 Final Pressure (psig): 3.54

Canister Dilution Factor: 1.41

CAS #	Compound	Result µg/m³	MRL µg/m³	Result ppbV	MRL ppbV	Data Qualifier
115-07-1	Propene	**64**	7.1	**37**	4.1	
75-71-8	Dichlorodifluoromethane (CFC 12)	ND	7.1	ND	1.4	
74-87-3	Chloromethane	**44**	7.1	**21**	3.4	
76-14-2	1,2-Dichloro-1,1,2,2-tetrafluoroethane (CFC 114)	ND	7.1	ND	1.0	
75-01-4	Vinyl Chloride	ND	7.1	ND	2.8	
106-99-0	1,3-Butadiene	ND	7.1	ND	3.2	
74-83-9	Bromomethane	ND	7.1	ND	1.8	
75-00-3	Chloroethane	ND	7.1	ND	2.7	
64-17-5	Ethanol	ND	71	ND	37	
75-05-8	Acetonitrile	**75**	7.1	**45**	4.2	
107-02-8	Acrolein	**170**	28	**74**	12	
67-64-1	Acetone	**1,200**	71	**530**	30	
75-69-4	Trichlorofluoromethane	ND	7.1	ND	1.3	
67-63-0	2-Propanol (Isopropyl Alcohol)	ND	71	ND	29	
107-13-1	Acrylonitrile	**12**	7.1	**5.7**	3.2	
75-35-4	1,1-Dichloroethene	ND	7.1	ND	1.8	
75-09-2	Methylene Chloride	ND	7.1	ND	2.0	
107-05-1	3-Chloro-1-propene (Allyl Chloride)	ND	7.1	ND	2.3	
76-13-1	Trichlorotrifluoroethane	ND	7.1	ND	0.92	
75-15-0	Carbon Disulfide	ND	71	ND	23	
156-60-5	trans-1,2-Dichloroethene	ND	7.1	ND	1.8	
75-34-3	1,1-Dichloroethane	ND	7.1	ND	1.7	
1634-04-4	Methyl tert-Butyl Ether	ND	7.1	ND	2.0	
108-05-4	Vinyl Acetate	**410**	71	**120**	20	
78-93-3	2-Butanone (MEK)	**240**	71	**81**	24	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.
MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

Client: **A. Lanfranco and Associates Inc.**
Client Sample ID: **Carbonization Stack Run-1**
Client Project ID: **Cantimber**

ALS Project ID: P1605283
ALS Sample ID: P1605283-001

Test Code: EPA TO-15
Instrument ID: Tekmar AUTOCAN/Agilent 5973inert/6890N/MS9
Analyst: Simon Cao
Sample Type: 6.0 L Summa Canister
Test Notes:
Container ID: SC01769

Date Collected: 11/8/16
Date Received: 11/11/16
Date Analyzed: 11/15/16
Volume(s) Analyzed: 0.10 Liter(s)

Initial Pressure (psig): -1.80 Final Pressure (psig): 3.54

Canister Dilution Factor: 1.41

CAS #	Compound	Result µg/m³	MRL µg/m³	Result ppbV	MRL ppbV	Data Qualifier
156-59-2	cis-1,2-Dichloroethene	ND	7.1	ND	1.8	
141-78-6	Ethyl Acetate	ND	14	ND	3.9	
110-54-3	n-Hexane	**7.1**	7.1	**2.0**	2.0	
67-66-3	Chloroform	ND	7.1	ND	1.4	
109-99-9	Tetrahydrofuran (THF)	**51**	7.1	**17**	2.4	
107-06-2	1,2-Dichloroethane	ND	7.1	ND	1.7	
71-55-6	1,1,1-Trichloroethane	ND	7.1	ND	1.3	
71-43-2	Benzene	**860**	7.1	**270**	2.2	
56-23-5	Carbon Tetrachloride	ND	7.1	ND	1.1	
110-82-7	Cyclohexane	ND	14	ND	4.1	
78-87-5	1,2-Dichloropropane	ND	7.1	ND	1.5	
75-27-4	Bromodichloromethane	ND	7.1	ND	1.1	
79-01-6	Trichloroethene	ND	7.1	ND	1.3	
123-91-1	1,4-Dioxane	ND	7.1	ND	2.0	
80-62-6	Methyl Methacrylate	ND	14	ND	3.4	
142-82-5	n-Heptane	ND	7.1	ND	1.7	
10061-01-5	cis-1,3-Dichloropropene	ND	7.1	ND	1.6	
108-10-1	4-Methyl-2-pentanone	ND	7.1	ND	1.7	
10061-02-6	trans-1,3-Dichloropropene	ND	7.1	ND	1.6	
79-00-5	1,1,2-Trichloroethane	ND	7.1	ND	1.3	
108-88-3	Toluene	**50**	7.1	**13**	1.9	
591-78-6	2-Hexanone	ND	7.1	ND	1.7	
124-48-1	Dibromochloromethane	ND	7.1	ND	0.83	
106-93-4	1,2-Dibromoethane	ND	7.1	ND	0.92	
123-86-4	n-Butyl Acetate	ND	7.1	ND	1.5	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.
MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

ALS ENVIRONMENTAL

RESULTS OF ANALYSIS

Client: **A. Lanfranco and Associates Inc.**
Client Sample ID: **Carbonization Stack Run-1**
Client Project ID: **Cantimber**

ALS Project ID: P1605283
ALS Sample ID: P1605283-001

Test Code: EPA TO-15
Instrument ID: Tekmar AUTOCAN/Agilent 5973inert/6890N/MS9
Analyst: Simon Cao
Sample Type: 6.0 L Summa Canister
Test Notes:
Container ID: SC01769

Date Collected: 11/8/16
Date Received: 11/11/16
Date Analyzed: 11/15/16
Volume(s) Analyzed: 0.10 Liter(s)

Initial Pressure (psig): -1.80 Final Pressure (psig): 3.54

Canister Dilution Factor: 1.41

CAS #	Compound	Result µg/m³	MRL µg/m³	Result ppbV	MRL ppbV	Data Qualifier
111-65-9	n-Octane	ND	7.1	ND	1.5	
127-18-4	Tetrachloroethene	ND	7.1	ND	1.0	
108-90-7	Chlorobenzene	**29**	7.1	**6.2**	1.5	
100-41-4	Ethylbenzene	ND	7.1	ND	1.6	
179601-23-1	m,p-Xylenes	ND	14	ND	3.2	
75-25-2	Bromoform	ND	7.1	ND	0.68	
100-42-5	Styrene	**7.1**	7.1	**1.7**	1.7	
95-47-6	o-Xylene	ND	7.1	ND	1.6	
111-84-2	n-Nonane	ND	7.1	ND	1.3	
79-34-5	1,1,2,2-Tetrachloroethane	ND	7.1	ND	1.0	
98-82-8	Cumene	ND	7.1	ND	1.4	
80-56-8	alpha-Pinene	ND	7.1	ND	1.3	
103-65-1	n-Propylbenzene	ND	7.1	ND	1.4	
622-96-8	4-Ethyltoluene	ND	7.1	ND	1.4	
108-67-8	1,3,5-Trimethylbenzene	ND	7.1	ND	1.4	
95-63-6	1,2,4-Trimethylbenzene	ND	7.1	ND	1.4	
100-44-7	Benzyl Chloride	ND	7.1	ND	1.4	
541-73-1	1,3-Dichlorobenzene	ND	7.1	ND	1.2	
106-46-7	1,4-Dichlorobenzene	ND	7.1	ND	1.2	
95-50-1	1,2-Dichlorobenzene	ND	7.1	ND	1.2	
5989-27-5	d-Limonene	ND	7.1	ND	1.3	
96-12-8	1,2-Dibromo-3-chloropropane	ND	7.1	ND	0.73	
120-82-1	1,2,4-Trichlorobenzene	ND	7.1	ND	0.95	
91-20-3	Naphthalene	**370**	7.1	**70**	1.3	
87-68-3	Hexachlorobutadiene	ND	7.1	ND	0.66	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.
MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

ALS ENVIRONMENTAL

RESULTS OF ANALYSIS

Client: **A. Lanfranco and Associates Inc.**
Client Sample ID: **Carbonization Stack Run-2**
Client Project ID: **Cantimber**

ALS Project ID: P1605283
ALS Sample ID: P1605283-002

Test Code: EPA TO-15
Instrument ID: Tekmar AUTOCAN/Agilent 5973inert/6890N/MS9
Analyst: Simon Cao
Sample Type: 6.0 L Summa Canister
Test Notes:
Container ID: SC00282

Date Collected: 11/8/16
Date Received: 11/11/16
Date Analyzed: 11/15/16
Volume(s) Analyzed: 0.40 Liter(s)

Initial Pressure (psig): -1.85 Final Pressure (psig): 3.55

Canister Dilution Factor: 1.42

CAS #	Compound	Result µg/m³	MRL µg/m³	Result ppbV	MRL ppbV	Data Qualifier
115-07-1	Propene	**97**	1.8	**56**	1.0	
75-71-8	Dichlorodifluoromethane (CFC 12)	ND	1.8	ND	0.36	
74-87-3	Chloromethane	**37**	1.8	**18**	0.86	
76-14-2	1,2-Dichloro-1,1,2,2-tetrafluoroethane (CFC 114)	ND	1.8	ND	0.25	
75-01-4	Vinyl Chloride	ND	1.8	ND	0.69	
106-99-0	1,3-Butadiene	ND	1.8	ND	0.80	
74-83-9	Bromomethane	**3.1**	1.8	**0.79**	0.46	
75-00-3	Chloroethane	ND	1.8	ND	0.67	
64-17-5	Ethanol	**23**	18	**12**	9.4	
75-05-8	Acetonitrile	**60**	1.8	**36**	1.1	
107-02-8	Acrolein	**94**	7.1	**41**	3.1	
67-64-1	Acetone	**960**	18	**410**	7.5	
75-69-4	Trichlorofluoromethane	ND	1.8	ND	0.32	
67-63-0	2-Propanol (Isopropyl Alcohol)	ND	18	ND	7.2	
107-13-1	Acrylonitrile	**6.9**	1.8	**3.2**	0.82	
75-35-4	1,1-Dichloroethene	ND	1.8	ND	0.45	
75-09-2	Methylene Chloride	ND	1.8	ND	0.51	
107-05-1	3-Chloro-1-propene (Allyl Chloride)	ND	1.8	ND	0.57	
76-13-1	Trichlorotrifluoroethane	ND	1.8	ND	0.23	
75-15-0	Carbon Disulfide	ND	18	ND	5.7	
156-60-5	trans-1,2-Dichloroethene	ND	1.8	ND	0.45	
75-34-3	1,1-Dichloroethane	ND	1.8	ND	0.44	
1634-04-4	Methyl tert-Butyl Ether	ND	1.8	ND	0.49	
108-05-4	Vinyl Acetate	**450**	18	**130**	5.0	
78-93-3	2-Butanone (MEK)	**230**	18	**79**	6.0	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.
MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

ALS ENVIRONMENTAL

RESULTS OF ANALYSIS

Client: **A. Lanfranco and Associates Inc.**
Client Sample ID: **Carbonization Stack Run-2**
Client Project ID: **Cantimber**

ALS Project ID: P1605283
ALS Sample ID: P1605283-002

Test Code: EPA TO-15
Instrument ID: Tekmar AUTOCAN/Agilent 5973inert/6890N/MS9
Analyst: Simon Cao
Sample Type: 6.0 L Summa Canister
Test Notes:
Container ID: SC00282

Date Collected: 11/8/16
Date Received: 11/11/16
Date Analyzed: 11/15/16
Volume(s) Analyzed: 0.40 Liter(s)

Initial Pressure (psig): -1.85 Final Pressure (psig): 3.55

Canister Dilution Factor: 1.42

CAS #	Compound	Result µg/m³	MRL µg/m³	Result ppbV	MRL ppbV	Data Qualifier
156-59-2	cis-1,2-Dichloroethene	ND	1.8	ND	0.45	
141-78-6	Ethyl Acetate	**7.5**	3.6	**2.1**	0.99	
110-54-3	n-Hexane	**8.0**	1.8	**2.3**	0.50	
67-66-3	Chloroform	**2.0**	1.8	**0.42**	0.36	
109-99-9	Tetrahydrofuran (THF)	**43**	1.8	**15**	0.60	
107-06-2	1,2-Dichloroethane	ND	1.8	ND	0.44	
71-55-6	1,1,1-Trichloroethane	ND	1.8	ND	0.33	
71-43-2	Benzene	**300**	1.8	**95**	0.56	
56-23-5	Carbon Tetrachloride	ND	1.8	ND	0.28	
110-82-7	Cyclohexane	ND	3.6	ND	1.0	
78-87-5	1,2-Dichloropropane	ND	1.8	ND	0.38	
75-27-4	Bromodichloromethane	ND	1.8	ND	0.27	
79-01-6	Trichloroethene	ND	1.8	ND	0.33	
123-91-1	1,4-Dioxane	ND	1.8	ND	0.49	
80-62-6	Methyl Methacrylate	ND	3.6	ND	0.87	
142-82-5	n-Heptane	**2.0**	1.8	**0.49**	0.43	
10061-01-5	cis-1,3-Dichloropropene	ND	1.8	ND	0.39	
108-10-1	4-Methyl-2-pentanone	**2.9**	1.8	**0.70**	0.43	
10061-02-6	trans-1,3-Dichloropropene	ND	1.8	ND	0.39	
79-00-5	1,1,2-Trichloroethane	ND	1.8	ND	0.33	
108-88-3	Toluene	**57**	1.8	**15**	0.47	
591-78-6	2-Hexanone	**5.3**	1.8	**1.3**	0.43	
124-48-1	Dibromochloromethane	ND	1.8	ND	0.21	
106-93-4	1,2-Dibromoethane	ND	1.8	ND	0.23	
123-86-4	n-Butyl Acetate	ND	1.8	ND	0.37	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.
MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

ALS ENVIRONMENTAL

RESULTS OF ANALYSIS

Client: **A. Lanfranco and Associates Inc.**
Client Sample ID: **Carbonization Stack Run-2**
Client Project ID: **Cantimber**

ALS Project ID: P1605283
ALS Sample ID: P1605283-002

Test Code: EPA TO-15
Instrument ID: Tekmar AUTOCAN/Agilent 5973inert/6890N/MS9
Analyst: Simon Cao
Sample Type: 6.0 L Summa Canister
Test Notes:
Container ID: SC00282

Date Collected: 11/8/16
Date Received: 11/11/16
Date Analyzed: 11/15/16
Volume(s) Analyzed: 0.40 Liter(s)

Initial Pressure (psig): -1.85 Final Pressure (psig): 3.55

Canister Dilution Factor: 1.42

CAS #	Compound	Result µg/m³	MRL µg/m³	Result ppbV	MRL ppbV	Data Qualifier
111-65-9	n-Octane	**2.1**	1.8	**0.45**	0.38	
127-18-4	Tetrachloroethene	ND	1.8	ND	0.26	
108-90-7	Chlorobenzene	**30**	1.8	**6.6**	0.39	
100-41-4	Ethylbenzene	**9.2**	1.8	**2.1**	0.41	
179601-23-1	m,p-Xylenes	**20**	3.6	**4.6**	0.82	
75-25-2	Bromoform	ND	1.8	ND	0.17	
100-42-5	Styrene	ND	1.8	ND	0.42	
95-47-6	o-Xylene	**5.7**	1.8	**1.3**	0.41	
111-84-2	n-Nonane	ND	1.8	ND	0.34	
79-34-5	1,1,2,2-Tetrachloroethane	ND	1.8	ND	0.26	
98-82-8	Cumene	ND	1.8	ND	0.36	
80-56-8	alpha-Pinene	ND	1.8	ND	0.32	
103-65-1	n-Propylbenzene	ND	1.8	ND	0.36	
622-96-8	4-Ethyltoluene	**3.8**	1.8	**0.78**	0.36	
108-67-8	1,3,5-Trimethylbenzene	**2.6**	1.8	**0.53**	0.36	
95-63-6	1,2,4-Trimethylbenzene	**4.0**	1.8	**0.82**	0.36	
100-44-7	Benzyl Chloride	ND	1.8	ND	0.34	
541-73-1	1,3-Dichlorobenzene	**4.8**	1.8	**0.79**	0.30	
106-46-7	1,4-Dichlorobenzene	**2.1**	1.8	**0.35**	0.30	
95-50-1	1,2-Dichlorobenzene	**8.4**	1.8	**1.4**	0.30	
5989-27-5	d-Limonene	ND	1.8	ND	0.32	
96-12-8	1,2-Dibromo-3-chloropropane	ND	1.8	ND	0.18	
120-82-1	1,2,4-Trichlorobenzene	**2.7**	1.8	**0.36**	0.24	
91-20-3	Naphthalene	**130**	1.8	**26**	0.34	
87-68-3	Hexachlorobutadiene	ND	1.8	ND	0.17	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.
MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

ALS ENVIRONMENTAL

RESULTS OF ANALYSIS

Client: **A. Lanfranco and Associates Inc.**
Client Sample ID: **Carbonization Stack Run-3**
Client Project ID: **Cantimber**

ALS Project ID: P1605283
ALS Sample ID: P1605283-003

Test Code: EPA TO-15
Instrument ID: Tekmar AUTOCAN/Agilent 5973inert/6890N/MS9
Analyst: Simon Cao
Sample Type: 6.0 L Summa Canister
Test Notes:
Container ID: SC00929

Date Collected: 11/8/16
Date Received: 11/11/16
Date Analyzed: 11/15/16
Volume(s) Analyzed: 0.070 Liter(s)

Initial Pressure (psig): -2.44 Final Pressure (psig): 3.53

Canister Dilution Factor: 1.49

CAS #	Compound	Result µg/m³	MRL µg/m³	Result ppbV	MRL ppbV	Data Qualifier
115-07-1	Propene	**56**	11	**32**	6.2	
75-71-8	Dichlorodifluoromethane (CFC 12)	ND	11	ND	2.2	
74-87-3	Chloromethane	**42**	11	**20**	5.2	
76-14-2	1,2-Dichloro-1,1,2,2-tetrafluoroethane (CFC 114)	ND	11	ND	1.5	
75-01-4	Vinyl Chloride	ND	11	ND	4.2	
106-99-0	1,3-Butadiene	ND	11	ND	4.8	
74-83-9	Bromomethane	ND	11	ND	2.7	
75-00-3	Chloroethane	ND	11	ND	4.0	
64-17-5	Ethanol	ND	110	ND	57	
75-05-8	Acetonitrile	**56**	11	**33**	6.3	
107-02-8	Acrolein	**94**	43	**41**	19	
67-64-1	Acetone	**1,000**	110	**420**	45	
75-69-4	Trichlorofluoromethane	ND	11	ND	1.9	
67-63-0	2-Propanol (Isopropyl Alcohol)	ND	110	ND	43	
107-13-1	Acrylonitrile	ND	11	ND	4.9	
75-35-4	1,1-Dichloroethene	ND	11	ND	2.7	
75-09-2	Methylene Chloride	ND	11	ND	3.1	
107-05-1	3-Chloro-1-propene (Allyl Chloride)	ND	11	ND	3.4	
76-13-1	Trichlorotrifluoroethane	ND	11	ND	1.4	
75-15-0	Carbon Disulfide	ND	110	ND	34	
156-60-5	trans-1,2-Dichloroethene	ND	11	ND	2.7	
75-34-3	1,1-Dichloroethane	ND	11	ND	2.6	
1634-04-4	Methyl tert-Butyl Ether	ND	11	ND	3.0	
108-05-4	Vinyl Acetate	**550**	110	**160**	30	
78-93-3	2-Butanone (MEK)	**200**	110	**69**	36	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.
MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

