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**RESULTS OF THE MERCURY TMDL  
TESTING AT THE UNITED TACONITE  
FACILITY IN FORBES, MINNESOTA  
EQUI45 & EQUI47**

**Permit No. 13700113-007  
Agency Interest ID: 140099**

Submitted to:

**UNITED TACONITE**  
1200 West Highway 16  
Forbes, Minnesota 55738

Attention:

Mike Bonham

Reviewed by:



Kathleen Eickstadt

Coordinator

Source Testing Department

Report Number 19-37384 (Hg)  
April 25, 2019  
KE/kce

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## ABBREVIATIONS

|                        |   |
|------------------------|---|
| ACFM                   | actual cubic feet per minute                        |
| cc (ml)                | cubic centimeter (milliliter)                       |
| DSCFM                  | dry standard cubic foot of dry gas per minute       |
| DSML                   | dry standard milliliter                             |
| DEG-F (°F)             | degrees Fahrenheit                                  |
| DIA.                   | Diameter  |
| FT/SEC                 | feet per second                                     |
| g                      | gram  |
| GPM                    | gallons per minute                                  |
| GR/ACF                 | grains per actual cubic foot                        |
| GR/DSCF                | grains per dry standard cubic foot                  |
| g/dscm                 | grams per dry standard meter                        |
| HP                     | horsepower  |
| HRS                    | hours   |
| IN.                    | inches  |
| IN.HG.                 | inches of mercury                                   |
| IN.WC.                 | inches of water                                     |
| LB                     | pound   |
| LB/DSCF                | pounds per dry standard cubic foot                  |
| LB/HR                  | pounds per hour                                     |
| LB/10 <sup>6</sup> BTU | pounds per million British Thermal Units heat input |
| LB/MMBTU               | pounds per million British Thermal Units heat input |
| MW                     | megawatt  |
| mg/dscm                | milligrams per dry standard cubic meter             |
| ug/dscm                | micrograms per dry standard cubic meter             |
| microns (um)           | micrometer  |
| MIN.                   | minutes   |
| ng                     | nanograms   |
| PM                     | particulate matter                                  |
| PPH                    | pounds per hour                                     |
| PPM                    | parts per million                                   |
| ppmC                   | parts per million carbon                            |
| ppm,d                  | parts per million, dry                              |
| ppm,w                  | parts per million, wet                              |
| ppt                    | parts per trillion                                  |
| PSI                    | pounds per square inch                              |
| SQ.FT.                 | square feet   |
| TPD                    | tons per day  |
| ug                     | micrograms  |
| v/v                    | percent by volume                                   |
| w/w                    | percent by weight                                   |

Standard conditions are defined as 68 °F (20 °C) and 29.92 IN. of mercury pressure



Minnesota Pollution  
Control Agency

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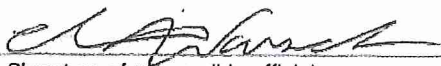
# Air Performance Test Form

## Certifications Required for Performance Test Reports

**NOTE:** All performance test reports must contain a certification by the responsible parties that the test results have been reported accurately, that the field data is a true representation of the sampling procedures, and that the process data is a true indicator of the operating parameters of the emissions unit at the time of the performance test. (Ref. Minn. R. 7017.2040). Performance test results will not be accepted without certification of the report. Please note that original signatures are required.

**1. Certification of sampling procedures by the team leader of the personnel conducting the sampling procedures:**

"I certify under penalty of law that the sampling procedures were performed in accordance with the approved test plan and that the data presented in this test report are, to the best of my knowledge and belief, true, accurate, and complete. All exceptions are listed and explained below."

  
Signature of responsible official

Chris Warneke  
Printed name of person signing

Title Field Engineer

Date 2-14-19

**2. Certification of analytical procedures by the person responsible for the laboratory analysis of field samples:**

"I certify under penalty of law that the analytical procedures were performed in accordance with the requirements of the test methods and that the data presented for use in the test report were, to the best of my knowledge and belief, true, accurate, and complete. All exceptions are listed and explained below."

  
Signature of responsible official

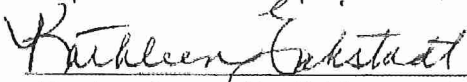
Gregg Holman  
Printed name of person signing

Title Lab Manager

Date 4/18/19

**3. Certification of test report by the senior staff person at the testing company who is responsible for compiling and checking the test report:**

"I certify under penalty of law that this test report and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the test information submitted. Based on my inquiry of the person or persons who performed sampling and analysis relating to the performance test, the information submitted in this test report is, to the best of my knowledge and belief, true, accurate, and complete. All exceptions are listed and explained below."