ALS ENVIRONMENTAL

RESULTS OF ANALYSIS

Client: **A. Lanfranco and Associates Inc.**
Client Sample ID: **Carbonization Stack Run-3**
Client Project ID: **Cantimber**

ALS Project ID: P1605283
ALS Sample ID: P1605283-003

Test Code: EPA TO-15
Instrument ID: Tekmar AUTOCAN/Agilent 5973inert/6890N/MS9
Analyst: Simon Cao
Sample Type: 6.0 L Summa Canister
Test Notes:
Container ID: SC00929

Date Collected: 11/8/16
Date Received: 11/11/16
Date Analyzed: 11/15/16
Volume(s) Analyzed: 0.070 Liter(s)

Initial Pressure (psig): -2.44 Final Pressure (psig): 3.53

Canister Dilution Factor: 1.49

CAS #	Compound	Result µg/m³	MRL µg/m³	Result ppbV	MRL ppbV	Data Qualifier
156-59-2	cis-1,2-Dichloroethene	ND	11	ND	2.7	
141-78-6	Ethyl Acetate	ND	21	ND	5.9	
110-54-3	n-Hexane	ND	11	ND	3.0	
67-66-3	Chloroform	ND	11	ND	2.2	
109-99-9	Tetrahydrofuran (THF)	**37**	11	**12**	3.6	
107-06-2	1,2-Dichloroethane	ND	11	ND	2.6	
71-55-6	1,1,1-Trichloroethane	ND	11	ND	2.0	
71-43-2	Benzene	**160**	11	**51**	3.3	
56-23-5	Carbon Tetrachloride	ND	11	ND	1.7	
110-82-7	Cyclohexane	ND	21	ND	6.2	
78-87-5	1,2-Dichloropropane	ND	11	ND	2.3	
75-27-4	Bromodichloromethane	ND	11	ND	1.6	
79-01-6	Trichloroethene	ND	11	ND	2.0	
123-91-1	1,4-Dioxane	ND	11	ND	3.0	
80-62-6	Methyl Methacrylate	ND	21	ND	5.2	
142-82-5	n-Heptane	ND	11	ND	2.6	
10061-01-5	cis-1,3-Dichloropropene	ND	11	ND	2.3	
108-10-1	4-Methyl-2-pentanone	ND	11	ND	2.6	
10061-02-6	trans-1,3-Dichloropropene	ND	11	ND	2.3	
79-00-5	1,1,2-Trichloroethane	ND	11	ND	2.0	
108-88-3	Toluene	**21**	11	**5.7**	2.8	
591-78-6	2-Hexanone	ND	11	ND	2.6	
124-48-1	Dibromochloromethane	ND	11	ND	1.2	
106-93-4	1,2-Dibromoethane	ND	11	ND	1.4	
123-86-4	n-Butyl Acetate	ND	11	ND	2.2	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.
MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

ALS ENVIRONMENTAL

RESULTS OF ANALYSIS

Client: **A. Lanfranco and Associates Inc.**
Client Sample ID: **Carbonization Stack Run-3**
Client Project ID: **Cantimber**

ALS Project ID: P1605283
ALS Sample ID: P1605283-003

Test Code: EPA TO-15
Instrument ID: Tekmar AUTOCAN/Agilent 5973inert/6890N/MS9
Analyst: Simon Cao
Sample Type: 6.0 L Summa Canister
Test Notes:
Container ID: SC00929

Date Collected: 11/8/16
Date Received: 11/11/16
Date Analyzed: 11/15/16
Volume(s) Analyzed: 0.070 Liter(s)

Initial Pressure (psig): -2.44 Final Pressure (psig): 3.53

Canister Dilution Factor: 1.49

CAS #	Compound	Result µg/m³	MRL µg/m³	Result ppbV	MRL ppbV	Data Qualifier
111-65-9	n-Octane	ND	11	ND	2.3	
127-18-4	Tetrachloroethene	ND	11	ND	1.6	
108-90-7	Chlorobenzene	**23**	11	**4.9**	2.3	
100-41-4	Ethylbenzene	ND	11	ND	2.5	
179601-23-1	m,p-Xylenes	ND	21	ND	4.9	
75-25-2	Bromoform	ND	11	ND	1.0	
100-42-5	Styrene	ND	11	ND	2.5	
95-47-6	o-Xylene	ND	11	ND	2.5	
111-84-2	n-Nonane	ND	11	ND	2.0	
79-34-5	1,1,2,2-Tetrachloroethane	ND	11	ND	1.6	
98-82-8	Cumene	ND	11	ND	2.2	
80-56-8	alpha-Pinene	ND	11	ND	1.9	
103-65-1	n-Propylbenzene	ND	11	ND	2.2	
622-96-8	4-Ethyltoluene	ND	11	ND	2.2	
108-67-8	1,3,5-Trimethylbenzene	ND	11	ND	2.2	
95-63-6	1,2,4-Trimethylbenzene	ND	11	ND	2.2	
100-44-7	Benzyl Chloride	ND	11	ND	2.1	
541-73-1	1,3-Dichlorobenzene	ND	11	ND	1.8	
106-46-7	1,4-Dichlorobenzene	ND	11	ND	1.8	
95-50-1	1,2-Dichlorobenzene	ND	11	ND	1.8	
5989-27-5	d-Limonene	ND	11	ND	1.9	
96-12-8	1,2-Dibromo-3-chloropropane	ND	11	ND	1.1	
120-82-1	1,2,4-Trichlorobenzene	ND	11	ND	1.4	
91-20-3	Naphthalene	**95**	11	**18**	2.0	
87-68-3	Hexachlorobutadiene	ND	11	ND	1.0	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.
MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

ALS ENVIRONMENTAL

RESULTS OF ANALYSIS

Client: **A. Lanfranco and Associates Inc.**
Client Sample ID: **Activation Stack Run-1**
Client Project ID: **Cantimber**

ALS Project ID: P1605283
ALS Sample ID: P1605283-004

Test Code: EPA TO-15 Modified
Instrument ID: Tekmar AUTOCAN/Agilent 5973inert/6890N/MS9
Analyst: Simon Cao
Sample Type: 6.0 L Summa Canister
Test Notes:
Container ID: SC00403

Date Collected: 11/9/16
Date Received: 11/11/16
Date Analyzed: 11/15/16
Volume(s) Analyzed: 0.266 Liter(s)

Initial Pressure (psig): -1.30 Final Pressure (psig): 3.64

Canister Dilution Factor: 1.37

CAS #	Compound	Result µg/m³	MRL µg/m³	Result ppbV	MRL ppbV	Data Qualifier
115-07-1	Propene	ND	2.6	ND	1.5	
75-71-8	Dichlorodifluoromethane (CFC 12)	ND	2.6	ND	0.52	
74-87-3	Chloromethane	ND	2.6	ND	1.2	
76-14-2	1,2-Dichloro-1,1,2,2-tetrafluoroethane (CFC 114)	ND	2.6	ND	0.37	
75-01-4	Vinyl Chloride	ND	2.6	ND	1.0	
106-99-0	1,3-Butadiene	ND	2.6	ND	1.2	
74-83-9	Bromomethane	ND	2.6	ND	0.66	
75-00-3	Chloroethane	ND	2.6	ND	0.98	
64-17-5	Ethanol	ND	26	ND	14	
75-05-8	Acetonitrile	**15**	2.6	**8.9**	1.5	
107-02-8	Acrolein	**12**	10	**5.4**	4.5	
67-64-1	Acetone	**250**	26	**110**	11	
75-69-4	Trichlorofluoromethane	ND	2.6	ND	0.46	
67-63-0	2-Propanol (Isopropyl Alcohol)	ND	26	ND	10	
107-13-1	Acrylonitrile	ND	2.6	ND	1.2	
75-35-4	1,1-Dichloroethene	ND	2.6	ND	0.65	
75-09-2	Methylene Chloride	ND	2.6	ND	0.74	
107-05-1	3-Chloro-1-propene (Allyl Chloride)	ND	2.6	ND	0.82	
76-13-1	Trichlorotrifluoroethane	ND	2.6	ND	0.34	
75-15-0	Carbon Disulfide	ND	26	ND	8.3	
156-60-5	trans-1,2-Dichloroethene	ND	2.6	ND	0.65	
75-34-3	1,1-Dichloroethane	ND	2.6	ND	0.64	
1634-04-4	Methyl tert-Butyl Ether	ND	2.6	ND	0.71	
108-05-4	Vinyl Acetate	**110**	26	**32**	7.3	
78-93-3	2-Butanone (MEK)	**37**	26	**12**	8.7	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.
MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

Client: **A. Lanfranco and Associates Inc.**
Client Sample ID: **Activation Stack Run-1**
Client Project ID: **Cantimber**

ALS Project ID: P1605283
ALS Sample ID: P1605283-004

Test Code: EPA TO-15 Modified
Instrument ID: Tekmar AUTOCAN/Agilent 5973inert/6890N/MS9
Analyst: Simon Cao
Sample Type: 6.0 L Summa Canister
Test Notes:
Container ID: SC00403

Date Collected: 11/9/16
Date Received: 11/11/16
Date Analyzed: 11/15/16
Volume(s) Analyzed: 0.266 Liter(s)

Initial Pressure (psig): -1.30 Final Pressure (psig): 3.64

Canister Dilution Factor: 1.37

CAS #	Compound	Result µg/m³	MRL µg/m³	Result ppbV	MRL ppbV	Data Qualifier
156-59-2	cis-1,2-Dichloroethene	ND	2.6	ND	0.65	
141-78-6	Ethyl Acetate	ND	5.2	ND	1.4	
110-54-3	n-Hexane	**8.8**	2.6	**2.5**	0.73	
67-66-3	Chloroform	ND	2.6	ND	0.53	
109-99-9	Tetrahydrofuran (THF)	**5.1**	2.6	**1.7**	0.87	
107-06-2	1,2-Dichloroethane	ND	2.6	ND	0.64	
71-55-6	1,1,1-Trichloroethane	ND	2.6	ND	0.47	
71-43-2	Benzene	**100**	2.6	**32**	0.81	
56-23-5	Carbon Tetrachloride	ND	2.6	ND	0.41	
110-82-7	Cyclohexane	ND	5.2	ND	1.5	
78-87-5	1,2-Dichloropropane	ND	2.6	ND	0.56	
75-27-4	Bromodichloromethane	ND	2.6	ND	0.38	
79-01-6	Trichloroethene	**3.8**	2.6	**0.72**	0.48	
123-91-1	1,4-Dioxane	ND	2.6	ND	0.71	
80-62-6	Methyl Methacrylate	ND	5.2	ND	1.3	
142-82-5	n-Heptane	ND	2.6	ND	0.63	
10061-01-5	cis-1,3-Dichloropropene	ND	2.6	ND	0.57	
108-10-1	4-Methyl-2-pentanone	ND	2.6	ND	0.63	
10061-02-6	trans-1,3-Dichloropropene	ND	2.6	ND	0.57	
79-00-5	1,1,2-Trichloroethane	ND	2.6	ND	0.47	
108-88-3	Toluene	**41**	2.6	**11**	0.68	
591-78-6	2-Hexanone	ND	2.6	ND	0.63	
124-48-1	Dibromochloromethane	ND	2.6	ND	0.30	
106-93-4	1,2-Dibromoethane	ND	2.6	ND	0.34	
123-86-4	n-Butyl Acetate	ND	2.6	ND	0.54	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.
MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

ALS ENVIRONMENTAL

RESULTS OF ANALYSIS

Client: **A. Lanfranco and Associates Inc.**
Client Sample ID: **Activation Stack Run-1**
Client Project ID: **Cantimber**

ALS Project ID: P1605283
ALS Sample ID: P1605283-004

Test Code: EPA TO-15 Modified
Instrument ID: Tekmar AUTOCAN/Agilent 5973inert/6890N/MS9
Analyst: Simon Cao
Sample Type: 6.0 L Summa Canister
Test Notes:
Container ID: SC00403

Date Collected: 11/9/16
Date Received: 11/11/16
Date Analyzed: 11/15/16
Volume(s) Analyzed: 0.266 Liter(s)

Initial Pressure (psig): -1.30 Final Pressure (psig): 3.64

Canister Dilution Factor: 1.37

CAS #	Compound	Result µg/m³	MRL µg/m³	Result ppbV	MRL ppbV	Data Qualifier
111-65-9	n-Octane	ND	2.6	ND	0.55	
127-18-4	Tetrachloroethene	ND	2.6	ND	0.38	
108-90-7	Chlorobenzene	ND	2.6	ND	0.56	
100-41-4	Ethylbenzene	ND	2.6	ND	0.59	
179601-23-1	m,p-Xylenes	ND	5.2	ND	1.2	
75-25-2	Bromoform	ND	2.6	ND	0.25	
100-42-5	Styrene	ND	2.6	ND	0.61	
95-47-6	o-Xylene	ND	2.6	ND	0.59	
111-84-2	n-Nonane	ND	2.6	ND	0.49	
79-34-5	1,1,2,2-Tetrachloroethane	ND	2.6	ND	0.38	
98-82-8	Cumene	ND	2.6	ND	0.52	
80-56-8	alpha-Pinene	ND	2.6	ND	0.46	
103-65-1	n-Propylbenzene	ND	2.6	ND	0.52	
622-96-8	4-Ethyltoluene	ND	2.6	ND	0.52	
108-67-8	1,3,5-Trimethylbenzene	ND	2.6	ND	0.52	
95-63-6	1,2,4-Trimethylbenzene	ND	2.6	ND	0.52	
100-44-7	Benzyl Chloride	ND	2.6	ND	0.50	
541-73-1	1,3-Dichlorobenzene	ND	2.6	ND	0.43	
106-46-7	1,4-Dichlorobenzene	ND	2.6	ND	0.43	
95-50-1	1,2-Dichlorobenzene	ND	2.6	ND	0.43	
5989-27-5	d-Limonene	ND	2.6	ND	0.46	
96-12-8	1,2-Dibromo-3-chloropropane	ND	2.6	ND	0.27	
120-82-1	1,2,4-Trichlorobenzene	ND	2.6	ND	0.35	
91-20-3	Naphthalene	**9.6**	2.6	**1.8**	0.49	
87-68-3	Hexachlorobutadiene	ND	2.6	ND	0.24	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.
MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

ALS ENVIRONMENTAL

RESULTS OF ANALYSIS

Client: **A. Lanfranco and Associates Inc.**
Client Sample ID: **Activation Stack Run-2**
Client Project ID: **Cantimber**

ALS Project ID: P1605283
ALS Sample ID: P1605283-005

Test Code: EPA TO-15 Modified
Instrument ID: Tekmar AUTOCAN/Agilent 5973inert/6890N/MS9
Analyst: Simon Cao
Sample Type: 6.0 L Summa Canister
Test Notes:
Container ID: SC02019

Date Collected: 11/9/16
Date Received: 11/11/16
Date Analyzed: 11/15/16
Volume(s) Analyzed: 0.615 Liter(s)

Initial Pressure (psig): -1.78 Final Pressure (psig): 3.88

Canister Dilution Factor: 1.44

CAS #	Compound	Result µg/m³	MRL µg/m³	Result ppbV	MRL ppbV	Data Qualifier
115-07-1	Propene	ND	1.2	ND	0.68	
75-71-8	Dichlorodifluoromethane (CFC 12)	**1.4**	1.2	**0.29**	0.24	
74-87-3	Chloromethane	ND	1.2	ND	0.57	
76-14-2	1,2-Dichloro-1,1,2,2-tetrafluoroethane (CFC 114)	ND	1.2	ND	0.17	
75-01-4	Vinyl Chloride	ND	1.2	ND	0.46	
106-99-0	1,3-Butadiene	ND	1.2	ND	0.53	
74-83-9	Bromomethane	ND	1.2	ND	0.30	
75-00-3	Chloroethane	ND	1.2	ND	0.44	
64-17-5	Ethanol	ND	12	ND	6.2	
75-05-8	Acetonitrile	**12**	1.2	**6.9**	0.70	
107-02-8	Acrolein	ND	4.7	ND	2.0	
67-64-1	Acetone	**120**	12	**52**	4.9	
75-69-4	Trichlorofluoromethane	ND	1.2	ND	0.21	
67-63-0	2-Propanol (Isopropyl Alcohol)	ND	12	ND	4.8	
107-13-1	Acrylonitrile	ND	1.2	ND	0.54	
75-35-4	1,1-Dichloroethene	ND	1.2	ND	0.30	
75-09-2	Methylene Chloride	ND	1.2	ND	0.34	
107-05-1	3-Chloro-1-propene (Allyl Chloride)	ND	1.2	ND	0.37	
76-13-1	Trichlorotrifluoroethane	ND	1.2	ND	0.15	
75-15-0	Carbon Disulfide	ND	12	ND	3.8	
156-60-5	trans-1,2-Dichloroethene	ND	1.2	ND	0.30	
75-34-3	1,1-Dichloroethane	ND	1.2	ND	0.29	
1634-04-4	Methyl tert-Butyl Ether	ND	1.2	ND	0.32	
108-05-4	Vinyl Acetate	**97**	12	**28**	3.3	
78-93-3	2-Butanone (MEK)	**22**	12	**7.4**	4.0	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.
MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

ALS ENVIRONMENTAL

RESULTS OF ANALYSIS

Client: **A. Lanfranco and Associates Inc.**
Client Sample ID: **Activation Stack Run-2**
Client Project ID: **Cantimber**

ALS Project ID: P1605283
ALS Sample ID: P1605283-005

Test Code: EPA TO-15 Modified
Instrument ID: Tekmar AUTOCAN/Agilent 5973inert/6890N/MS9
Analyst: Simon Cao
Sample Type: 6.0 L Summa Canister
Test Notes:
Container ID: SC02019

Date Collected: 11/9/16
Date Received: 11/11/16
Date Analyzed: 11/15/16
Volume(s) Analyzed: 0.615 Liter(s)

Initial Pressure (psig): -1.78 Final Pressure (psig): 3.88

Canister Dilution Factor: 1.44

CAS #	Compound	Result µg/m³	MRL µg/m³	Result ppbV	MRL ppbV	Data Qualifier
156-59-2	cis-1,2-Dichloroethene	ND	1.2	ND	0.30	
141-78-6	Ethyl Acetate	ND	2.3	ND	0.65	
110-54-3	n-Hexane	**8.2**	1.2	**2.3**	0.33	
67-66-3	Chloroform	ND	1.2	ND	0.24	
109-99-9	Tetrahydrofuran (THF)	**2.6**	1.2	**0.87**	0.40	
107-06-2	1,2-Dichloroethane	ND	1.2	ND	0.29	
71-55-6	1,1,1-Trichloroethane	ND	1.2	ND	0.21	
71-43-2	Benzene	**73**	1.2	**23**	0.37	
56-23-5	Carbon Tetrachloride	ND	1.2	ND	0.19	
110-82-7	Cyclohexane	ND	2.3	ND	0.68	
78-87-5	1,2-Dichloropropane	ND	1.2	ND	0.25	
75-27-4	Bromodichloromethane	ND	1.2	ND	0.17	
79-01-6	Trichloroethene	ND	1.2	ND	0.22	
123-91-1	1,4-Dioxane	ND	1.2	ND	0.33	
80-62-6	Methyl Methacrylate	ND	2.3	ND	0.57	
142-82-5	n-Heptane	ND	1.2	ND	0.29	
10061-01-5	cis-1,3-Dichloropropene	ND	1.2	ND	0.26	
108-10-1	4-Methyl-2-pentanone	ND	1.2	ND	0.29	
10061-02-6	trans-1,3-Dichloropropene	ND	1.2	ND	0.26	
79-00-5	1,1,2-Trichloroethane	ND	1.2	ND	0.21	
108-88-3	Toluene	**15**	1.2	**4.1**	0.31	
591-78-6	2-Hexanone	ND	1.2	ND	0.29	
124-48-1	Dibromochloromethane	ND	1.2	ND	0.14	
106-93-4	1,2-Dibromoethane	ND	1.2	ND	0.15	
123-86-4	n-Butyl Acetate	ND	1.2	ND	0.25	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.
MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

ALS ENVIRONMENTAL

RESULTS OF ANALYSIS

Client: **A. Lanfranco and Associates Inc.**
Client Sample ID: **Activation Stack Run-2**
Client Project ID: **Cantimber**

ALS Project ID: P1605283
ALS Sample ID: P1605283-005

Test Code: EPA TO-15 Modified
Instrument ID: Tekmar AUTOCAN/Agilent 5973inert/6890N/MS9
Analyst: Simon Cao
Sample Type: 6.0 L Summa Canister
Test Notes:
Container ID: SC02019

Date Collected: 11/9/16
Date Received: 11/11/16
Date Analyzed: 11/15/16
Volume(s) Analyzed: 0.615 Liter(s)

Initial Pressure (psig): -1.78 Final Pressure (psig): 3.88

Canister Dilution Factor: 1.44

CAS #	Compound	Result µg/m³	MRL µg/m³	Result ppbV	MRL ppbV	Data Qualifier
111-65-9	n-Octane	ND	1.2	ND	0.25	
127-18-4	Tetrachloroethene	ND	1.2	ND	0.17	
108-90-7	Chlorobenzene	ND	1.2	ND	0.25	
100-41-4	Ethylbenzene	ND	1.2	ND	0.27	
179601-23-1	m,p-Xylenes	ND	2.3	ND	0.54	
75-25-2	Bromoform	ND	1.2	ND	0.11	
100-42-5	Styrene	ND	1.2	ND	0.28	
95-47-6	o-Xylene	ND	1.2	ND	0.27	
111-84-2	n-Nonane	ND	1.2	ND	0.22	
79-34-5	1,1,2,2-Tetrachloroethane	ND	1.2	ND	0.17	
98-82-8	Cumene	ND	1.2	ND	0.24	
80-56-8	alpha-Pinene	ND	1.2	ND	0.21	
103-65-1	n-Propylbenzene	ND	1.2	ND	0.24	
622-96-8	4-Ethyltoluene	ND	1.2	ND	0.24	
108-67-8	1,3,5-Trimethylbenzene	ND	1.2	ND	0.24	
95-63-6	1,2,4-Trimethylbenzene	ND	1.2	ND	0.24	
100-44-7	Benzyl Chloride	ND	1.2	ND	0.23	
541-73-1	1,3-Dichlorobenzene	ND	1.2	ND	0.19	
106-46-7	1,4-Dichlorobenzene	ND	1.2	ND	0.19	
95-50-1	1,2-Dichlorobenzene	ND	1.2	ND	0.19	
5989-27-5	d-Limonene	ND	1.2	ND	0.21	
96-12-8	1,2-Dibromo-3-chloropropane	ND	1.2	ND	0.12	
120-82-1	1,2,4-Trichlorobenzene	ND	1.2	ND	0.16	
91-20-3	Naphthalene	**8.8**	1.2	**1.7**	0.22	
87-68-3	Hexachlorobutadiene	ND	1.2	ND	0.11	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.
MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

ALS ENVIRONMENTAL

RESULTS OF ANALYSIS

Client: **A. Lanfranco and Associates Inc.**
Client Sample ID: **Activation Stack Run-3**
Client Project ID: **Cantimber**

ALS Project ID: P1605283
ALS Sample ID: P1605283-006

Test Code: EPA TO-15 Modified
Instrument ID: Tekmar AUTOCAN/Agilent 5973inert/6890N/MS9
Analyst: Simon Cao
Sample Type: 6.0 L Summa Canister
Test Notes:
Container ID: SC01693

Date Collected: 11/9/16
Date Received: 11/11/16
Date Analyzed: 11/15/16
Volume(s) Analyzed: 1.11 Liter(s)

Initial Pressure (psig): -1.70 Final Pressure (psig): 3.62

Canister Dilution Factor: 1.41

CAS #	Compound	Result µg/m³	MRL µg/m³	Result ppbV	MRL ppbV	Data Qualifier
115-07-1	Propene	**2.0**	0.64	**1.2**	0.37	
75-71-8	Dichlorodifluoromethane (CFC 12)	**1.4**	0.64	**0.29**	0.13	
74-87-3	Chloromethane	ND	0.64	ND	0.31	
76-14-2	1,2-Dichloro-1,1,2,2-tetrafluoroethane (CFC 114)	ND	0.64	ND	0.091	
75-01-4	Vinyl Chloride	ND	0.64	ND	0.25	
106-99-0	1,3-Butadiene	ND	0.64	ND	0.29	
74-83-9	Bromomethane	ND	0.64	ND	0.16	
75-00-3	Chloroethane	ND	0.64	ND	0.24	
64-17-5	Ethanol	ND	6.4	ND	3.4	
75-05-8	Acetonitrile	**7.8**	0.64	**4.7**	0.38	
107-02-8	Acrolein	ND	2.5	ND	1.1	
67-64-1	Acetone	**48**	6.4	**20**	2.7	
75-69-4	Trichlorofluoromethane	**0.73**	0.64	**0.13**	0.11	
67-63-0	2-Propanol (Isopropyl Alcohol)	ND	6.4	ND	2.6	
107-13-1	Acrylonitrile	ND	0.64	ND	0.29	
75-35-4	1,1-Dichloroethene	ND	0.64	ND	0.16	
75-09-2	Methylene Chloride	ND	0.64	ND	0.18	
107-05-1	3-Chloro-1-propene (Allyl Chloride)	ND	0.64	ND	0.20	
76-13-1	Trichlorotrifluoroethane	ND	0.64	ND	0.083	
75-15-0	Carbon Disulfide	**8.0**	6.4	**2.6**	2.0	
156-60-5	trans-1,2-Dichloroethene	ND	0.64	ND	0.16	
75-34-3	1,1-Dichloroethane	ND	0.64	ND	0.16	
1634-04-4	Methyl tert-Butyl Ether	ND	0.64	ND	0.18	
108-05-4	Vinyl Acetate	**55**	6.4	**15**	1.8	
78-93-3	2-Butanone (MEK)	**9.6**	6.4	**3.3**	2.2	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.
MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

ALS ENVIRONMENTAL

RESULTS OF ANALYSIS

Client: **A. Lanfranco and Associates Inc.**
Client Sample ID: **Activation Stack Run-3**
Client Project ID: **Cantimber**

ALS Project ID: P1605283
ALS Sample ID: P1605283-006

Test Code: EPA TO-15 Modified
Instrument ID: Tekmar AUTOCAN/Agilent 5973inert/6890N/MS9
Analyst: Simon Cao
Sample Type: 6.0 L Summa Canister
Test Notes:
Container ID: SC01693

Date Collected: 11/9/16
Date Received: 11/11/16
Date Analyzed: 11/15/16
Volume(s) Analyzed: 1.11 Liter(s)

Initial Pressure (psig): -1.70 Final Pressure (psig): 3.62

Canister Dilution Factor: 1.41

CAS #	Compound	Result µg/m³	MRL µg/m³	Result ppbV	MRL ppbV	Data Qualifier
156-59-2	cis-1,2-Dichloroethene	ND	0.64	ND	0.16	
141-78-6	Ethyl Acetate	ND	1.3	ND	0.35	
110-54-3	n-Hexane	**4.5**	0.64	**1.3**	0.18	
67-66-3	Chloroform	ND	0.64	ND	0.13	
109-99-9	Tetrahydrofuran (THF)	**0.72**	0.64	**0.24**	0.22	
107-06-2	1,2-Dichloroethane	ND	0.64	ND	0.16	
71-55-6	1,1,1-Trichloroethane	ND	0.64	ND	0.12	
71-43-2	Benzene	**56**	0.64	**17**	0.20	
56-23-5	Carbon Tetrachloride	ND	0.64	ND	0.10	
110-82-7	Cyclohexane	ND	1.3	ND	0.37	
78-87-5	1,2-Dichloropropane	ND	0.64	ND	0.14	
75-27-4	Bromodichloromethane	ND	0.64	ND	0.095	
79-01-6	Trichloroethene	ND	0.64	ND	0.12	
123-91-1	1,4-Dioxane	ND	0.64	ND	0.18	
80-62-6	Methyl Methacrylate	ND	1.3	ND	0.31	
142-82-5	n-Heptane	ND	0.64	ND	0.16	
10061-01-5	cis-1,3-Dichloropropene	ND	0.64	ND	0.14	
108-10-1	4-Methyl-2-pentanone	ND	0.64	ND	0.16	
10061-02-6	trans-1,3-Dichloropropene	ND	0.64	ND	0.14	
79-00-5	1,1,2-Trichloroethane	ND	0.64	ND	0.12	
108-88-3	Toluene	**13**	0.64	**3.6**	0.17	
591-78-6	2-Hexanone	ND	0.64	ND	0.16	
124-48-1	Dibromochloromethane	ND	0.64	ND	0.075	
106-93-4	1,2-Dibromoethane	ND	0.64	ND	0.083	
123-86-4	n-Butyl Acetate	ND	0.64	ND	0.13	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.
MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

ALS ENVIRONMENTAL

RESULTS OF ANALYSIS

Client: **A. Lanfranco and Associates Inc.**
Client Sample ID: **Activation Stack Run-3**
Client Project ID: **Cantimber**

ALS Project ID: P1605283
ALS Sample ID: P1605283-006

Test Code: EPA TO-15 Modified
Instrument ID: Tekmar AUTOCAN/Agilent 5973inert/6890N/MS9
Analyst: Simon Cao
Sample Type: 6.0 L Summa Canister
Test Notes:
Container ID: SC01693

Date Collected: 11/9/16
Date Received: 11/11/16
Date Analyzed: 11/15/16
Volume(s) Analyzed: 1.11 Liter(s)

Initial Pressure (psig): -1.70 Final Pressure (psig): 3.62

Canister Dilution Factor: 1.41

CAS #	Compound	Result µg/m³	MRL µg/m³	Result ppbV	MRL ppbV	Data Qualifier
111-65-9	n-Octane	**0.78**	0.64	**0.17**	0.14	
127-18-4	Tetrachloroethene	ND	0.64	ND	0.094	
108-90-7	Chlorobenzene	ND	0.64	ND	0.14	
100-41-4	Ethylbenzene	ND	0.64	ND	0.15	
179601-23-1	m,p-Xylenes	**1.4**	1.3	**0.33**	0.29	
75-25-2	Bromoform	ND	0.64	ND	0.061	
100-42-5	Styrene	ND	0.64	ND	0.15	
95-47-6	o-Xylene	ND	0.64	ND	0.15	
111-84-2	n-Nonane	ND	0.64	ND	0.12	
79-34-5	1,1,2,2-Tetrachloroethane	ND	0.64	ND	0.093	
98-82-8	Cumene	ND	0.64	ND	0.13	
80-56-8	alpha-Pinene	ND	0.64	ND	0.11	
103-65-1	n-Propylbenzene	ND	0.64	ND	0.13	
622-96-8	4-Ethyltoluene	ND	0.64	ND	0.13	
108-67-8	1,3,5-Trimethylbenzene	ND	0.64	ND	0.13	
95-63-6	1,2,4-Trimethylbenzene	ND	0.64	ND	0.13	
100-44-7	Benzyl Chloride	ND	0.64	ND	0.12	
541-73-1	1,3-Dichlorobenzene	ND	0.64	ND	0.11	
106-46-7	1,4-Dichlorobenzene	ND	0.64	ND	0.11	
95-50-1	1,2-Dichlorobenzene	ND	0.64	ND	0.11	
5989-27-5	d-Limonene	ND	0.64	ND	0.11	
96-12-8	1,2-Dibromo-3-chloropropane	ND	0.64	ND	0.066	
120-82-1	1,2,4-Trichlorobenzene	ND	0.64	ND	0.086	
91-20-3	Naphthalene	**6.1**	0.64	**1.2**	0.12	
87-68-3	Hexachlorobutadiene	ND	0.64	ND	0.060	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.
MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

ALS ENVIRONMENTAL

RESULTS OF ANALYSIS

Client: **A. Lanfranco and Associates Inc.**
Client Sample ID: **Method Blank**
Client Project ID: **Cantimber**

ALS Project ID: P1605283
ALS Sample ID: P161115-MB

Test Code: EPA TO-15
Instrument ID: Tekmar AUTOCAN/Agilent 5973inert/6890N/MS9
Analyst: Simon Cao
Sample Type: 6.0 L Summa Canister
Test Notes:

Date Collected: NA
Date Received: NA
Date Analyzed: 11/15/16
Volume(s) Analyzed: 1.00 Liter(s)

Canister Dilution Factor: 1.00

CAS #	Compound	Result µg/m³	MRL µg/m³	Result ppbV	MRL ppbV	Data Qualifier
115-07-1	Propene	ND	0.50	ND	0.29	
75-71-8	Dichlorodifluoromethane (CFC 12)	ND	0.50	ND	0.10	
74-87-3	Chloromethane	ND	0.50	ND	0.24	
76-14-2	1,2-Dichloro-1,1,2,2-tetrafluoroethane (CFC 114)	ND	0.50	ND	0.072	
75-01-4	Vinyl Chloride	ND	0.50	ND	0.20	
106-99-0	1,3-Butadiene	ND	0.50	ND	0.23	
74-83-9	Bromomethane	ND	0.50	ND	0.13	
75-00-3	Chloroethane	ND	0.50	ND	0.19	
64-17-5	Ethanol	ND	5.0	ND	2.7	
75-05-8	Acetonitrile	ND	0.50	ND	0.30	
107-02-8	Acrolein	ND	2.0	ND	0.87	
67-64-1	Acetone	ND	5.0	ND	2.1	
75-69-4	Trichlorofluoromethane	ND	0.50	ND	0.089	
67-63-0	2-Propanol (Isopropyl Alcohol)	ND	5.0	ND	2.0	
107-13-1	Acrylonitrile	ND	0.50	ND	0.23	
75-35-4	1,1-Dichloroethene	ND	0.50	ND	0.13	
75-09-2	Methylene Chloride	ND	0.50	ND	0.14	
107-05-1	3-Chloro-1-propene (Allyl Chloride)	ND	0.50	ND	0.16	
76-13-1	Trichlorotrifluoroethane	ND	0.50	ND	0.065	
75-15-0	Carbon Disulfide	ND	5.0	ND	1.6	
156-60-5	trans-1,2-Dichloroethene	ND	0.50	ND	0.13	
75-34-3	1,1-Dichloroethane	ND	0.50	ND	0.12	
1634-04-4	Methyl tert-Butyl Ether	ND	0.50	ND	0.14	
108-05-4	Vinyl Acetate	ND	5.0	ND	1.4	
78-93-3	2-Butanone (MEK)	ND	5.0	ND	1.7	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.
MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

Client: **A. Lanfranco and Associates Inc.**
Client Sample ID: **Method Blank**
Client Project ID: **Cantimber**

ALS Project ID: P1605283
ALS Sample ID: P161115-MB

Test Code: EPA TO-15
Instrument ID: Tekmar AUTOCAN/Agilent 5973inert/6890N/MS9
Analyst: Simon Cao
Sample Type: 6.0 L Summa Canister
Test Notes:

Date Collected: NA
Date Received: NA
Date Analyzed: 11/15/16
Volume(s) Analyzed: 1.00 Liter(s)

Canister Dilution Factor: 1.00

CAS #	Compound	Result µg/m³	MRL µg/m³	Result ppbV	MRL ppbV	Data Qualifier
156-59-2	cis-1,2-Dichloroethene	ND	0.50	ND	0.13	
141-78-6	Ethyl Acetate	ND	1.0	ND	0.28	
110-54-3	n-Hexane	ND	0.50	ND	0.14	
67-66-3	Chloroform	ND	0.50	ND	0.10	
109-99-9	Tetrahydrofuran (THF)	ND	0.50	ND	0.17	
107-06-2	1,2-Dichloroethane	ND	0.50	ND	0.12	
71-55-6	1,1,1-Trichloroethane	ND	0.50	ND	0.092	
71-43-2	Benzene	ND	0.50	ND	0.16	
56-23-5	Carbon Tetrachloride	ND	0.50	ND	0.080	
110-82-7	Cyclohexane	ND	1.0	ND	0.29	
78-87-5	1,2-Dichloropropane	ND	0.50	ND	0.11	
75-27-4	Bromodichloromethane	ND	0.50	ND	0.075	
79-01-6	Trichloroethene	ND	0.50	ND	0.093	
123-91-1	1,4-Dioxane	ND	0.50	ND	0.14	
80-62-6	Methyl Methacrylate	ND	1.0	ND	0.24	
142-82-5	n-Heptane	ND	0.50	ND	0.12	
10061-01-5	cis-1,3-Dichloropropene	ND	0.50	ND	0.11	
108-10-1	4-Methyl-2-pentanone	ND	0.50	ND	0.12	
10061-02-6	trans-1,3-Dichloropropene	ND	0.50	ND	0.11	
79-00-5	1,1,2-Trichloroethane	ND	0.50	ND	0.092	
108-88-3	Toluene	ND	0.50	ND	0.13	
591-78-6	2-Hexanone	ND	0.50	ND	0.12	
124-48-1	Dibromochloromethane	ND	0.50	ND	0.059	
106-93-4	1,2-Dibromoethane	ND	0.50	ND	0.065	
123-86-4	n-Butyl Acetate	ND	0.50	ND	0.11	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.
MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