  
Signature of responsible official

Kathleen Eickstadt  
Printed name of person signing

Title Source Testing Coordinator

Date 4/22/19

**4. Certification of test report by owner or operator of the emission facility:**

"I certify under penalty of law that the information submitted in this test report accurately reflects the operating conditions at the emission facility during this performance test and describes the date and nature of all operational and maintenance activities that were performed on process and control equipment during the month prior to the performance test. Based on my inquiry of the person or persons who performed the operational and maintenance activities, the information submitted in this test report is, to the best of my knowledge and belief, true, accurate, and complete. All exceptions are listed and explained below."

  
Signature of responsible official

CHAD R. ASHMAN  
Printed name of person signing

Title General Manager

Date 4/26/19

**Note:** This form is to be submitted as part of the performance test report and must have original signatures.

## 1 INTRODUCTION

On February 13 and March 12, 2019, Interpoll Laboratories conducted mercury TMDL emission testing on the Line 1 and Line 2 Pellet Induration Furnaces at the United Taconite facility in Forbes, Minnesota. On-site testing was performed by Chris Warneke, Colin Kelly, Ed Juers, Tony Smith, Ryan Lenski and Taylor Myslicki. Coordination between testing activities and plant operation was provided by Mike Bonham and Logan Koskela of United Taconite. The tests were not witnessed by a representative of the MPCA.

Mercury sampling was performed in accordance with EPA Method 29. The Multi-Metal Modified Method 5 sampling train, described in this method, was used to isokinetically collect solid and vapor phase trace metals from the exhaust gas stream. The aerosol or solid phase trace metal samples were collected on Whatman QMA ultra-pure Quartz Fiber filters. The vapor phase trace metals were collected in an all glass impinger train. The first impinger was left empty as a knockout, second and third impingers each contained 100 cc of a mixture of 5%  $\text{HNO}_3$  and 10%  $\text{H}_2\text{O}_2$ . The Fourth Impinger was empty and the fourth and fifth impingers each contained 100 cc of a mixture of 4.0%  $\text{KMnO}_4$  and 10%  $\text{H}_2\text{SO}_4$ . These impingers collect any elemental mercury, which might penetrate the Nitric Acid impingers.

The recovered samples were returned to the laboratory where they were analyzed for Mercury by Cold Vapor Atomic Absorption Spectrometry (CV/AA). One reagent blank and one field-biased train blank were also collected and recovered at the test site and analyzed for mercury with the field samples.

Oxygen and carbon dioxide sampling was conducted using EPA Method 3A. A slipstream of sample gas was withdrawn from the exhaust gas stream using a heat-traced probe and filter assembly. After passing through the filter, the gas passed through a heated manifold and then two condenser-type moisture removal systems operating in series. The particulate-free dry gas was then transported to the analyzers, with the excess exhausted to the atmosphere through a rotameter which was used to ensure that the flow from the stack exceeds the requirements of the analyzers. The instruments were calibrated before and after the runs using EPA Protocol 1 calibration gases.

A summary of all of the important results is given in the following section. Supplemental information such as field data sheets and laboratory results are presented in the appendices.

## 2 SUMMARY AND DISCUSSION

The air emission results are summarized in the following tables. An overview of all results is presented below:

**Table 1: Summary of Compliance Test Results**

| <b>Emission Unit No.</b>   | <b>Limitation Basis</b> | <b>Pollutant Tested/<br/>Permit Limit</b> | <b>Test Result</b>   |
|--|-------------------------|---|--|
| EQUI 45(EU040)/<br>STRU 53<br><b>Line 1 Pellet<br/>Induration Furnace<br/>(Natural Gas/Coal<br/>Mixture)</b> | MN R 7007.0800          | <b>Mercury</b>                            | <b>Mercury</b><br>$\leq 5.73 \text{ ug/dscm}$<br>$\leq 0.0063 \text{ lb/hr}$   |
| EQUI 47<br>STRU15, STRU16<br><b>Line 2 Pellet<br/>Induration Furnace<br/>(Natural Gas/Coal<br/>Mixture)</b>  | MN R 7007.0800          | <b>Mercury</b>                            | <b>Mercury</b><br><b><u>2A-STRU16</u></b><br>$\leq 5.21 \text{ ug/dscm}$<br>$\leq 0.0061 \text{ lb/hr}$<br><br><b><u>2B-STRU15</u></b><br>$\leq 4.91 \text{ ug/dscm}$<br>$\leq 0.0061 \text{ lb/hr}$ |