Client: **A. Lanfranco and Associates Inc.**
Client Sample ID: **Method Blank**
Client Project ID: **Cantimber**

ALS Project ID: P1605283
ALS Sample ID: P161115-MB

Test Code: EPA TO-15
Instrument ID: Tekmar AUTOCAN/Agilent 5973inert/6890N/MS9
Analyst: Simon Cao
Sample Type: 6.0 L Summa Canister
Test Notes:

Date Collected: NA
Date Received: NA
Date Analyzed: 11/15/16
Volume(s) Analyzed: 1.00 Liter(s)

Canister Dilution Factor: 1.00

CAS #	Compound	Result µg/m³	MRL µg/m³	Result ppbV	MRL ppbV	Data Qualifier
111-65-9	n-Octane	ND	0.50	ND	0.11	
127-18-4	Tetrachloroethene	ND	0.50	ND	0.074	
108-90-7	Chlorobenzene	ND	0.50	ND	0.11	
100-41-4	Ethylbenzene	ND	0.50	ND	0.12	
179601-23-1	m,p-Xylenes	ND	1.0	ND	0.23	
75-25-2	Bromoform	ND	0.50	ND	0.048	
100-42-5	Styrene	ND	0.50	ND	0.12	
95-47-6	o-Xylene	ND	0.50	ND	0.12	
111-84-2	n-Nonane	ND	0.50	ND	0.095	
79-34-5	1,1,2,2-Tetrachloroethane	ND	0.50	ND	0.073	
98-82-8	Cumene	ND	0.50	ND	0.10	
80-56-8	alpha-Pinene	ND	0.50	ND	0.090	
103-65-1	n-Propylbenzene	ND	0.50	ND	0.10	
622-96-8	4-Ethyltoluene	ND	0.50	ND	0.10	
108-67-8	1,3,5-Trimethylbenzene	ND	0.50	ND	0.10	
95-63-6	1,2,4-Trimethylbenzene	ND	0.50	ND	0.10	
100-44-7	Benzyl Chloride	ND	0.50	ND	0.097	
541-73-1	1,3-Dichlorobenzene	ND	0.50	ND	0.083	
106-46-7	1,4-Dichlorobenzene	ND	0.50	ND	0.083	
95-50-1	1,2-Dichlorobenzene	ND	0.50	ND	0.083	
5989-27-5	d-Limonene	ND	0.50	ND	0.090	
96-12-8	1,2-Dibromo-3-chloropropane	ND	0.50	ND	0.052	
120-82-1	1,2,4-Trichlorobenzene	ND	0.50	ND	0.067	
91-20-3	Naphthalene	ND	0.50	ND	0.095	
87-68-3	Hexachlorobutadiene	ND	0.50	ND	0.047	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.
MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

ALS ENVIRONMENTAL

SURROGATE SPIKE RECOVERY RESULTS

Client: **A. Lanfranco and Associates Inc.**
Client Project ID: **Cantimber**

ALS Project ID: P1605283

Test Code: EPA TO-15 / EPA TO-15 Modified
Instrument ID: Tekmar AUTOCAN/Agilent 5973inert/6890N/MS9
Analyst: Simon Cao
Sample Type: 6.0 L Summa Canister(s)
Test Notes:

Date(s) Collected: 11/8 - 11/9/16
Date(s) Received: 11/11/16
Date(s) Analyzed: 11/15/16

Client Sample ID	ALS Sample ID	1,2-Dichloroethane-d4 Percent Recovered	Toluene-d8 Percent Recovered	Bromofluorobenzene Percent Recovered	Acceptance Limits	Data Qualifier
Method Blank	P161115-MB	**103**	**100**	**96**	70-130	
Lab Control Sample	P161115-LCS	**101**	**99**	**98**	70-130	
Carbonization Stack Run-1	P1605283-001	**102**	**96**	**98**	70-130	
Carbonization Stack Run-2	P1605283-002	**103**	**98**	**100**	70-130	
Carbonization Stack Run-3	P1605283-003	**102**	**97**	**97**	70-130	
Activation Stack Run-1	P1605283-004	**102**	**96**	**98**	70-130	
Activation Stack Run-2	P1605283-005	**105**	**96**	**98**	70-130	
Activation Stack Run-3	P1605283-006	**106**	**98**	**100**	70-130	

Surrogate percent recovery is verified and accepted based on the on-column result.
Reported results are shown in concentration units and as a result of the calculation, may vary slightly from the on-column percent recovery.

ALS ENVIRONMENTAL

LABORATORY CONTROL SAMPLE SUMMARY

Client: **A. Lanfranco and Associates Inc.**
Client Sample ID: **Lab Control Sample**
Client Project ID: **Cantimber**

ALS Project ID: P1605283
ALS Sample ID: P161115-LCS

Test Code: EPA TO-15
Instrument ID: Tekmar AUTOCAN/Agilent 5973inert/6890N/MS9
Analyst: Simon Cao
Sample Type: 6.0 L Summa Canister
Test Notes:

Date Collected: NA
Date Received: NA
Date Analyzed: 11/15/16
Volume(s) Analyzed: 0.125 Liter(s)

CAS #	Compound	Spike Amount µg/m³	Result µg/m³	% Recovery	ALS Acceptance Limits	Data Qualifier
115-07-1	Propene	210	**205**	**98**	52-127	
75-71-8	Dichlorodifluoromethane (CFC 12)	210	**203**	**97**	68-109	
74-87-3	Chloromethane	210	**209**	**100**	51-130	
76-14-2	1,2-Dichloro-1,1,2,2-tetrafluoroethane (CFC 114)	211	**195**	**92**	66-114	
75-01-4	Vinyl Chloride	210	**194**	**92**	61-125	
106-99-0	1,3-Butadiene	210	**210**	**100**	62-144	
74-83-9	Bromomethane	210	**210**	**100**	73-123	
75-00-3	Chloroethane	210	**214**	**102**	69-122	
64-17-5	Ethanol	1,060	**1140**	**108**	62-124	
75-05-8	Acetonitrile	213	**219**	**103**	57-114	
107-02-8	Acrolein	212	**206**	**97**	62-116	
67-64-1	Acetone	1,060	**1000**	**94**	57-117	
75-69-4	Trichlorofluoromethane	210	**200**	**95**	63-98	
67-63-0	2-Propanol (Isopropyl Alcohol)	424	**444**	**105**	66-121	
107-13-1	Acrylonitrile	213	**223**	**105**	68-123	
75-35-4	1,1-Dichloroethene	213	**206**	**97**	76-118	
75-09-2	Methylene Chloride	212	**199**	**94**	60-118	
107-05-1	3-Chloro-1-propene (Allyl Chloride)	212	**220**	**104**	65-126	
76-13-1	Trichlorotrifluoroethane	212	**208**	**98**	73-114	
75-15-0	Carbon Disulfide	213	**229**	**108**	57-102	**L**
156-60-5	trans-1,2-Dichloroethene	213	**215**	**101**	74-123	
75-34-3	1,1-Dichloroethane	212	**206**	**97**	69-111	
1634-04-4	Methyl tert-Butyl Ether	213	**207**	**97**	69-113	
108-05-4	Vinyl Acetate	1,060	**1050**	**99**	76-128	
78-93-3	2-Butanone (MEK)	212	**216**	**102**	63-127	

Laboratory Control Sample percent recovery is verified and accepted based on the on-column result.
Reported results are shown in concentration units and as a result of the calculation, may vary slightly.
L = Laboratory control sample recovery outside the specified limits, results may be biased high.

Client: **A. Lanfranco and Associates Inc.**
Client Sample ID: **Lab Control Sample**
Client Project ID: **Cantimber**

ALS Project ID: P1605283
ALS Sample ID: P161115-LCS

Test Code: EPA TO-15
Instrument ID: Tekmar AUTOCAN/Agilent 5973inert/6890N/MS9
Analyst: Simon Cao
Sample Type: 6.0 L Summa Canister
Test Notes:

Date Collected: NA
Date Received: NA
Date Analyzed: 11/15/16
Volume(s) Analyzed: 0.125 Liter(s)

CAS #	Compound	Spike Amount µg/m³	Result µg/m³	% Recovery	ALS Acceptance Limits	Data Qualifier
156-59-2	cis-1,2-Dichloroethene	212	**212**	**100**	72-117	
141-78-6	Ethyl Acetate	426	**456**	**107**	68-127	
110-54-3	n-Hexane	213	**225**	**106**	55-116	
67-66-3	Chloroform	212	**208**	**98**	70-109	
109-99-9	Tetrahydrofuran (THF)	213	**207**	**97**	72-113	
107-06-2	1,2-Dichloroethane	212	**210**	**99**	69-113	
71-55-6	1,1,1-Trichloroethane	212	**200**	**94**	72-115	
71-43-2	Benzene	212	**197**	**93**	65-107	
56-23-5	Carbon Tetrachloride	213	**201**	**94**	71-113	
110-82-7	Cyclohexane	425	**415**	**98**	71-115	
78-87-5	1,2-Dichloropropane	212	**212**	**100**	71-115	
75-27-4	Bromodichloromethane	214	**211**	**99**	75-118	
79-01-6	Trichloroethene	212	**206**	**97**	68-114	
123-91-1	1,4-Dioxane	213	**218**	**102**	81-131	
80-62-6	Methyl Methacrylate	424	**440**	**104**	72-130	
142-82-5	n-Heptane	213	**209**	**98**	68-116	
10061-01-5	cis-1,3-Dichloropropene	210	**211**	**100**	77-126	
108-10-1	4-Methyl-2-pentanone	213	**218**	**102**	69-126	
10061-02-6	trans-1,3-Dichloropropene	213	**216**	**101**	79-125	
79-00-5	1,1,2-Trichloroethane	212	**208**	**98**	75-119	
108-88-3	Toluene	212	**199**	**94**	59-118	
591-78-6	2-Hexanone	213	**222**	**104**	69-129	
124-48-1	Dibromochloromethane	213	**210**	**99**	74-136	
106-93-4	1,2-Dibromoethane	212	**212**	**100**	73-131	
123-86-4	n-Butyl Acetate	216	**227**	**105**	69-130	

Laboratory Control Sample percent recovery is verified and accepted based on the on-column result.
Reported results are shown in concentration units and as a result of the calculation, may vary slightly.

ALS ENVIRONMENTAL

LABORATORY CONTROL SAMPLE SUMMARY

Client: **A. Lanfranco and Associates Inc.**
Client Sample ID: **Lab Control Sample**
Client Project ID: **Cantimber**

ALS Project ID: P1605283
ALS Sample ID: P161115-LCS

Test Code: EPA TO-15
Instrument ID: Tekmar AUTOCAN/Agilent 5973inert/6890N/MS9
Analyst: Simon Cao
Sample Type: 6.0 L Summa Canister
Test Notes:

Date Collected: NA
Date Received: NA
Date Analyzed: 11/15/16
Volume(s) Analyzed: 0.125 Liter(s)

CAS #	Compound	Spike Amount µg/m³	Result µg/m³	% Recovery	ALS Acceptance Limits	Data Qualifier
111-65-9	n-Octane	212	**221**	**104**	66-120	
127-18-4	Tetrachloroethene	213	**207**	**97**	65-130	
108-90-7	Chlorobenzene	212	**204**	**96**	68-120	
100-41-4	Ethylbenzene	212	**206**	**97**	68-122	
179601-23-1	m,p-Xylenes	424	**413**	**97**	68-123	
75-25-2	Bromoform	212	**214**	**101**	69-130	
100-42-5	Styrene	212	**214**	**101**	71-133	
95-47-6	o-Xylene	212	**207**	**98**	68-122	
111-84-2	n-Nonane	212	**212**	**100**	65-120	
79-34-5	1,1,2,2-Tetrachloroethane	212	**213**	**100**	69-130	
98-82-8	Cumene	212	**205**	**97**	70-123	
80-56-8	alpha-Pinene	213	**206**	**97**	70-128	
103-65-1	n-Propylbenzene	214	**210**	**98**	69-125	
622-96-8	4-Ethyltoluene	212	**217**	**102**	67-130	
108-67-8	1,3,5-Trimethylbenzene	212	**206**	**97**	67-124	
95-63-6	1,2,4-Trimethylbenzene	212	**211**	**100**	67-129	
100-44-7	Benzyl Chloride	212	**228**	**108**	79-138	
541-73-1	1,3-Dichlorobenzene	212	**215**	**101**	65-136	
106-46-7	1,4-Dichlorobenzene	213	**219**	**103**	66-141	
95-50-1	1,2-Dichlorobenzene	212	**216**	**102**	67-136	
5989-27-5	d-Limonene	212	**201**	**95**	71-134	
96-12-8	1,2-Dibromo-3-chloropropane	212	**231**	**109**	73-136	
120-82-1	1,2,4-Trichlorobenzene	212	**238**	**112**	64-134	
91-20-3	Naphthalene	214	**249**	**116**	62-136	
87-68-3	Hexachlorobutadiene	213	**220**	**103**	60-133	

Laboratory Control Sample percent recovery is verified and accepted based on the on-column result.
Reported results are shown in concentration units and as a result of the calculation, may vary slightly.

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Full Service Analytical Microscopy Laboratory

3300 Breckinridge Blvd
Suite 400
Duluth, GA 30096

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FAX 770.662.8532
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Report of Results: MVA11801

Particle Size Distribution Measurement

Prepared for:

A. Lanfranco & Associates
9488 189 St., Suite 101
Surrey, BC V4W 4W7
Canada

Respectfully Submitted by: EXECUTED BY ELECTRONIC SIGNATURE

Tim B. Vander Wood, Ph.D.
Executive Director

5 December 2016

Report of Results: MVA11801

Particle Size Distribution Measurement

Introduction

This report includes the results of the requested particle size analysis to 0.5µm minimum diameter of two of four Method 5 filter samples received on 17 November 2016. We were asked to hold the remaining two samples. Upon receipt, the analyzed samples were assigned unique MVA Scientific Consultants laboratory identification numbers as shown in Table 1. Analyses were performed at MVA Scientific Consultants during the period of 18 November through 5 December 2016.

Methods

Samples were prepared for analysis in accordance with MVA SOP 310, "Sample Preparation Methods for Total Particle Sizing Using Microscopical Techniques."

The particle size distribution was measured in accordance with MVA SOP 318, "Manual Feature Sizing in Digital Images Using ImageJ" from digital images of the particles on the filters obtained using a JEOL JSM-6500F field emission scanning electron microscope. The particle size data are presented in terms of particle number and in terms of estimated mass. The assumption has been made that the particles are all of similar density and therefore the particle volume distribution is equivalent to the particle mass distribution.

Results

The size distributions of the particles down to 0.5 micrometer are shown in Tables 1 and 2. Sample AB1829 (Cantimber Run-2 Nov 9/16 Activation Stack) was very lightly loaded with particulate.

Table 1. MVA 11801. Percentages of Particles in Various Diameter Ranges by Number of Particles

MVA#	AB1829	AB1831
Client ID	Cantimber Run-2 Nov 9/16 Activation Stack	Cantimber Run-2 Nov 8/16 Carbonization Stack
Diameter Range (µm)	Number %	Number %
0.5-≤1.0	71.6	86.7
>1.0-≤2.5	25.5	12.3
>2.5-≤5.0	2.8	0.6
>5.0-≤7.5	0.0	0.2
>7.5-≤10.0	0.0	0.1
>10.0	0.0	0.1

Table 2. MVA 11801. Percentages of Particles in Various Diameter Ranges by Mass of Particles

MVA#	AB1829	AB1831
Client ID	Cantimber Run-2 Nov 9/16 Activation Stack	Cantimber Run-2 Nov 8/16 Carbonization Stack
Diameter Range (µm)	Mass %	Mass %
0.5-≤1.0	14.0	5.6
>1.0-≤2.5	48.7	11.6
>2.5-≤5.0	37.3	8.2
>5.0-≤7.5	0.0	13.1
>7.5-≤10.0	0.0	14.6
>10.0	0.0	46.9

11801

MVA SCIENTIFIC CONSULTANTS
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CHAIN OF CUSTODY

Project No. or Identification Cantimber

Client Sample ID	MVA ID*	Comments / Analytical Requests
		report to mark.lanfranco@alanfranco.com
Activation Run2	AB1829	
*Activation Run3	AB1830	* only to be run if Run 2 is compromised. Backup only.
Carbonization Run2	AB1831	
*Carbonization Run3	AB1832	* only to be run if Run 2 is compromised. Backup only.
		To be clear we want 2 analysis only

Relinquished by (sign):	Relinquished by (sign):
Via:	Via:
Date: Nov. 16 Printed Name: Mark Lanfranco	Date: Printed Name:
Company: A. Lanfranco and Associates	Company:

Received by (sign):	Received by (sign):
Date: 11/17/16 Printed Name: Tim VanderWoude	Date: Printed Name:
Company: MVA Scientific Consultants	Company:

APPENDIX 3

FIELD DATA SHEETS

12-14 5

Lanfranco and Associates Inc.

NOTE: 4A1 Probe has Short probe temp on Umbilical not Working

40.31
2.43
47.75

CLIENT	CANTIMBER	PROBE TIP DIAMETER, IN.	0.4020
RUN No	PART 1 ACTIVATION	PROBE LENGTH, FT / Cp	~~0.8369~~ 0.8450 4A2
SOURCE	NORTH SCRUBBER - WEST	PORT LENGTH	
DATE	NOV. 9, 2016	STATIC PRESSURE, IN. H2O	+.03
OPERATOR:	JOHN BURCH / CARTER LAW	STACK DIAMETER	15"
CONTROL UNIT / Y	1.0194 ST CAE 2	STACK HEIGHT	
ΔH@	1.825		
BAROMETRIC PRESSURE, IN. Hg	30.11	INITIAL LEAK TEST	.004
ASSUMED MOISTURE, Bw	18% assumed SAT	FINAL LEAK TEST	.004
		WB = 138 DB = 138	

IMPINGER VOLUMES	INITIAL (mL)	FINAL (mL)	TOTAL GAIN (mL)
Imp. #1	100	222	122
Imp. #2	100	134	34
Imp. #3	102	102	2
Imp. #4			
Imp. #5			
Imp. #6			
Upstream Diameters	>2		
Downstream Diameters	35 in		

Same pts as South Scrubber

Point	Clock Time	Dry Gas Meter ft³	Pitot ΔP IN. H_2O	Orifice ΔH IN. H_2O	Temperature °F Dry Gas Outlet	Stack	Probe	Box	Impinger Exit	Pump Vac. IN. Hg	Fyrites CO_2 Vol. %	O_2 Vol. %	PRE LIM FLOWS
	9:50	557.570											
1	2.5	557.16	0.08	1.45	59	138	240	240	48	3			.08
2	5.0	560.75	0.08	1.45	59	138	240	240	48	3			.08
3	7.5	562.34	0.08	1.45	59	138	240	240	48	3			.10
4	10.0	563.93	0.08	1.45	59	137	240	240	48	3	7.5	13.0	.10
5	12.5	565.52	0.08	1.45	59	137	240	240	48	3			.10
6	15.0	567.30	0.10	1.81	59	137	240	240	48	3			.10
7	17.5	569.08	0.10	1.81	59	137	240	240	48	3			
8	20.0	570.86	0.10	1.81	60	138	240	240	48	3			
9	22.5	572.64	0.10	1.81	60	138	240	240	48	3			
10	25.0	574.43	0.10	1.81	61	138	240	240	48	3	7.5	13.0	
11	27.5	576.22	0.10	1.81	61	138	240	240	48	3			
12	30.0	578.01	0.10	1.81	62	138	240	240	48	3			
1	2.5	579.61	0.08	1.46	63	139	240	240	48	3			
2	5.0	581.21	0.08	1.46	63	139	240	240	48	3			
3	7.5	582.81	0.08	1.46	63	139	240	240	48	3	7.5	13.0	
4	10.0	584.42	0.08	1.46	64	138	240	241	48	3			
5	12.5	586.03	0.08	1.46	64	138	240	241	48	3			
6	15.0	587.64	0.08	1.46	65	139	240	240	48	3			
7	17.5	589.25	0.08	1.46	66	139	240	240	48	3			
8	20.0	591.05	0.10	1.83	66	139	240	240	48	3			
9	22.5	592.85	0.10	1.83	66	139	240	240	48	3			
10	25.0	594.65	0.10	1.83	67	139	238	240	48	3			
11	27.5	596.26	0.08	1.47	68	139	238	240	48	3			
12	30.0	597.886	0.08	1.47	69	139	240	240	48	3			
	10:51	END OF TEST											

A. Lanfranco and Associates Inc.

CLIENT	CANTIMBER	PROBE TIP DIAMETER, IN.	0.4020
		PROBE LENGTH, FT / Cp	0.8450
RUN No	PART 2		4A2
SOURCE	NORTH SCRUBBER - ACTIVATION WEST	PORT LENGTH	
DATE	NOV. 9, 2016	STATIC PRESSURE, IN. H2O	.03
OPERATOR:	JOHN BURCH	STACK DIAMETER	15"
CONTROL UNIT / Y	1.0194	STACK HEIGHT	
ΔH@	1.825		
BAROMETRIC PRESSURE, IN. Hg	30.11	INITIAL LEAK TEST	.004
ASSUMED MOISTURE, Bw	18% - 16%	FINAL LEAK TEST	.004

IMPINGER VOLUMES	INITIAL (mL)	FINAL (mL)	TOTAL GAIN (mL)
Imp. #1	100	230	130
Imp. #2	100	120	20
Imp. #3	100	104	4
Imp. #4			
Imp. #5			
Imp. #6			
Upstream Diameters			
Downstream Diameters			

Point	Clock Time	Dry Gas Meter ft³	Pitot ΔP IN. H_2O	Orifice ΔH IN. H_2O	Temperature °F: Dry Gas Outlet	Stack	Probe	Box	Impinger Exit	Pump Vac. IN. Hg	Fyrites: CO_2 Vol. %	Fyrites: O_2 Vol. %	CYC ANGLE
	11:25 (C)	598.035											
1	2.5	599.55	0.07	1.30	71	138	240	240	48	3			0
2	5.0	601.07	0.07	1.30	71	138	240	240	48	3			0
3	7.5	602.59	0.07	1.30	71	138	240	240	48	3	7.5	13.0	0
4	10.0	604.22	0.08	1.48	71	137	235	240	48	3			0
5	12.5	605.85	0.08	1.48	71	137	240	240	48	3			0
6	15.0	607.48	0.08	1.48	71	137	240	240	48	3			0
7	17.5	609.11	0.08	1.48	71	137	240	241	48	3			5
8	20.0	610.74	0.08	1.48	71	137	240	240	48	3			0
9	22.5	612.37	0.08	1.48	71	137	240	240	48	3	7.5	13.0	0
10	25.0	614.04	0.08	1.54	71	137	240	240	48	3			0
11	27.5	615.71	0.08	1.54	71	137	240	240	48	3			0
12	30.0	617.38	0.08	1.54	71	137	240	240	48	3			0
1	2.5	619.05	0.08	1.54	72	137	240	238	48	3			0
2	5.0	620.72	0.08	1.54	72	137	240	238	48	3			0
3	7.5	622.39	0.08	1.54	72	137	240	238	48	3	7.5	13.0	5
4	10.0	624.26	0.10	1.94	73	136	240	240	48	3			0
5	12.5	626.14	0.10	1.94	73	136	240	240	48	3			0
6	15.0	627.82	0.08	1.55	73	136	240	240	48	3			5
7	17.5	629.50	0.08	1.55	74	137	240	240	48	3			0
8	20.0	631.18	0.08	1.55	74	137	240	240	48	3			0
9	22.5	632.86	0.08	1.56	75	136	240	241	48	3			0
10	25.0	634.54	0.08	1.56	75	136	240	241	48	3			0
11	27.5	636.22	0.08	1.56	75	137	240	240	48	3			0
12	30.0	637.904	0.08	1.56	75	137	240	240	48	3			0
	12:28	END OF TEST											

A. Lanfranco and Associates Inc.

CLIENT CANTIMBER	PROBE TIP DIAMETER, IN. 0.4020	IMPINGER VOLUMES	INITIAL (mL) / FINAL (mL) / TOTAL GAIN (mL)
RUN No PART 3 ACTIVATION	PROBE LENGTH, FT / Cp 0.8450	Imp. #1	100 / 242
SOURCE NORTH SCRUBBER - WEST	4A2	Imp. #2	100 / 112
DATE NOV. 9, 2016	PORT LENGTH	Imp. #3	100 / 102
OPERATOR: John Burch / CARTER LAN	STATIC PRESSURE, IN. H2O .03	Imp. #4	
CONTROL UNIT / Y 1.0194	STACK DIAMETER 15"	Imp. #5	
ΔH@ 1.825	STACK HEIGHT	Imp. #6	
BAROMETRIC PRESSURE, IN. Hg 30.11		Upstream Diameters	
ASSUMED MOISTURE, Bw 16%	INITIAL LEAK TEST .004	Downstream Diameters	
	FINAL LEAK TEST .004		

Point	Clock Time	Dry Gas Meter ft³	Pitot ΔP IN. H_2O	Orifice ΔH IN. H_2O	Temperature °F: Dry Gas Outlet	Stack	Probe	Box	Impinger Exit	Pump Vac. IN. Hg	Fyrites: CO_2 Vol. %	Fyrites: O_2 Vol. %		
	13:10	638.100												
1	2.5	639.79	0.08	1.56	77	136	240	240	48	3				
2	5.0	641.48	0.08	1.56	77	136	240	240	48	3				
3	7.5	643.17	0.08	1.56	77	136	240	240	48	3				
4	10.0	644.86	0.08	1.56	77	136	240	240	48	3	7.5	13.0		
5	12.5	646.55	0.08	1.56	77	136	240	239	48	3				
6	15.0	648.24	0.08	1.56	77	136	241	240	48	3				
7	17.5	649.93	0.08	1.56	77	136	241	241	48	3				
8	20.0	651.62	0.08	1.56	77	136	241	240	48	3				
9	22.5	653.31	0.08	1.56	77	136	241	240	48	3				
10	25.0	655.00	0.08	1.56	78	136	240	240	48	3	7.5	13.0		
11	27.5	656.69	0.08	1.56	78	136	240	246	48	3				
12	30.0	658.38	0.08	1.56	78	136	240	240	48	3				
1	2.5	660.08	0.08	1.57	79	136	240	240	48	3				
2	5.0	661.78	0.08	1.57	79	136	240	240	48	3				
3	7.5	663.48	0.08	1.57	79	136	240	240	48	3	7.5	13.0		
4	10.0	665.18	0.08	1.57	79	136	240	240	48	3				
5	12.5	666.87	0.08	1.57	79	136	240	240	48	3				
6	15.0	668.56	0.08	1.57	79	136	240	239	48	3				
7	17.5	670.46	0.10	1.96	79	136	240	238	48	3				
8	20.0	672.35	0.10	1.96	79	136	240	239	48	3				
9	22.5	674.25	0.10	1.96	80	135	240	238	48	3				
10	25.0	675.95	0.08	1.57	80	135	240	238	48	3				
11	27.5	677.65	0.08	1.57	80	135	240	238	48	3				
12	30.0	679.356	0.08	1.57	80	135	240	240	48	3				
	14:10	END OF TEST												

A. Lanfranco and Associates Inc.

10.217 11.05

WET BULB = 124
DRY BULB = 124

CLIENT CANTIMBER

RUN No PART 1 CARBONIZATION EAST

SOURCE SOUTH SCRUBBER (INSIDE)

DATE NOV. 8, 2016

OPERATOR: JOHN BURCH / CARTER LAN.

CONTROL UNIT / Y 1.0194

ΔH@ 1.825

BAROMETRIC PRESSURE, IN. Hg 29.92

ASSUMED MOISTURE, Bw 13% - 16% - 19%

PROBE TIP DIAMETER, IN. 0.3720

PROBE LENGTH, FT / Cp 4A2 0.8450

PORT LENGTH 5"

STATIC PRESSURE, IN. H2O .05

STACK DIAMETER 15"

STACK HEIGHT

INITIAL LEAK TEST .004

FINAL LEAK TEST .004

IMPINGER VOLUMES	INITIAL (mL)	FINAL (mL)	TOTAL GAIN (mL)
Imp. #1	100	216	116
Imp. #2	100	140	40
Imp. #3	100	104	4
Imp. #4			
Imp. #5			
Imp. #6			

Upstream Diameters [redacted] >2

Downstream Diameters [redacted] 3.5"

STACK PTS

Point	Clock Time	Dry Gas Meter ft³	Pitot ΔP IN. H_2O	Orifice ΔH IN. H_2O	Temperature °F: Dry Gas Outlet	Stack	Probe	Box	Impinger Exit	Pump Vac. IN. Hg	Fyrites: CO_2 Vol. %	Fyrites: O_2 Vol. %	CYC AMG	
0.31 1	11:50	438.568												
1.0 2	2.5	440.23	0.10	1.53	68	121	240	240	48	3			0	
1.8 3	5.0	441.90	0.10	1.52	68	123	240	240	48	3			0	
2.6 4	7.5	443.50	0.10	1.46	68	127	241	240	48	3	10.0	11.0	0	
3.7 5	10.0	445.09	0.10	1.42	68	130	240	240	48	3			0	
5.3 6	12.5	446.68	0.10	1.42	68	132	246	240	48	3			0	
9.7 7	15.0	448.27	0.10	1.42	68	134	240	240	48	3			<5	
11.2 8	17.5	449.86	0.10	1.41	68	136	240	240	48	3			0	
12.3 9	20.0	451.44	0.10	1.41	68	138	240	240	48	3			0	
13.2 10	22.5	453.03	0.10	1.41	69	138	240	240	48	3	9.0	12.0	0	
14.0 11	25.0	454.62	0.10	1.41	70	139	241	241	48	3			0	
14.7 12	27.5	456.21	0.10	1.41	70	139	241	241	48	3			<5	
	30.0	457.79	0.10	1.41	70	140	241	241	48	3			0	
													0	
1	2.5	459.46	0.11	1.55	71	140	240	240	48	3			0	
2	5.0	461.13	0.11	1.55	71	140	240	240	48	3	9.0	12.0	0	
3	7.5	462.76	0.11	1.49	71	140	241	241	48	3			0	
4	10.0	464.39	0.11	1.49	71	140	241	241	48	3			<10	
5	12.5	466.10	0.12	1.62	72	141	241	240	48	3			0	
6	15.0	467.81	0.12	1.62	73	142	240	240	48	3			0	
7	17.5	469.52	0.12	1.62	74	142	240	240	48	3			0	
8	20.0	471.23	0.12	1.63	74	142	240	240	48	3			0	
9	22.5	473.02	0.13	1.76	74	142	240	240	48	3			<5	
10	25.0	474.81	0.13	1.76	75	142	240	240	48	3			0	
11	27.5	476.60	0.13	1.76	75	142	240	240	48	3			0	
12	30.0	478.326	0.12	1.63	75	142	240	240	48	3			0	
	12:58	END OF TEST												

A. Lanfranco and Associates Inc.

13.08
52.42

CLIENT	CANTIMBER	PROBE TIP DIAMETER, IN.	0.3720
		PROBE LENGTH, FT / Cp	4A2 0.8450
RUN No	PART 2 CARBONIZATION	PORT LENGTH	
SOURCE	SOUTH SCRUBBER EAST	STATIC PRESSURE, IN. H2O	.05
DATE	NOV. 8, 2016	STACK DIAMETER	15"
OPERATOR:	JOHN BURCH / CARTER LAN	STACK HEIGHT	
CONTROL UNIT / Y	1.0194		
ΔH@	1.825		
BAROMETRIC PRESSURE, IN. Hg	29.92	INITIAL LEAK TEST	.004
ASSUMED MOISTURE, Bw	18% - 20%	FINAL LEAK TEST	.004

IMPINGER VOLUMES	INITIAL (mL)	FINAL (mL)	TOTAL GAIN (mL)
Imp. #1	100	250	
Imp. #2	100	126	
Imp. #3	100	102	
Imp. #4			
Imp. #5			
Imp. #6			
Upstream Diameters			
Downstream Diameters			

Point	Clock Time	Dry Gas Meter ft³	Pitot ΔP IN. H_2O	Orifice ΔH IN. H_2O	Temperature °F: Dry Gas Outlet	Stack	Probe	Box	Impinger Exit	Pump Vac. IN. Hg	Fyrites: CO_2 Vol. %	Fyrites: O_2 Vol. %		
	13:20 (0)	478.606												
1	2.5	480.18	0.10	1.36	76	141	240	240	48	3				
2	5.0	481.75	0.10	1.36	76	141	240	240	48	3				
3	7.5	483.32	0.10	1.36	76	146	240	240	48	3	9.0	12.0		
4	10.0	484.89	0.10	1.36	76	140	240	240	48	3				
5	12.5	486.46	0.10	1.36	76	140	240	240	48	3				
6	15.0	488.04	0.10	1.36	76	140	240	240	48	3				
7	17.5	489.62	0.10	1.36	76	140	240	240	48	3	9.0	12.0		
8	20.0	491.19	0.10	1.36	76	140	240	240	48	3				
9	22.5	492.76	0.10	1.36	76	140	240	240	48	3				
10	25.0	494.33	0.10	1.36	76	140	240	240	48	3				
11	27.5	495.90	0.10	1.36	76	140	240	240	48	3				
12	30.0	497.47	0.10	1.36	76	142	240	240	48	3				
1	2.5	499.19	0.12	1.63	77	142	240	240	48	3				
2	5.0	500.92	0.12	1.63	78	143	240	240	48	3	9.0	12.0		
3	7.5	502.65	0.12	1.64	78	142	240	239	48	3				
4	10.0	504.38	0.12	1.64	78	141	240	240	48	3				
5	12.5	506.11	0.12	1.64	78	141	241	240	48	3				
6	15.0	507.84	0.12	1.64	78	141	241	240	48	3				
7	17.5	509.57	0.12	1.64	78	141	240	240	48	3				
8	20.0	511.30	0.12	1.65	79	141	240	240	48	3				
9	22.5	512.96	0.11	1.51	80	146	238	240	48	3				
10	25.0	514.63	0.11	1.51	81	140	240	240	48	3				
11	27.5	516.29	0.11	1.51	80	140	240	240	48	3				
12	30.0	517.953	0.11	1.51	80	140	240	240	48	3				
	14:20													

A. Lanfranco and Associates Inc.

CLIENT CANTIMBER	PROBE TIP DIAMETER, IN. 0.3720	IMPINGER VOLUMES	INITIAL (mL) / FINAL (mL) / TOTAL GAIN (mL)
RUN No PART 3 CHARGIZATION	PROBE LENGTH, FT / Cp 442 0.8450	Imp. #1	100 / 246 /
SOURCE SOUTH SCRUBBER EAST	PORT LENGTH	Imp. #2	100 / 114 /
DATE NOV. 8, 2016	STATIC PRESSURE, IN. H2O .05	Imp. #3	100 / 100 /
OPERATOR: JOHN BURCH / CARTER LAN.	STACK DIAMETER 15.0"	Imp. #4	
CONTROL UNIT / Y 1.0154	STACK HEIGHT	Imp. #5	
ΔH@ 1.825		Imp. #6	
BAROMETRIC PRESSURE, IN. Hg 29.92	INITIAL LEAK TEST .004	Upstream Diameters	
ASSUMED MOISTURE, Bw 18%	FINAL LEAK TEST .004	Downstream Diameters	

Point	Clock Time	Dry Gas Meter ft³	Pitot ΔP IN. H_2O	Orifice ΔH IN. H_2O	Temperature °F: Dry Gas Outlet	Stack	Probe	Box	Impinger Exit	Pump Vac. IN. Hg	Fyrites CO_2 Vol. %	Fyrites O_2 Vol. %	Cyc ANG
	14:40 @	518.235											
1	2.5	519.84	0.10	1.37	78	139	240	240	48	3			0
2	5.0	521.39	0.10	1.37	78	139	240	240	48	3			0
3	7.5	522.97	0.10	1.37	78	139	240	240	48	3			0
4	10.0	524.49	0.10	1.26	78	139	240	240	48	3	9.0	12.0	0
5	12.5	526.01	0.10	1.26	78	138	240	240	48	3			0
6	15.0	527.53	0.10	1.26	78	138	240	240	48	3			<5
7	17.5	529.05	0.10	1.26	77	139	240	240	48	3			0
8	20.0	530.57	0.10	1.26	77	139	240	240	48	3			0
9	22.5	532.09	0.10	1.26	78	138	241	240	48	3	9.0	12.0	0
10	25.0	533.61	0.10	1.26	78	138	240	240	48	3			0
11	27.5	535.13	0.10	1.26	77	139	240	240	48	3			<5
12	30.0	536.65	0.10	1.26	77	139	240	240	48	3			0
													0
1	2.5	538.24	0.11	1.39	78	139	240	240	48	3			0
2	5.0	539.83	0.11	1.39	78	139	240	240	48	3			0
3	7.5	541.43	0.11	1.39	78	139	240	240	48	3			0
4	10.0	543.09	0.12	1.52	78	139	240	240	48	3	9.0	12.0	0
5	12.5	544.76	0.12	1.52	78	138	240	240	48	3			210
6	15.0	546.43	0.12	1.52	78	139	240	240	48	3			0
7	17.5	548.09	0.12	1.52	78	139	240	240	48	3			0
8	20.0	549.76	0.12	1.52	78	139	240	240	48	3			0
9	22.5	551.36	0.11	1.39	79	139	240	240	48	3			<5
10	25.0	552.96	0.11	1.39	79	139	240	240	48	3			0
11	27.5	554.55	0.11	1.39	79	139	240	240	48	3			0
12	30.0	556.152	0.11	1.39	79	139	240	240	48	3			0
	15:42	END OF TEST											0