Testing was conducted with only minor process delays during the course of Run 1 and 3 of the 2/12/19 testing. During Run 2 of the Natural Gas/Coal testing scenario (on 2/12/19), flow indication for the Line 2B scrubber (STRU15) was lost. A phone call was made to Andy Place of the MPCA and he stated to make note of this occurrence in the report and he was agreeable to have the testing continue and, if possible, take flow readings manually for the third run (manual readings are not possible). However, before the start of the third run, the water flow signal for the 2B scrubber was restored and testing continued. The assumption of water flow is based on the fact that the valve being a manual valve and was not moved before the lost flow indication nor after when the water flow indication was restored.

No other difficulties were encountered in the field or in the laboratory evaluation of the samples. On the basis of these facts and a complete review of the data and results, it is our opinion that the concentrations and emission rates reported herein are accurate and closely reflect the actual values which existed at the time the tests were performed.

**Table 2.** Test 1 Summary of the February 13, 2019 Mercury Emission Test on the Line 1 (SV046/STRU53) Pellet Induration Stack at the United Taconite facility in Forbes, Minnesota.(Natural Gas/ Coal)

| Item                      | Run 1                          | Run 2                          | Run 3                          | Average                        |
|---------------------------|--------------------------------|--------------------------------|--------------------------------|--------------------------------|
| Date of test              | 02-13-19                       | 02-13-19                       | 02-13-19                       |                                |
| Time runs were done       | 0800 / 0904                    | 0942 / 1232                    | 1305 / 1409                    |                                |
| Volumetric Flow           |                                |                                |                                |                                |
| Actual                    | 419,767                        | 410,641                        | 387,798                        | 406,069                        |
| Standard                  | 301,322                        | 298,876                        | 278,549                        | 292,916                        |
| Standard                  | 21,024,197                     | 20,575,726                     | 19,441,981                     | 20,347,301                     |
| Standard                  | 595,350                        | 582,651                        | 550,546                        | 576,182                        |
| Gas Temperature           | 140                            | 140                            | 139                            | 140                            |
| Moisture Content          | 14.01                          | 12.85                          | 14.04                          | 13.63                          |
| Gas Composition           |                                |                                |                                |                                |
| Carbon Dioxide            | 2.10                           | 2.07                           | 1.91                           | 2.02                           |
| Oxygen                    | 17.54                          | 17.51                          | 17.45                          | 17.50                          |
| Nitrogen                  | 80.37                          | 80.42                          | 80.64                          | 80.48                          |
| Isokinetic Variation      | 101.3                          | 99.1                           | 101.4                          | 100.6                          |
| Sample Volume             | 42.70                          | 41.46                          | 39.50                          |                                |
| Sample Volume             | 1.41                           | 1.35                           | 1.30                           |                                |
|                           | 10113                          | 10153                          | 10115                          |                                |
| <b>Method 29 Results</b>  |                                |                                |                                |                                |
| <i>Mercury Front Half</i> |                                |                                |                                |                                |
| Concentration - Actual    | <                              | <                              | <                              | <                              |
| Emission Rate             | (ug/DSCM)                      | (ug/DSCM)                      | (ug/DSCM)                      | (ug/DSCM)                      |
| Concentration             | (ug/DSCM @ 7% O <sub>2</sub> ) | (ug/DSCM @ 7% O <sub>2</sub> ) | (ug/DSCM @ 7% O <sub>2</sub> ) | (ug/DSCM @ 7% O <sub>2</sub> ) |
|                           | 0.05                           | 0.05                           | 0.05                           | 0.05                           |
|                           | 0.041                          | 0.043                          | 0.045                          | 0.043                          |
|                           | 0.000047                       | 0.000048                       | 0.000047                       | 0.00005                        |
|                           | 0.171                          | 0.174                          | 0.180                          | 0.175                          |
| <i>Mercury Back Half</i>  |                                |                                |                                |                                |
| Concentration - Actual    | <                              | <                              | <                              | <                              |
| Emission Rate             | (ug/DSCM)                      | (ug/DSCM)                      | (ug/DSCM)                      | (ug/DSCM)                      |
| Concentration             | (ug/DSCM @ 7% O <sub>2</sub> ) | (ug/DSCM @ 7% O <sub>2</sub> ) | (ug/DSCM @ 7% O <sub>2</sub> ) | (ug/DSCM @ 7% O <sub>2</sub> ) |
|                           | 7.27                           | 7.02                           | 5.68                           | 6.66                           |
|                           | 6.010                          | 5.982                          | 5.074                          | 5.688                          |
|                           | 0.006773                       | 0.006686                       | 0.005286                       | 0.00625                        |
|                           | 24.826                         | 24.510                         | 20.435                         | 23.257                         |
| <i>Mercury Total</i>      |                                |                                |                                |                                |
| Concentration - Actual    | <                              | <                              | <                              | <                              |
| Concentration             | (ug/DSCM)                      | (ug/DSCM)                      | (ug/DSCM)                      | (ug/DSCM)                      |
| Emission Rate             | (ug/DSCM)                      | (ug/DSCM)                      | (ug/DSCM)                      | (ug/DSCM)                      |
| Concentration             | (ug/DSCM @ 7% O <sub>2</sub> ) | (ug/DSCM @ 7% O <sub>2</sub> ) | (ug/DSCM @ 7% O <sub>2</sub> ) | (ug/DSCM @ 7% O <sub>2</sub> ) |
|                           | 7.32                           | 7.07                           | 5.73                           | 6.71                           |
|                           | 6.051                          | 6.024                          | 5.118                          | 5.731                          |
|                           | 5.2062                         | 5.2530                         | 4.4022                         | 4.9538                         |
|                           | 0.006819                       | 0.006734                       | 0.005332                       | 0.00630                        |
|                           | 24.997                         | 24.684                         | 20.615                         | 23.432                         |