DS ✓ (1)

CEM FIELD DATA SHEET

Client: Cantimber - Ft. Albany
Source: Inside Scrubber Stk (South)
Date: Nov 8, 2016 (Carbonization Stk)
Technician: D.S.
Ambient Temp (°C): 10°C
Barometric Pressure (in. Hg): 29.94

	N_2	H_2	1 Gas	2 Gas	3 Gas	4 Gas 105	5 Gas	O_2/CO_2	Comb Air	Low Meth	Mid Meth	High Meth
Cylinder #			838	023	963	~~500~~						1700
Pressure (psi)			550	1500	300	~~500~~		1500				
O_2 (%)								10.95				
CO_2 (%)								9.98				
CO (ppm)			463	248								
SO_2 (ppm)				173		10.04						
NOx (ppm)				242	45.7							
THC (ppm)					502							2508

Analyzer Range	O_2	CO_2	CO	SO_2	NOx	THC

CEM READINGS

Time	Source	O_2	CO_2	CO	SO_2	NOx	THC	Response Time (sec)
	Ambient	20.96						O_2 Up
MANIFOLD 1110	N_2	.03	.02	1.56	-.40	0.20		O_2 Dn
	1 Gas			469.8				CO_2 Up
	2 Gas			252.17	172.62	242.08		CO_2 Dn
	3 Gas					44.90		CO Up
	4 Gas				9.52			CO Dn
	O2/CO2	11.03	9.98					SO_2 Up
								SO_2 Dn
STACK:	N_2	0.13	0.05	1.47	.13	1.21	1.68	NOx Up
	1 Gas			462.81	162.98			NOx Dn
	2 Gas			246.38	9.44	239.46		THC Up
	3 Gas					45.31	510.43	THC Dn
	4 Gas				9.76			
	High Meth						2509	
(3 Gas)	Mid Meth						510.43	
	O2/CO2	10.87	9.90					
	Run #1 : 12:15 - 13:15							
	N_2	.04	.06	2.41	-4.42	0.40	2.78	
	2 Gas			242.05	159.08	232.49		
	3 Gas					43.49	489.22	
	4 Gas				9.62			
	O2/CO2	11.08	9.58					

DS ✓ (2)

CEM FIELD DATA SHEET

Client: Continaer - Pt. Alberni.
Source: Scrubber Stk - (South) Cont.
Date: Nov. 8, 2012 (Carbonization Stack)

Technician: D.S.
Ambient Temp (°C):
Barometric Pressure (in. Hg): 29.99

	N_2	H_2	1 Gas	2 Gas	3 Gas	4 Gas	5 Gas	O_2	Comb Air	Low Meth	Mid Meth	High Meth
Cylinder #												
Pressure (psi)												
O_2 (%)												
CO_2 (%)												
CO (ppm)												
SO_2 (ppm)												
NOx (ppm)												
THC (ppm)												

Analyzer Range	O_2	CO_2	CO	SO_2	NOx	THC

CEM READINGS

Time	Source	O_2	CO_2	CO	SO_2	NOx	THC	Response Time (sec)
	Run #2 - 13:40 - 14:40							O_2 Up
	N_2	.34	.07	.28	-2.83	.30	-7.7	O_2 Dn
	2 Gas			233.19	154.83	229.41		CO_2 Up
	3 Gas					42.98	505.62	O_2 Dn
	4 Gas				9.26			CO Up
	O2/CO2	10.98	9.75					CO Dn
								SO_2 Up
	Run #3: 15:00 - 16:00							SO_2 Dn
	N_2	.06	.13	.39	-5.11	.91	-1.94	NOx Up
	2 Gas			243.61	155.92	235.01		NOx Dn
	3 Gas					45.0	528.7	THC Up
	4 Gas				8.62			THC Dn
	O2/CO2	10.92	10.08					

DS ✓ (1)

CEM FIELD DATA SHEET

Client: CANFIBER - Pt. Alberni
Source: North Scrubber
Date: Nov. 9, 2015 (Activation Stack)

Technician: DS
Ambient Temp (°C): 10°C
Barometric Pressure (in. Hg): ~~30.44~~ 30.44

	N_2	H_2	1 Gas	2 Gas	3 Gas	4 Gas	5 Gas	O_2	Comb Air	Low Meth	Mid Meth	High Meth
Cylinder #					963							
Pressure (psi)					200							
O_2 (%)								10.95				
CO_2 (%)								9.98				
CO (ppm)			463	248								
SO_2 (ppm)				173	~~10.09~~	10.04						
NOx (ppm)				242	45.7	~~45.7~~						
THC (ppm)											44.1	91.4

Analyzer Range	O_2	CO_2	CO	SO_2	NOx	THC
	0-25	0-20	0-~~500~~ 2000	0-200	0-300	0-100

CEM READINGS

Time	Source	O_2	CO_2	CO	SO_2	NOx	THC	Response Time (sec)
	Ambient	20.90						O_2 Up
MANIFOLD: 845	N_2	0.0	.03	2.72	-.27	.61		O_2 Dn
	1 Gas			467.64				CO_2 Up
	2 Gas			247.95	172.62	242.49		CO_2 Dn
	3 Gas					45.21		CO Up
	4 Gas				9.96			CO Dn
	O_2/CO_2	11.0	10.04					SO_2 Up
								SO_2 Dn
STACK: 905	N_2	0.11	0.07	1.35	.13	071	.72	NOx Up
	Gas			462.48				NOx Dn
	2 Gas			244.63	168.24	241.78		THC Up
	3 Gas					44.90		THC Dn
	4 Gas				10.16			
	High Meth						91.42	
	Mid Meth						43.20	
	O_2/CO_2	10.99	9.92					
	Run #1:			10:15	-11:15			
	N_2	0.18	0.11	4.52	-2.96	.61	.14	
	2 Gas			243.56	165.24	237.80		
	3 Gas					42.98		
	4 Gas				6.42			
	Mid Meth						44.05	
	O_2/CO_2	11.08	9.93					

DS ✓ (2)

CEM FIELD DATA SHEET

Client: Cantimer - Pt. Alberni
Source: North Scrubber Cont...
Date: Nov. 9, 2016 (Activation Stack)

Technician: DS
Ambient Temp (°C): 10°C
Barometric Pressure (in. Hg): 30.11

	N_2	H_2	1 Gas	2 Gas	3 Gas	4 Gas	5 Gas	O_2	Comb Air	Low Meth	Mid Meth	High Meth
Cylinder #												
Pressure (psi)												
O_2 (%)												
CO_2 (%)												
CO (ppm)												
SO_2 (ppm)												
NOx (ppm)												
THC (ppm)												

Analyzer Range	O_2	CO_2	CO	SO_2	NOx	THC

CEM READINGS

Time	Source	O_2	CO_2	CO	SO_2	NOx	THC	Response Time (sec)
		Run #2:		11:35	-12:35			O_2 Up
	N_2	-.24	0.09	2.94	-3.30	0.50	-.07	O_2 Dn
	2 Gas			243.08	156.42	238.70		CO_2 Up
	3 Gas					41.62		CO_2 Dn
	4 Gas				6.13			CO Up
	O_2/CO_2	11.11	9.87					CO Dn
	MID METH						42.07	SO_2 Up
								SO_2 Dn
		Run #3:		13:10	-14:10			NOx Up
	N_2	.28	.15	10.08	-3.23	1.01	.97	NOx Dn
	2 Gas			248.34	155.42	239.81		THC Up
	3 Gas					42.44		THC Dn
	4 Gas				6.10			
	O_2/CO_2	11.13	9.96					
	MID METH						42.59	

DSV

A. Lanfranco and Associates Inc.

Carbonization Stack

Client Cantimber | Y Wizit 4620 1.0180
Source South Scrubber | Cp
Parameter HCAH-Phenol-methanol | Pbar 29.92 | Static
Date Nov. 8/16 | Operator Carter Lanfranco

Leak Check	Run 1	Run 2	Run 3
Initial @ 15"	0.0001	0.0001	0.0001
Final @ 15"	0.0001	0.0001	0.0001

Test No.	Time (hhmm)	DGM Volume (cu ft) / (m^3)	Temperature (°F) DGM Outlet	Temperature (°F) Stack	Imp. Vol. (mL)	ΔP IN. H_2O R1	ΔP IN. H_2O R2	ΔP IN. H_2O R3
1	11:50	1.9116	62					
			65					
			68					
			70					
			72					
	12:50	1.9508	74					
2	12:55	1.9515	68					
			70					
			70					
			70					
			72					
	13:55	1.9830	71					
3	14:00	1.9832	68					
			69					
			70					
			68					
			66					
	15:00	2.0055	66					

Activation Stack

Client Cantimber | Y Wizit 4620 1.0180
Source North Scrubber | Cp
Parameter HCAH-Phenol-Methanol | Pbar 29.90 | Static
Date Nov. 9/16 | Operator Carter Lanfranco

Leak Check	Run 1	Run 2	Run 3
Initial @ 15"	0.0001	0.0001	0.0001
Final @ 15"	0.0001	0.0001	0.0001

Test No.	Time (hhmm)	DGM Volume (cu ft) / (m^3)	Temperature (°F) DGM Outlet	Temperature (°F) Stack	Imp. Vol. (mL)	ΔP IN. H_2O R1	ΔP IN. H_2O R2	ΔP IN. H_2O R3
1	10:15	2.0059	58					
			60					
			60					
			62					
			64					
	11:15	2.0424	64					
2	11:35	2.0428	60					
			59					
			60					
			60					
			62					
	12:35	2.0780	64					
3	13:12	2.0785	66					
			65					
			66					
			66					
			64					
			62					
	14:17	2.1152						

Canister sampling sheet

Plant Cantimber Test Date Nov. 8/16
File No. South Scrubber Recovery Date
Carbonization Stacks

Source: Run-1

Pbar in hg		29.92					
Canister number		500769					
Controller number		0A01093					
Initial:	Start time	11:56					
	Flask Vac. (in Hg)	-30					
Final:	Finish time	12:56					
	Flask Vac. (in Hg)	-5					

Source: Run-2

Pbar in hg		29.92					
Canister number		500782					
Controller number		0A0164					
Initial:	Start time	13:00					
	Flask Vac. (in Hg)	-27					
Final:	End time	14:00					
	Flask Vac. (in Hg)	-3					

Source: Run-3

Pbar in hg		29.92					
Canister number		500929					
Controller number		0A00572					
Initial:	Start time	14:07					
	Flask Vac. (in Hg)	-29					
Final:	End time	15:07					
	Flask Vac. (in Hg)	-5					

Source:

Pbar in hg							
Canister number							
Controller number							
Initial:	Start time						
	Flask Vac. (in Hg)						
Final:	End time						
	Flask Vac. (in Hg)						

13402 dtenlmin

Canister sampling sheet

Plant Centimber Test Date Nov. 9/16
File No. North Scrubber Activation Stack Recovery Date

Source: Run-1

Pbar in hg		29.90					
Canister number		SC00403					
Controller number		CA01516					
Initial:	Start time	10:28					
	Flask Vac. (in Hg)	-31					
Final:	Finish time	11:28					
	Flask Vac. (in Hg)	-5					

Source: Run-2

Pbar in hg		29.90					
Canister number		SC02019					
Controller number		CA01828	*				
Initial:	Start time	11:46					
	Flask Vac. (in Hg)	-29					
Final:	End time	12:46					
	Flask Vac. (in Hg)	-5					

Source: Run-3

Pbar in hg		29.90					
Canister number		SC01693					
Controller number		CA01141					
Initial:	Start time	13:12					
	Flask Vac. (in Hg)	-29					
Final:	End time	14:12					
	Flask Vac. (in Hg)	-4					

Source:

Pbar in hg							
Canister number							
Controller number							
Initial:	Start time						
	Flask Vac. (in Hg)						
Final:	End time						
	Flask Vac. (in Hg)						

APPENDIX 4

CALIBRATION DATA
and PROCESS DATA

Pitot Tube Calibration

Date: 04-Jul-16
Pbar (in.Hg): 29.88

Temp (R): 530
Dn (in.): 0.25

Pitot ID: **Napp 4A**

Reference Pitot (in H2O)	S-Type Pitot (in H2O)	Air Velocity (ft/s)	Pitot Coeff. Cp	Deviation (absolute)
0.120	0.160	22.9	0.8574	0.0040
0.210	0.280	30.4	0.8574	0.0040
0.360	0.490	39.7	0.8486	0.0048
0.510	0.690	47.3	0.8511	0.0023
0.660	0.890	53.8	0.8525	0.0009
		Average :	0.8534	0.0032

Pitot ID: **HT-4A**

Reference Pitot (in H2O)	S-Type Pitot (in H2O)	Air Velocity (ft/s)	Pitot Coeff. Cp	Deviation (absolute)
0.130	0.180	23.9	0.8413	0.0039
0.285	0.390	35.4	0.8463	0.0011
0.470	0.650	45.4	0.8418	0.0034
0.670	0.920	54.2	0.8448	0.0004
0.770	1.040	58.1	0.8519	0.0066
		Average :	0.8452	0.0031

Pitot ID: **AL 4A-1**

Reference Pitot (in H2O)	S-Type Pitot (in H2O)	Air Velocity (ft/s)	Pitot Coeff. Cp	Deviation (absolute)
0.135	0.190	24.3	0.8345	0.0024
0.280	0.390	35.1	0.8388	0.0019
0.390	0.550	41.4	0.8337	0.0033
0.540	0.760	48.7	0.8345	0.0024
0.660	0.910	53.8	0.8431	0.0062
		Average :	0.8369	0.0032

Pitot ID: **HT-4B**

Reference Pitot (in H2O)	S-Type Pitot (in H2O)	Air Velocity (ft/s)	Pitot Coeff. Cp	Deviation (absolute)
0.140	0.190	24.8	0.8498	0.0046
0.210	0.285	30.4	0.8498	0.0046
0.300	0.405	36.3	0.8521	0.0068
0.440	0.600	43.9	0.8478	0.0026
0.710	0.955	55.8	0.8536	0.0084
		Average :	0.8506	0.0054

Pitot ID: **AL 4A-2**

Reference Pitot (in H2O)	S-Type Pitot (in H2O)	Air Velocity (ft/s)	Pitot Coeff. Cp	Deviation (absolute)
0.125	0.170	23.4	0.8489	0.0039
0.280	0.390	35.1	0.8388	0.0061
0.370	0.510	40.3	0.8432	0.0017
0.500	0.690	46.8	0.8427	0.0022
0.680	0.920	54.6	0.8511	0.0062
		Average :	0.8450	0.0040

Pitot ID: **HT-4C**

Reference Pitot (in H2O)	S-Type Pitot (in H2O)	Air Velocity (ft/s)	Pitot Coeff. Cp	Deviation (absolute)
0.140	0.190	24.8	0.8498	0.0046
0.210	0.285	30.4	0.8498	0.0046
0.305	0.410	36.6	0.8539	0.0086
0.510	0.690	47.3	0.8511	0.0059
0.680	0.910	54.6	0.8558	0.0106
		Average :	0.8521	0.0068

Pitot ID: **4B**

Reference Pitot (in H2O)	S-Type Pitot (in H2O)	Air Velocity (ft/s)	Pitot Coeff. Cp	Deviation (absolute)
0.050	0.070	14.8	0.8367	0.0064
0.200	0.280	29.6	0.8367	0.0064
0.275	0.380	34.7	0.8422	0.0010
0.490	0.660	46.4	0.8530	0.0099
0.820	1.120	60.0	0.8471	0.0040
		Average :	0.8431	0.0055

Pitot ID: **HT-4D**

Reference Pitot (in H2O)	S-Type Pitot (in H2O)	Air Velocity (ft/s)	Pitot Coeff. Cp	Deviation (absolute)
0.180	0.240	28.1	0.8574	0.0121
0.230	0.310	31.8	0.8527	0.0075
0.355	0.480	39.5	0.8514	0.0062
0.510	0.690	47.3	0.8511	0.0059
0.680	0.920	54.6	0.8511	0.0059
		Average :	0.8528	0.0075

* Average absolute deviation must not exceed 0.01.

Calibrated by A. Lanfranco and Associates Inc.

A. Lanfranco & Associates inc.

EPA Method 5

Meter Box Calibration

English Meter Box Units, English K' Factor

Model #: **Wizit**

Serial #: **4620**

Date:	04-May-16	
Barometric Pressure:	29.95	(in. Hg)
Theoretical Critical Vacuum:	14.13	(in. Hg)

!!!!!!!!!

IMPORTANT For valid test results, the Actual Vacuum should be 1 to 2 in. Hg greater than the Theoretical Critical Vacuum shown above.

IMPORTANT The Critical Orifice Coefficient, K', must be entered in English units, (ft)^3*(deg R)^0.5/((in.Hg)*(min)).

!!!!!!!!!

---------- DRY GAS METER READINGS ----------

dH (in H2O)	Time (min)	Volume Initial (m^3)	Volume Final (m^3)	Volume Total (cu ft)	Initial Temps. Inlet (deg F)	Initial Temps. Outlet (deg F)	Final Temps. Inlet (deg F)	Final Temps. Outlet (deg F)
0.00	6.00	1.425	1.478	1.861	75.0	75.0	75.0	75.0
0.00	22.00	1.478	1.671	6.823	75.0	75.0	77.0	77.0
0.00	15.00	1.671	1.803	4.672	77.0	77.0	78.0	78.0

-CRITICAL ORIFICE READINGS-

Orifice Serial# (number)	K' Orifice Coefficient (see above)	Actual Vacuum (in Hg)	-- Ambient Temperature -- Initial (deg F)	Final (deg F)	Average (deg F)
40	0.2408	14.0	75.0	75.0	75.0
40	0.2408	14.0	75.0	77.0	76.0
40	0.2408	14.0	77.0	76.0	76.5

********** RESULTS **********

--- DRY GAS METER ---

VOLUME CORRECTED Vm(std) (cu ft)	VOLUME CORRECTED Vm(std) (liters)
1.838	52.0
6.725	190.5
4.592	130.1

--------- ORIFICE ---------

VOLUME CORRECTED Vcr(std) (cu ft)	VOLUME CORRECTED Vcr(std) (liters)	VOLUME NOMINAL Vcr (cu ft)
1.871	53.0	1.894
6.853	194.1	6.953
4.670	132.3	4.743

-- DRY GAS METER --

CALIBRATION FACTOR Y Value (number)	CALIBRATION FACTOR Y Variation (number)
1.018	0.000
1.019	0.001
1.017	-0.001

--------- ORIFICE ---------

CALIBRATION FACTOR dH@ Value (in H2O)	Value (mm H2O)	Variation (in H2O)
0.000	0.00	0.000
0.000	0.00	0.000
0.000	0.00	0.000

Average Y---------> 1.0180 **Average dH@-----> 0.0001** **0.00**

Note: For Calibration Factor Y, the ratio of the reading of the calibration meter to the dry gas meter, acceptable tolerance of individual values from the average is +-0.02.