"<" = BDL (Below Detection Level)-All analytical levels used to calculate emission values are less than the laboratory's detection levels.  
 "≤" = DLL (Detection Level Limited)- At least one but not all values used to calculate emission values are less than the laboratory's detection levels.  
 " " = ADL (Above Detection Limit) - All analytical values used to calculate emissions are greater than the laboratory's reported detection levels.

**Table 3.** Test 3 Summary of the March 12, 2019 Mercury Emission Test on the Line 2A (SV048/STRU16) Waste Gas Stack at the UTAC facility in Forbes, Minnesota. (Coal/Natural Gas)

| Item                      | Run 1                          | Run 2       | Run 3       | Average    |
|---------------------------|--------------------------------|-------------|-------------|------------|
| Date of test              | 03-12-19                       | 03-12-19    | 03-12-19    |            |
| Time runs were done       | (Hrs)                          | 1242 / 1447 | 1610 / 1826 |            |
| Volumetric Flow           |                                |             |             |            |
| Actual                    | (ACFM)                         | 420,290     | 420,933     | 425,549    |
| Standard                  | (DSCFM)                        | 307,428     | 310,095     | 314,140    |
| Standard                  | (SCFH)                         | 21,195,245  | 21,336,596  | 21,545,514 |
| Standard                  | (SCMH)                         | 600,194     | 604,197     | 610,113    |
| Gas Temperature           | (°F)                           | 133         | 134         | 135        |
| Moisture Content          | (%v/v)                         | 11.81       | 12.80       | 12.53      |
| Gas Composition           | (%v/v, dry)                    |             |             |            |
| Carbon Dioxide            |                                | 1.34        | 1.62        | 1.60       |
| Oxygen                    |                                | 18.50       | 18.24       | 18.35      |
| Nitrogen                  |                                | 80.16       | 80.14       | 80.06      |
| Isokinetic Variation      | (%)                            | 99.3        | 101.4       | 100.2      |
| Sample Volume             | (DSCF)                         | 79.04       | 76.39       | 76.00      |
| Sample Volume             | (SCM)                          | 2.54        | 2.48        | 2.47       |
|                           |                                | 10113       | 10153       | 10115      |
| <b>Results</b>            |                                |             |             |            |
| <i>Mercury Front Half</i> |                                |             |             |            |
| Concentration - Actual    | (ug)                           | <           | <           | <          |
| Emission Rate             | (ug/DSCM)                      | <           | <           | <          |
|                           | (LB/HR)                        | <           | <           | <          |
| Concentration             | (ug/DSCM @ 7% O <sub>2</sub> ) | <           | <           | <          |
| <i>Mercury Back Half</i>  |                                |             |             |            |
| Concentration - Actual    | (ug)                           | <           | <           | <          |
| Emission Rate             | (ug/DSCM)                      | <           | <           | <          |
|                           | (LB/HR)                        | <           | <           | <          |
| Concentration             | (ug/DSCM @ 7% O <sub>2</sub> ) | <           | <           | <          |
| <i>Mercury Total</i>      |                                |             |             |            |
| Concentration - Actual    | (ug)                           | <           | <           | <          |
| Concentration             | (ug/DSCM)                      | <           | <           | <          |
| Emission Rate             | (ug/SCM)                       | <           | <           | <          |
| Concentration             | (ug/DSCM @ 7% O <sub>2</sub> ) | <           | <           | <          |

"<" = BDL (Below Detection Level)-All analytical levels used to calculate emission values are less than the laboratory's detection levels.

"≤" = DLL (Detection Level Limited)- At least one but not all values used to calculate emission values are less than the laboratory's detection levels.

" " = ADL (Above Detection Limit) - All analytical values used to calculate emissions are greater than the laboratory's reported detection levels.



**Table 4. Test 1 Summary of the March 12, 2019 Mercury Emission Test on the Line 2B (EQUI47/STRU15) Pellet Induration**  
Stack at the United Taconite Facility Located in Forbes, MN (Coal/Natural Gas)

| Item                      |                      | Run 1       | Run 2       | Run 3       | Average    |
|---------------------------|----------------------|-------------|-------------|-------------|------------|
| Date of test              |                      | 03-12-19    | 03-12-19    | 03-12-19    |            |
| Time runs were done       | (Hrs)                | 0910 / 1145 | 1242 / 1449 | 1610 / 1825 |            |
| Volumetric Flow           |                      |             |             |             |            |
| Actual                    | (ACFM)               | 447,875     | 449,485     | 442,053     | 446,471    |
| Standard                  | (DSCFM)              | 333,007     | 338,694     | 327,860     | 333,187    |
| Standard                  | (SCFH)               | 23,020,500  | 23,182,617  | 22,716,220  | 22,973,112 |
| Standard                  | (SCMH)               | 651,880     | 656,471     | 643,264     | 650,538    |
| Gas Temperature           | (°F)                 | 123         | 124         | 124         | 124        |
| Moisture Content          | (%v/v)               | 13.21       | 12.34       | 13.40       | 12.98      |
| Gas Composition           |                      |             |             |             |            |
| Carbon Dioxide            | (%v/v, dry)          | 1.53        | 1.39        | 1.43        | 1.45       |
| Oxygen                    |                      | 18.18       | 18.13       | 18.19       | 18.17      |
| Nitrogen                  |                      | 80.29       | 80.48       | 80.38       | 80.38      |
| Isokinetic Variation      | (%)                  | 100.6       | 99.4        | 100.7       | 100.2      |
| Sample Volume             | (DSCF)               | 71.80       | 71.84       | 70.71       |            |
| Sample Volume             | (SCM)                | 2.34        | 2.32        | 2.31        |            |
| <b>Method 29 Results</b>  |                      |             |             |             |            |
| <i>Mercury Front Half</i> |                      |             |             |             |            |
| Concentration - Actual    | (ug)                 | <           | <           | <           | <          |
| Emission Rate             | (ug/DSCM)<br>(LB/HR) | <           | <           | <           | <          |
| <i>Mercury Back Half</i>  |                      |             |             |             |            |
| Concentration - Actual    | (ug)                 | <           | 10.23       | 8.83        | <          |
| Emission Rate             | (ug/DSCM)<br>(LB/HR) | <           | 5.026       | 4.407       | <          |
| <i>Mercury Total</i>      |                      |             |             |             |            |
| Concentration - Actual    | (ug)                 | <           | 10.28       | 8.88        | <          |
| Concentration             | (ug/DSCM)            | <           | 5.050       | 4.432       | <          |
| Emission Rate             | (ug/SCM)<br>(LB/HR)  | <           | 4.4294      | 3.8398      | <          |
|                           |                      | <           | 0.006397    | 0.005434    | <          |

### **3        SAMPLING DATA**

The sampling data is presented in this section. Gas composition and moisture are presented first followed by the computer printout of the Method 29 sampling data. Preliminary measurements including test port locations are given in the appendices.