For Orifice Calibration Factor dH@, the orifice differential pressure in inches of H20 that equates to 0.75 cfm of air at 68 F and 29.92 inches of Hg, acceptable tolerance of individual values from the average is +-0.2.

For Temperature Devicee, the reading must be within 1.5% of certified calibration standard (absolute temperature) to be acceptable.

SIGNED: _____

Date: May 4, 2016

A.Lanfranco & Associates inc.

EPA Method 5

Meter Box Calibration

English Meter Box Units, English K' Factor

Model #: ST CAE2

Serial #: 0028-072911-1

Date: 05-Jul-16

Barometric Pressure: 29.98 (in. Hg)

Theoretical Critical Vacuum: 14.14 (in. Hg)

!!!!!!!!

IMPORTANT For valid test results, the Actual Vacuum should be 1 to 2 in. Hg greater than the Theoretical Critical Vacuum shown above.

IMPORTANT The Critical Orifice Coefficient, K', must be entered in English units, (ft)^3*(deg R)^0.5/((in.Hg)*(min)).

!!!!!!!!

DRY GAS METER READINGS									CRITICAL ORIFICE READINGS					
dH (in H2O)	Time (min)	Volume Initial (cu ft)	Volume Final (cu ft)	Volume Total (cu ft)	Initial Temps. Inlet (deg F)	Initial Temps. Outlet (deg F)	Final Temps. Inlet (deg F)	Final Temps. Outlet (deg F)	Orifice Serial# (number)	K' Orifice Coefficient (see above)	Actual Vacuum (in Hg)	Ambient Temperature Initial (deg F)	Ambient Temperature Final (deg F)	Ambient Temperature Average (deg F)
0.33	15.00	322.000	326.596	4.596	77.0	75.0	78.0	76.0	40	0.2408	24.3	81.0	82.0	81.5
0.68	15.00	315.200	321.947	6.747	76.0	74.0	78.0	75.0	48	0.3560	22.5	76.0	75.0	75.5
1.15	16.00	305.700	315.171	9.471	73.0	73.0	77.0	74.0	55	0.4606	20.5	75.0	76.0	75.5
1.95	15.00	294.200	305.660	11.460	73.0	71.0	74.0	72.0	63	0.5956	19.0	73.0	78.0	75.5
3.70	15.00	278.400	294.200	15.800	70.0	70.0	75.0	71.0	73	0.8185	16.0	70.0	74.0	72.0

********** RESULTS **********

DRY GAS METER		ORIFICE			DRY GAS METER		ORIFICE			
VOLUME CORRECTED Vm(std) (cu ft)	VOLUME CORRECTED Vm(std) (liters)	VOLUME CORRECTED Vcr(std) (cu ft)	VOLUME CORRECTED Vcr(std) (liters)	VOLUME NOMINAL Vcr (cu ft)	CALIBRATION FACTOR Y Value (number)	CALIBRATION FACTOR Y Variation (number)	CALIBRATION FACTOR dH@ Value (in H2O)	CALIBRATION FACTOR dH@ Value (mm H2O)	CALIBRATION FACTOR dH@ Variation (in H2O)	Ko (value)
4.534	128.4	4.654	131.8	4.765	1.026	0.007	1.877	47.66	0.051	0.698
6.671	188.9	6.918	195.9	7.005	1.037	0.018	1.780	45.21	-0.045	0.709
9.402	266.3	9.548	270.4	9.668	1.016	-0.004	1.801	45.76	-0.024	0.719
11.436	323.9	11.574	327.8	11.720	1.012	-0.007	1.834	46.58	0.009	0.714
15.864	449.3	15.958	451.9	16.053	1.006	-0.013	1.834	46.58	0.009	0.717
				Average Y----->	**1.0194**		**Average dH@----->**	**1.825**	**46.4**	**Average Ko----->**	**0.711**

TEMPERATURE CALIBRATION

Calibration Standard -------> Omega Model CL23A S/N:T-218768

Reference Temperature Set-Point (deg F)	Temperature Device Reading (deg F)	Results Variation (degF)	Results Percent of Absolute
32	32	0	0.00%
100	100	0	0.00%
300	300	0	0.00%
500	500	0	0.00%
1000	1000	0	0.00%

Note. For Calibration Factor Y, the ratio of the reading of the calibration meter to the dry gas meter, acceptable tolerance of individual values from the average is +-0.02.
For Orifice Calibration Factor dH@, the orifice differential pressure in inches of H20 that equates to 0.75 cfm of air at 68 F and 29.92 inches of Hg, acceptable tolerance of individual values from the average is +-0.2.
For Temperature Devicee, the reading must be within 1.5% of certified calibration standard (absolute temperature) to be acceptable.

SIGNED:

Date: July 5, 2016

A. LANFRANCO and ASSOCIATES INC.

ENVIRONMENTAL CONSULTANTS

NOZZLE DIAMETER CALIBRATION FORM

Technician: S. Ferguson
Date: July 4, 2016
Signature:

Nozzle I.D.	d1 (inch)	d2 (inch)	d3 (inch)	difference (inch)	average dia. (inch)	average area (ft^2)
ST01	0.1270	0.1240	0.1245	0.0030	0.1252	0.0000854
ST05	0.1695	0.1720	0.1710	0.0025	0.1708	0.0001592
SS-7	0.1715	0.1715	0.1740	0.0025	0.1723	0.0001620
SS-1	0.1775	0.1785	0.1790	0.0015	0.1783	0.0001735
SS-8	0.2010	0.1995	0.2020	0.0025	0.2008	0.0002200
ST11	0.2130	0.2135	0.2125	0.0010	0.2130	0.0002474
ST10	0.2345	0.2360	0.2355	0.0015	0.2353	0.0003021
SS-18	0.2415	0.2410	0.2400	0.0015	0.2408	0.0003163
ST15	0.2425	0.2430	0.2400	0.0030	0.2418	0.0003190
SS-2	0.2425	0.2430	0.2400	0.0030	0.2418	0.0003190
SS-24	0.2410	0.2440	0.2430	0.0030	0.2427	0.0003212
SS-3	0.2425	0.2450	0.2435	0.0025	0.2437	0.0003238
B	0.2450	0.2440	0.2465	0.0025	0.2452	0.0003278
ST30	0.2500	0.2470	0.2480	0.0030	0.2483	0.0003364
ST20	0.2475	0.2500	0.2485	0.0025	0.2487	0.0003373
SS-14	0.2505	0.2490	0.2485	0.0020	0.2493	0.0003391
A	0.2505	0.2505	0.2510	0.0005	0.2507	0.0003427
SS-9	0.2755	0.2770	0.2765	0.0015	0.2763	0.0004165
ST40	0.2850	0.2830	0.2855	0.0025	0.2845	0.0004415
SS-13	0.2970	0.2985	0.3000	0.0030	0.2985	0.0004860
ST50	0.3020	0.3015	0.3025	0.0010	0.3020	0.0004974
SS-30	0.3020	0.3025	0.3015	0.0010	0.3020	0.0004974
SS-4	0.3030	0.3010	0.3040	0.0030	0.3027	0.0004996
ST60	0.3035	0.3040	0.3050	0.0015	0.3042	0.0005046
SS-10	0.3175	0.3195	0.3200	0.0025	0.3190	0.0005550
ST65	0.3305	0.3305	0.3290	0.0015	0.3300	0.0005940
ST66	0.3395	0.3375	0.3385	0.0020	0.3385	0.0006249
ST80	0.3615	0.3615	0.3610	0.0005	0.3613	0.0007121
SS-5	0.3710	0.3730	0.3720	0.0020	0.3720	0.0007548
ST75	0.3730	0.3735	0.3705	0.0030	0.3723	0.0007561
SS-16	0.3730	0.3740	0.3750	0.0020	0.3740	0.0007629
ST76	0.3740	0.3745	0.3750	0.0010	0.3745	0.0007649
ST85	0.4030	0.4000	0.4030	0.0030	0.4020	0.0008814
SS-15	0.4050	0.4060	0.4065	0.0015	0.4058	0.0008983
DD	0.4070	0.4050	0.4065	0.0020	0.4062	0.0008998
SS-11	0.4205	0.4190	0.4185	0.0020	0.4193	0.0009591
ST70	0.4250	0.4260	0.4240	0.0020	0.4250	0.0009852
ST86	0.4545	0.4510	0.4550	0.0040	0.4535	0.0011217
SS-49	0.4955	0.4965	0.4975	0.0020	0.4965	0.0013445
C	0.4960	0.4980	0.4970	0.0020	0.4970	0.0013472
SS-6	0.4980	0.4970	0.4975	0.0010	0.4975	0.0013499
ST90	0.4960	0.4980	0.5000	0.0040	0.4980	0.0013527
ST92	0.5060	0.5040	0.5045	0.0020	0.5048	0.0013900
ST96	0.5560	0.5540	0.5550	0.0020	0.5550	0.0016800
SS-12	0.7515	0.7505	0.7485	0.0030	0.7502	0.0030693

Where:

(a) D1, D2, D3 = three different nozzle diameters; each diameter must be measured to within (0.025mm) 0.001 in.

(b) Difference = maximum difference between any two diameters; must be less than or equal to (0.1mm) 0.004 in.

(c) Average = average of D1, D2 and D3

BAROMETER CALIBRATION FORM

Device	Cal Date	Pbar Env Canada (kPa)	Pbar Env Canada (inches of Hg)	Device (inches of Hg) Reading	Device (inches of Hg) Elevation Corrected	Difference (Env Can - Elv Corr)
LA	July 4, 2016	102.1	30.16	30.02	30.09	0.06
DS	July 4, 2016	102.1	30.16	30.02	30.09	0.06
CL	July 4, 2016	102.1	30.16	30.02	30.09	0.06
ML	July 4, 2016	102.1	30.16	30.02	30.09	0.06
MH	July 4, 2016	102.1	30.16	30.02	30.09	0.06
SH	July 4, 2016	102.1	30.16	30.02	30.09	0.06
JZ	July 4, 2016	102.1	30.16	30.02	30.09	0.06
JB	July 4, 2016	102.1	30.16	30.02	30.09	0.06
SF	July 4, 2016	102.1	30.16	30.02	30.09	0.06
AN	July 4, 2016	102.1	30.16	30.02	30.09	0.06

SIGNED: _____ Date: July 4, 2016

Performance Specification is

Device Corrected for Elevation must be +/- 0.1 " Hg of ENV CANADA SEA-LEVEL Pbar

Enter Environment canada Pressure from their website for Vancouver (link below)
and the reading from your barometer on the ground floor of the office.

http://www.weatheroffice.gc.ca/city/pages/bc-74_metric_e.html

A. LANFRANCO and ASSOCIATES INC.

ENVIRONMENTAL CONSULTANTS

TEMPERATURE CALIBRATION FORM

Technician: S. Ferguson
Date: 04-Jul-16

Signature:

TEMPERATURE DEVICE CALIBRATIONS

Reference Device Model CL23A Calibrator			Temperature Settings (degrees F)													
			32		100		200		300		500		800		1700	
Device	ALA #	Serial #	Reading	Variation	Reading	Variation	Reading	Variation	Reading	Variation	Reading	Variation	Reading	Variation	Reading	Variation
Omega HH11A - 1		230[illegible]	29	-0.61%	97	-0.54%	200	0.00%	301	0.13%	501	0.10%	802	0.12%	1705	0.35%
Omega HH11A	2	300104	32	0.00%	99	-0.18%	201	0.15%	301	0.13%	498	-0.21%	797	-0.24%	1700	0.00%
Omega HH11A	3	300132		-6.51%		-17.87%		-30.32%		-39.49%		-52.10%		-63.51%		-78.72%
Omega HH11A - ST	4	200167	32	0.00%	99	-0.18%	200	0.00%	300	0.00%	497	-0.31%	797	-0.24%	1696	-0.19%
Omega HH11A	5	600238	32	0.00%	99	-0.18%	200	0.00%	300	0.00%	497	-0.31%	796	-0.32%	1695	-0.23%
Omega HH11A	6	600059	33	0.20%	100	0.00%	201	0.15%	302	0.26%	499	-0.10%	798	-0.16%	1697	-0.14%
TPI 341K 2 - 4	7	20314590036	29	-0.61%	97	-0.54%	196	-0.61%	296	-0.53%	496	-0.42%	795	-0.40%	1692	-0.37%
TPI 341K 2 - 8	8	20313490047	29	-0.61%	98	-0.36%	197	-0.45%	297	-0.39%	497	-0.31%	796	-0.32%	1692	-0.37%
TPI 341K 2	9	20313490065	28	-0.41%	98	-0.36%	198	-0.30%	298	-0.26%	498	-0.21%	797	-0.24%	1694	-0.26%
Cont Cmpny	10	102008464		-6.51%		-17.87%		-30.32%		-39.49%		-52.10%		-63.51%		-78.72%
Cont Cmpny - 2	11	102008526	30	-0.41%	98	-0.36%	199	-0.15%	300	0.00%	502	0.21%	803	0.24%	1713	0.60%
HH501AJK ST-3	12	07000399		-6.51%		-17.87%		-30.32%		-39.49%		-52.10%		-63.51%		-78.72%
HH501AJK ST-4	13	07000408		-6.51%		-17.87%		-30.32%		-39.49%		-52.10%		-63.51%		-78.72%
Omega HH11	14	409426	33	0.20%	100	0.00%	201	0.15%	302	0.26%	499	-0.10%	799	-0.08%	1699	-0.05%
TPI 2	15	400120032		-6.51%		-17.87%		-30.32%		-39.49%		-52.10%		-63.51%		-78.72%
TPI 341K	16	400120029	30	-0.41%	98	-0.36%	198	-0.30%	299	-0.13%	499	-0.10%	800	0.00%	1703	0.14%
TPI 341K	17	20329480041	29	-0.61%	97	-0.54%	197	-0.45%	297	-0.39%	496	-0.42%	796	-0.32%	1696	-0.23%
TPI 341K	18	20329480036	30	-0.41%	99	-0.18%	198	-0.30%	298	-0.26%	498	-0.21%	797	-0.24%	1694	-0.26%
TPI 341K	19	20329480040	28	-0.81%	97	-0.54%	197	-0.45%	297	-0.39%	496	-0.42%	796	-0.32%	1694	-0.26%
TPI 341K	20	20329480013	29	-0.61%	98	-0.36%	197	-0.45%	297	-0.39%	496	-0.42%	796	-0.32%	1694	-0.26%
TPI 341K 2 - 3	21	400120106	32	0.00%	99	-0.18%	200	0.00%	299	-0.13%	500	0.00%	800	0.00%	1701	0.05%
Reference device is a NIST certified digital thermocouple calibrator																
Variation expressed as a percentage of the absolute temperature.....must be within 1.5 %																

A. LANFRANCO and ASSOCIATES INC.

ENVIRONMENTAL CONSULTANTS

TEMPERATURE CALIBRATION FORM

Technician: C. Lanfranco
Date: Jan. 4, 2016

Signature: 

K-TYPE THERMOCOUPLE CALIBRATIONS

Probe/TC ID	Hg Thermometer Temp (F)	CL23A Readout (F)		Probe/TC ID		Hg Thermometer Temp (F)	CL23A Readout (F)
3B	212	211		TC 3-3		212	211
3C	212	211		TC 4-3		210	211
4A	212	212		TC 4-4		212	212
4B	212	212		TC 5-4		210	212
5A	211	211		TC 5-5		n/a	n/a
5B	212	211		TC 5-6		212	211
5C	211	211		TC 6-4		211	211
5D	211	211		TC 10-3		211	211
6A	212	212		TC 10-4		n/a	n/a
6B	211	211		5' Fording		211	211
6C	212	211		TCMarshal		212	211
7C	210	210					
8A	211	212					
8B	210	210					
10A	210	211					
10B	212	212					
11A	210	211					
12A	213	212.0					
12B	209	209					

* n/a denotes not in service

PRAXAIR

DocNumber: 000054306

Praxair
5700 South Alameda Street
Los Angeles, CA 90058
Tel:(323)585-2154 Fax:(714)542-6689
PGVP ID: F22013

CERTIFICATE OF ANALYSIS / EPA PROTOCOL GAS

Customer & Order Information:

A LANFRANCO & ASSOC INC
101 9488 189TH ST
SURREY BC V4N 4W7

Praxair Order Number: 18220389
Customer PO Number: MARK LANFRANCC
Customer Reference Number:

Fill Date: 5/14/2013
Part Number: NI CO450NS1E-AS
Lot Number: 109313409
Cylinder Style and Outlet: AS CGA 660
Cylinder Pressure and Volume: 2000 psig 140 cu. ft.

Certified Concentration:

Expiration Date:	05/29/2021	NIST Traceable
Cylinder Number:	CC160838	Analytical Uncertainty:
463 ppm	CARBON MONOXIDE	± 1 %
464 ppm	NITRIC OXIDE	± 1 %
286 ppm	SULFUR DIOXIDE	± 1 %
Balance	NITROGEN	

NOx ppm = 464 PPM **NOX for Reference Only**

Certification Information:

Certification Date : 5/29/2013 *Term :* 96 Months *Expiration Date :* 05/29/2021

This cylinder was certified according to the 1997 EPA Traceability Protocol, Document #EPA-600/R-97/121, using Procedure G1. The certification expiration date was assigned using the May 2012 revision of the EPA Traceability Protocol document. Do Not Use this Standard if Pressure is less than 150 PSIG.