The results have been calculated on a personal computer using Microsoft Excel spreadsheets specifically for source testing calculations. EPA-published equations have been used as the basis of the calculation techniques in these programs.

### **3.1 Results of Orsat & Moisture Determinations**

Test Number 1  
Line 1 Pellet Induration (STRU53)

**Results of Gas Composition and Moisture Analyses — Methods 3A and 4 (% v/v)**

|                           | Run 1    | Run 2    | Run 3    |
|---------------------------|----------|----------|----------|
| Date of Run               | 02-13-19 | 02-13-19 | 02-13-19 |
| <b>Dry basis (Orsat)</b>  |          |          |          |
| Carbon Dioxide.....       | 2.10     | 2.07     | 1.91     |
| Oxygen.....               | 17.54    | 17.51    | 17.45    |
| Nitrogen.....             | 80.37    | 80.42    | 80.64    |
| <b>Wet basis (Orsat)</b>  |          |          |          |
| Carbon Dioxide.....       | 1.80     | 1.80     | 1.64     |
| Oxygen.....               | 15.08    | 15.26    | 15.00    |
| Nitrogen.....             | 69.11    | 70.09    | 69.32    |
| Water Vapor.....          | 14.01    | 12.85    | 14.04    |
| Dry Molecular Weight..... | 29.04    | 29.03    | 29.00    |
| Wet Molecular Weight..... | 27.4907  | 27.61    | 27.46    |
| Specific Gravity.....     | 0.950    | 0.954    | 0.948    |
| Water Mass Flow.....      | 137715   | 123548   | 127562   |
| Fo.....                   | 1.606    | 1.640    | 1.809    |

Test Number 3  
Waste Gas 2A

**Results of Gas Composition and Moisture Analyses --- Methods 3A and 4 (% v/v)**

|                           | Run 1    | Run 2    | Run 3    |
|---------------------------|----------|----------|----------|
| Date of Run               | 03-12-19 | 03-12-19 | 03-12-19 |
| <b>Dry basis (Orsat)</b>  |          |          |          |
| Carbon Dioxide.....       | 1.12     | 1.14     | 1.13     |
| Oxygen.....               | 18.50    | 18.24    | 18.30    |
| Nitrogen.....             | 80.38    | 80.62    | 80.57    |
| <b>Wet basis (Orsat)</b>  |          |          |          |
| Carbon Dioxide.....       | 0.99     | 0.99     | 0.99     |
| Oxygen.....               | 16.31    | 15.87    | 15.96    |
| Nitrogen.....             | 70.89    | 70.16    | 70.26    |
| Water Vapor.....          | 11.81    | 12.97    | 12.80    |
| Dry Molecular Weight..... | 28.92    | 28.91    | 28.91    |
| Wet Molecular Weight..... | 27.6295  | 27.50    | 27.52    |
| Specific Gravity.....     | 0.954    | 0.950    | 0.950    |
| Water Mass Flow.....      | 122162   | 128680   | 127878   |
| Fo.....                   | 2.143    | 2.333    | 2.301    |

Test Number 1  
Line 2B Pellet Induration

**Results of Gas Composition and Moisture Analyses --- Methods 3A and 4 (% v/v)**

|                           | Run 1    | Run 2    | Run 3    |
|---------------------------|----------|----------|----------|
| Date of Run               | 03-12-19 | 03-12-19 | 03-12-19 |
| <b>Dry basis (Orsat)</b>  |          |          |          |
| Carbon Dioxide.....       | 1.53     | 1.39     | 1.43     |
| Oxygen.....               | 18.18    | 18.13    | 18.19    |
| Nitrogen.....             | 80.29    | 80.48    | 80.38    |
| <b>Wet basis (Orsat)</b>  |          |          |          |
| Carbon Dioxide.....       | 1.33     | 1.22     | 1.24     |
| Oxygen.....               | 15.78    | 15.89    | 15.75    |
| Nitrogen.....             | 69.69    | 70.55    | 69.61    |
| Water Vapor.....          | 13.21    | 12.34    | 13.40    |
| Dry Molecular Weight..... | 28.97    | 28.95    | 28.96    |
| Wet Molecular Weight..... | 27.5230  | 27.60    | 27.49    |
| Specific Gravity.....     | 0.951    | 0.953    | 0.949    |
| Water Mass Flow.....      | 146716   | 133730   | 146046   |
| Fo.....                   | 1.778    | 1.993    | 1.895    |