Analytical Data:

(R=Reference Standard, Z=Zero Gas, C=Gas Candidate)

1 . Component: CARBON MONOXIDE

Requested Concentration: 450 ppm
Certified Concentration: 463 ppm
Instrument Used: HORIBA, VIA-510 576 876 015
Analytical Method: NDIR
Last Multipoint Calibration: 05/27/2013

First Analysis Data:						Date:	05/21/2013
Z:	0	R:	494	C:	463	Conc:	463
R:	494	Z:	0	C:	463	Conc:	463
Z:	0	C:	463	R:	494	Conc:	463
UOM:	ppm					Mean Test Assay:	463 ppm

Reference Standard Type: GMIS
Ref. Std. Cylinder #: SA16869
Ref. Std. Conc: 494 ppm
Ref. Std. traceable to SRM #: vs. 1680b
SRM Sample #: 2-J-15
SRM Cylinder #: CAL018072

Second Analysis Data:						Date:	
Z:	0	R:	0	C:	0	Conc:	0
R:	0	Z:	0	C:	0	Conc:	0
Z:	0	C:	0	R:	0	Conc:	0
UOM:	ppm					Mean Test Assay:	0 ppm

2 . Component: NITRIC OXIDE

Requested Concentration: 450 ppm
Certified Concentration: 464 ppm
Instrument Used: Thermo Electron 42i S/N 072602432C
Analytical Method: Chemiluminescence
Last Multipoint Calibration: 05/27/2013

First Analysis Data:						Date:	05/21/2013
Z:	0	R:	498	C:	464	Conc:	464
R:	494	Z:	0	C:	463	Conc:	463
Z:	0	C:	463	R:	494	Conc:	464
UOM:	ppm					Mean Test Assay:	464 ppm

Reference Standard Type: GMIS
Ref. Std. Cylinder #: CC207299
Ref. Std. Conc: 498 ppm
Ref. Std. traceable to SRM #: 1687b
SRM Sample #: 41-K-34
SRM Cylinder #: FF31364

Second Analysis Data:						Date:	05/29/2013
Z:	0	R:	498	C:	463	Conc:	463
R:	498	Z:	0	C:	463	Conc:	463
Z:	0	C:	463	R:	498	Conc:	464
UOM:	ppm					Mean Test Assay:	463 ppm

3 . Component: SULFUR DIOXIDE

Requested Concentration: 275 ppm
Certified Concentration: 286 ppm
Instrument Used: HORIBA, VIA-510, 56946604
Analytical Method: NDIR11
Last Multipoint Calibration: 05/27/2013

First Analysis Data:						Date:	05/21/2013
Z:	0	R:	495	C:	285	Conc:	285
R:	495	Z:	0	C:	284	Conc:	284
Z:	0	C:	284	R:	495	Conc:	285
UOM:	ppm					Mean Test Assay:	285 ppm

Reference Standard Type: GMIS
Ref. Std. Cylinder #: CC117224
Ref. Std. Conc: 495 ppm
Ref. Std. traceable to SRM #: vs. 1661a
SRM Sample #: 94-H-05
SRM Cylinder #: FF28146

Second Analysis Data:						Date:	05/29/2013
Z:	0	R:	495	C:	287	Conc:	287
R:	495	Z:	0	C:	286	Conc:	286
Z:	0	C:	286	R:	495	Conc:	286
UOM:	ppm					Mean Test Assay:	286 ppm

Analyzed by: Nelson Ma

Certified by: Diego Mestanza

PRAXAIR

Praxair
5700 South Alameda Street
Los Angeles, CA 90058
Tel: (323) 585-2154 Fax:(714) 542-6689
PGVPID: F22016

DocNumber: 000097877

CERTIFICATE OF ANALYSIS / EPA PROTOCOL GAS

Customer & Order Information:

A LANFRANCO & ASSOC INC
101 9488 189TH ST
SURREY BC V4N 4

Praxair Order Number: 27077023
Customer P. O. Number:
Customer Reference Number:

Fill Date: 8/17/2016
Part Number: NI CO240NS3E-AS
Lot Number: 109623008
Cylinder Style & Outlet: AS CGA 660
Cylinder Pressure & Volume: 2000 psig 140 cu. ft.

Certified Concentration:

Expiration Date:		**8/29/2024**	NIST Traceable
Cylinder Number:		**DT0014773**	Analytical Uncertainty:
248	**ppm**	**CARBON MONOXIDE**	± 0.6 %
242	**ppm**	**NITRIC OXIDE**	± 0.6 %
173	**ppm**	**SULFUR DIOXIDE**	± 0.5 %
	Balance	**NITROGEN**	

NOx = 242 ppm **NOx for Reference Only**

Certifcation Information: *Certification Date:* 8/29/2016 *Term:* 96 Months *Expiration Date:* 8/29/2024

This cylinder was certified according to the 2012 EPA Traceability Protocol, Document #EPA-600/R-12/531, using Procedure G1. Do Not Use this Standard if Pressure is less than 100 PSIG.

Analytical Data: *(R=Reference Standard, Z=Zero Gas, C=Gas Candidate)*

1. Component: CARBON MONOXIDE

Requested Concentration: 240 ppm
Certified Concentration: 248 ppm
Instrument Used: HORIBA, VIA-510 576 876 015
Analytical Method: NDIR
Last Multipoint Calibration: 8/26/2016

First Analysis Data:						Date:	8/22/2016
Z:	0	R:	251.6	C:	247.4	Conc:	247.4
R:	251.3	Z:	0	C:	247.7	Conc:	247.7
Z:	0	C:	247.5	R:	251.9	Conc:	247.5
UOM:	ppm			Mean Test Assay:			247.53 ppm

Reference Standard Type: GMIS
Ref. Std. Cylinder # : SA10433
Ref. Std. Conc: 251.6 ppm
Ref. Std. Traceable to SRM # : 2636a
SRM Sample # : 57-E-28
SRM Cylinder # : FF23380

Second Analysis Data:						Date:	
Z:	0	R:	0	C:	0	Conc:	0
R:	0	Z:	0	C:	0	Conc:	0
Z:	0	C:	0	R:	0	Conc:	0
UOM:	ppm			Mean Test Assay:			0 ppm

2. Component: NITRIC OXIDE

Requested Concentration: 235 ppm
Certified Concentration: 242 ppm
Instrument Used: Thermo Electron 42i S/N 072602432C
Analytical Method: Chemiluminescence
Last Multipoint Calibration: 8/10/2016

First Analysis Data:						Date:	8/22/2016
Z:	0	R:	248	C:	242	Conc:	242.33
R:	247	Z:	0	C:	241	Conc:	241.32
Z:	0	C:	242	R:	248	Conc:	242.33
UOM:	ppm			Mean Test Assay:			241.99 ppm

Reference Standard Type: GMIS
Ref. Std. Cylinder # : CC3151
Ref. Std. Conc: 248.0 ppm
Ref. Std. Traceable to SRM # : 1685b
SRM Sample # : 43-L-11
SRM Cylinder # : CAL017304

Second Analysis Data:						Date:	8/29/2016
Z:	0	R:	248	C:	242	Conc:	242
R:	248	Z:	0	C:	242	Conc:	242
Z:	0	C:	242	R:	248	Conc:	242
UOM:	ppm			Mean Test Assay:			242 ppm

3. Component: SULFUR DIOXIDE

Requested Concentration: 165 ppm
Certified Concentration: 173 ppm
Instrument Used: HORIBA, VIA-510, 5203551011
Analytical Method: NDIR
Last Multipoint Calibration: 8/15/2016

First Analysis Data:						Date:	8/22/2016
Z:	0	R:	507.9	C:	172.7	Conc:	172.41
R:	509.1	Z:	0	C:	172.9	Conc:	172.61
Z:	0	C:	173	R:	509.3	Conc:	172.71
UOM:	ppm			Mean Test Assay:			172.57 ppm

Reference Standard Type: GMIS
Ref. Std. Cylinder # : CC30796
Ref. Std. Conc: 507.9 ppm
Ref. Std. Traceable to SRM # : 1661a
SRM Sample # : 94-I-18
SRM Cylinder # : FF22304

Second Analysis Data:						Date:	8/29/2016
Z:	0	R:	507.9	C:	172.4	Conc:	172.4
R:	507.9	Z:	0	C:	172.9	Conc:	172.9
Z:	0	C:	172.8	R:	507.9	Conc:	172.8
UOM:	ppm			Mean Test Assay:			172.7 ppm

Analyzed by: Jose Vasquez

Certified by: Jack Eu

PRAXAIR

Praxair
5700 South Alameda Street
Los Angeles, CA 90058
Tel: (323) 585-2154 Fax:(714) 542-6689
PGVPID: F22013

DocNumber: 000056184

CERTIFICATE OF ANALYSIS / EPA PROTOCOL GAS

Customer & Order Information:

A LANFRANCO & ASSOC INC
101 9488 189TH ST
SURREY BC V4N 4

Praxair Order Number: 18656476
Customer P. O. Number: MARK
Customer Reference Number:

Fill Date: 7/13/2013
Part Number: NI ME490N1E-AS
Lot Number: 109319402
Cylinder Style & Outlet: AS CGA 660
Cylinder Pressure & Volume: 2000 psig 140 cu. ft.

Certified Concentration:

Expiration Date:	**7/25/2017**	NIST Traceable
Cylinder Number:	**CC423963**	Analytical Uncertainty:
45.7 ppm	**NITRIC OXIDE**	± 0.7 %
502 ppm	**METHANE**	± 1 %
Balance	**NITROGEN**	

NOx = 45.9 ppm **NOx for Reference Only**

Certifcation Information: *Certification Date:* 7/25/2013 *Term:* 48 Months *Expiration Date:* 7/25/2017

This cylinder was certified according to the 2012 EPA Traceability Protocol, Document #EPA-600/R-12/531, using Procedure G1. Do Not Use this Standard if Pressure is less than 100 PSIG.

Analytical Data: *(R=Reference Standard, Z=Zero Gas, C=Gas Candidate)*

1. Component: **NITRIC OXIDE**

Requested Concentration: 45 ppm
Certified Concentration: 45.7 ppm
Instrument Used: Thermo Electron 42C S/N 518112467
Analytical Method: Chemiluminescence
Last Multipoint Calibration: 7/24/2013

First Analysis Data:						Date:	7/17/2013
Z:	0	R:	50	C:	45.6	Conc:	45.6
R:	50	Z:	0	C:	45.6	Conc:	45.6
Z:	0	C:	45.6	R:	50	Conc:	45.6
UOM:	ppm			Mean Test Assay:			45.6 ppm

Reference Standard Type: GMIS
Ref. Std. Cylinder # : CC362455
Ref. Std. Conc: 50.0 ppm
Ref. Std. Traceable to SRM # : 1683b
SRM Sample # : 45-U-37
SRM Cylinder # : CAL015617

Second Analysis Data:						Date:	7/25/2013
Z:	0	R:	50	C:	45.5	Conc:	45.5
R:	50	Z:	0	C:	45.7	Conc:	45.7
Z:	0	C:	46	R:	50	Conc:	46
UOM:	ppm			Mean Test Assay:			45.733 ppm

2. Component: **METHANE**

Requested Concentration: 490 ppm
Certified Concentration: 502 ppm
Instrument Used: HORIBA, FIA-510, 851135122
Analytical Method: Flame Ionization Detector
Last Multipoint Calibration: 7/24/2013

First Analysis Data:						Date:	7/17/2013
Z:	0	R:	430.2	C:	432.6	Conc:	502.21
R:	431.3	Z:	0	C:	432.1	Conc:	501.63
Z:	0	C:	431.7	R:	430.6	Conc:	501.16
UOM:	ppmC			Mean Test Assay:			501.66 ppm

Reference Standard Type: GMIS
Ref. Std. Cylinder # : H93454
Ref. Std. Conc: 500 ppm
Ref. Std. Traceable to SRM # : vs. 2751
SRM Sample # : 212-09-AL
SRM Cylinder # : SX-20000

Second Analysis Data:						Date:	
Z:	0	R:	0	C:	0	Conc:	0
R:	0	Z:	0	C:	0	Conc:	0
Z:	0	C:	0	R:	0	Conc:	0
UOM:	ppmC			Mean Test Assay:			0 ppm

Analyzed by: Rolonda Kaywood

Certified by: Jack Fu

PRAXAIR

Praxair
5700 South Alameda Street
Los Angeles, CA 90058
Tel: (323) 585-2154 Fax:(714) 542-6689
PGVPID: F22013

DocNumber: 000050754

CERTIFICATE OF ANALYSIS / EPA PROTOCOL GAS

Customer & Order Information:

A LANFRANCO & ASSOC INC
101 9488 189TH ST
SURREY BC V4N 4

Praxair Order Number: 17623309
Customer P. O. Number: MARK LANFRAN
Customer Reference Number:

Fill Date: 3/5/2013
Part Number: NI SD10ME-AS
Lot Number: 109306407
Cylinder Style & Outlet: AS CGA 660
Cylinder Pressure & Volume: 2000 psig 140 cu. ft.

Certified Concentration:

Expiration Date:	**3/15/2017**		NIST Traceable
Cylinder Number:	**CC424105**		Analytical Uncertainty:
10.04	**ppm**	**SULFUR DIOXIDE**	± 2 %
	Balance	**NITROGEN**	

Certifcation Information: *Certification Date:* 3/15/2013 *Term:* 48 Months *Expiration Date:* 3/15/2017

This cylinder was certified according to the 1997 EPA Traceability Protocol, Document #EPA-600/R-97/121, using Procedure G1. The certification expiration date was assigned using the May 2012 revision of the EPA Traceability Protocol document.Do Not Use this Standard if Pressure is less than 150 PSIG.

Analytical Data: *(R=Reference Standard, Z=Zero Gas, C=Gas Candidate)*

1. **Component: SULFUR DIOXIDE**

Requested Concentration: 10 ppm
Certified Concentration: 10.04 ppm
Instrument Used: Ametek 921CE S/N AW-921-S321
Analytical Method: Ultraviolet Absorption
Last Multipoint Calibration: 3/11/2013

Reference Standard Type: GMIS
Ref. Std. Cylinder # : SA18706
Ref. Std. Conc 10.04 ppm
Ref. Std. Traceable to SRM # : vs. 1693a
SRM Sample # : 96-K-040
SRM Cylinder # : CAL015390

First Analysis Data: **Date:** 3/8/2013

Z:	0	R:	100.5	C:	99.6	Conc:	9.95
R:	100.9	Z:	0	C:	100.2	Conc:	9.97
Z:	0	C:	100.9	R:	100.6	Conc:	100.7

UOM: mV **Mean Test Assay:** 10 ppm

Second Analysis Data: **Date:** 3/15/2013

Z:	0	R:	99.2	C:	99.8	Conc:	10.1
R:	100.5	Z:	0	C:	100.6	Conc:	10.04
Z:	0	C:	100.7	R:	100.1	Conc:	10.1

UOM: mV **Mean Test Assay:** 10.08 ppm

Analyzed by: Jack Fu

Certified by: Diego Mestanza

PRAXAIR

Praxair
5700 South Alameda Street
Los Angeles, CA 90058
Tel: (323) 585-2154 Fax:(714) 542-6689
PGVPID: F22016

DocNumber: 000097295

CERTIFICATE OF ANALYSIS / EPA PROTOCOL GAS

Customer & Order Information:

A LANFRANCO & ASSOC INC
101 9488 189TH ST
SURREY BC V4N 4

Praxair Order Number: 26862209
Customer P. O. Number:
Customer Reference Number:

Fill Date: 7/25/2016
Part Number: NI CD10O28E-AS
Lot Number: 109620707
Cylinder Style & Outlet: AS CGA 590
Cylinder Pressure & Volume: 2000 psig 140 cu. ft.

Certified Concentration:

Expiration Date:		**8/4/2024**	NIST Traceable
Cylinder Number:		**CC308772**	Analytical Uncertainty:
9.98	**%**	**CARBON DIOXIDE**	± 0.4 %
10.95	**%**	**OXYGEN**	± 0.3 %
	Balance	**NITROGEN**	

Certifcation Information: *Certification Date:* 8/4/2016 *Term:* 96 Months *Expiration Date:* 8/4/2024

This cylinder was certified according to the 2012 EPA Traceability Protocol, Document #EPA-600/R-12/531, using Procedure G1. Do Not Use this Standard if Pressure is less than 100 PSIG.

O2 responses have been corrected for CO2 interference.

Analytical Data: *(R=Reference Standard, Z=Zero Gas, C=Gas Candidate)*

1. Component: CARBON DIOXIDE

Requested Concentration: 10 %
Certified Concentration: 9.98 %
Instrument Used: Horiba VIA-510 S/N 20C194WK
Analytical Method: NDIR
Last Multipoint Calibration: 7/18/2016

First Analysis Data:						**Date:**	8/4/2016
Z:	0	**R:**	9.95	**C:**	9.98	**Conc:**	9.973
R:	9.96	**Z:**	0	**C:**	9.98	**Conc:**	9.973
Z:	0	**C:**	9.99	**R:**	9.96	**Conc:**	9.983
UOM:	%			**Mean Test Assay:**			9.977 %

Reference Standard Type: GMIS
Ref. Std. Cylinder # : SA15063
Ref. Std. Conc: 9.95%
Ref. Std. Traceable to SRM # : 1674b
SRM Sample # : 7-H-07
SRM Cylinder # : FF10631

Second Analysis Data:						**Date:**	
Z:	0	**R:**	0	**C:**	0	**Conc:**	0
R:	0	**Z:**	0	**C:**	0	**Conc:**	0
Z:	0	**C:**	0	**R:**	0	**Conc:**	0
UOM:	%			**Mean Test Assay:**			0 %

2. Component: OXYGEN

Requested Concentration: 11 %
Certified Concentration: 10.95 %
Instrument Used: OXYMAT 5E
Analytical Method: PARAMAGNETIC
Last Multipoint Calibration: 7/29/2016

First Analysis Data:						**Date:**	8/4/2016
Z:	0	**R:**	10	**C:**	10.96	**Conc:**	10.96
R:	10	**Z:**	0	**C:**	10.94	**Conc:**	10.94
Z:	0	**C:**	10.96	**R:**	10	**Conc:**	10.96
UOM:	%			**Mean Test Assay:**			10.953 %

Reference Standard Type: GMIS
Ref. Std. Cylinder # : CC187493
Ref. Std. Conc: 10.00%
Ref. Std. Traceable to SRM # : 2658a
SRM Sample # : 72-D-28
SRM Cylinder # : CAL016862

Second Analysis Data:						**Date:**	
Z:	0	**R:**	0	**C:**	0	**Conc:**	0
R:	0	**Z:**	0	**C:**	0	**Conc:**	0
Z:	0	**C:**	0	**R:**	0	**Conc:**	0
UOM:	%			**Mean Test Assay:**			0 %

Analyzed by: Ying Yu

Certified by: Maria Soberanis

As a global, employee-owned organisation with over 50 years of experience, Golder Associates is driven by our purpose to engineer earth's development while preserving earth's integrity. We deliver solutions that help our clients achieve their sustainable development goals by providing a wide range of independent consulting, design and construction services in our specialist areas of earth, environment and energy.

For more information, visit golder.com

Africa	+ 27 11 254 4800
Asia	+ 86 21 6258 5522
Australasia	+ 61 3 8862 3500
Europe	+ 44 1628 851851
North America	+ 1 800 275 3281
South America	+ 56 2 2616 2000

solutions@golder.com
www.golder.com

Golder Associates Ltd.
Suite 200 - 2920 Virtual Way
Vancouver, BC, V5M 0C4
Canada
T: +1 (604) 296 4200

Golder Associates