### **3.2 Method 29 Sampling Data**

**Test Number 1****Line 1 Pellet Induration (STRU53)****Results of EPA Method 29 Sampling**

|                            |             | <b>Run 1</b> | <b>Run 2</b> | <b>Run 3</b> |
|----------------------------|-------------|--------------|--------------|--------------|
| Date of Test               |             | 02-13-19     | 02-13-19     | 02-13-19     |
| Time of Runs               | (Hrs)       | 0800 / 0904  | 0942 / 1232  | 1305 / 1409  |
| Static Pressure            | (In. of WC) | -1.20        | -1.20        | -1.20        |
| Cross Sectional Area       | (Sq. ft)    | 80.383       | 80.383       | 80.383       |
| Pitot Tube Coefficient     |             | 0.84         | 0.84         | 0.84         |
| Water in Sample Gas        |             |              |              |              |
| Impingers                  | (g)         | 136.5        | 117.6        | 129.8        |
| Desiccant                  | (g)         | 11.0         | 12.0         | 7.0          |
| Total                      | (g)         | 147.5        | 129.6        | 136.8        |
| Gas Meter Coefficient      |             | 1.0039       | 1.0039       | 1.0039       |
| Barometric Pressure        | (In. of Hg) | 28.47        | 28.47        | 28.47        |
| Avg. Orifice Pressure Drop | In. of WC)  | 1.82         | 1.72         | 1.58         |
| Avg. Gas Meter Temperature | (°F)        | 61.5         | 65.3         | 68.3         |
| Volume Through Gas Meter   |             |              |              |              |
| Meter Conditions           | (CF)        | 43.94        | 42.99        | 41.21        |
| Standard Conditions        | (DSCF)      | 42.70        | 41.46        | 39.50        |
| Standard Conditions        | (SCM)       | 1.41         | 1.35         | 1.30         |
| Total Sampling Time        | (Min.)      | 60.00        | 60.00        | 60.00        |
| Nozzle Diameter            | (In.)       | 0.185        | 0.185        | 0.185        |
| Avg. Stack Gas Temperature | (°F)        | 140.00       | 139.75       | 139.42       |
| Stack Gas Velocity         | (Ft/Sec)    | 87.03        | 85.1         | 80.41        |
| Volumetric Flow Rate       |             |              |              |              |
| Actual                     | (ACFM)      | 419,767      | 410,641      | 387,798      |
| Dry Standard               | (DSCFM)     | 301,322      | 298,876      | 278,549      |
| Isokinetic Variation       | (%)         | 101.3        | 99.1         | 101.4        |



**Test Number 3**  
**Waste Gas 2A**

**Results of EPA Method 29 Sampling**

|                            |             | Run 1       | Run 2       | Run 3       |
|----------------------------|-------------|-------------|-------------|-------------|
| Date of Test               |             | 03-12-19    | 03-12-19    | 03-12-19    |
| Time of Runs               | (Hrs)       | 0910 / 1143 | 1242 / 1447 | 1610 / 1826 |
| Static Pressure            | (In. of WC) | -0.50       | -0.50       | -0.50       |
| Cross Sectional Area       | (Sq. ft)    | 117.859     | 117.859     | 117.859     |
| Pitot Tube Coefficient     |             | 0.84        | 0.84        | 0.84        |
| Water in Sample Gas        |             |             |             |             |
| Impingers                  | (g)         | 205.0       | 222.2       | 219.6       |
| Desiccant                  | (g)         | 19.5        | 19.3        | 17.0        |
| Total                      | (g)         | 224.5       | 241.5       | 236.6       |
| Gas Meter Coefficient      |             | 1.0076      | 1.0076      | 1.0076      |
| Barometric Pressure        | (In. of Hg) | 28.49       | 28.49       | 28.49       |
| Avg. Orifice Pressure Drop | In. of WC)  | 1.62        | 1.54        | 1.54        |
| Avg. Gas Meter Temperature | (°F)        | 57.6        | 65.9        | 69.1        |
| Volume Through Gas Meter   |             |             |             |             |
| Meter Conditions           | (CF)        | 80.41       | 78.99       | 79.07       |
| Standard Conditions        | (DSCF)      | 79.04       | 76.39       | 76.00       |
| Standard Conditions        | (SCM)       | 2.54        | 2.48        | 2.47        |
| Total Sampling Time        | (Min.)      | 120.00      | 120.00      | 120.00      |
| Nozzle Diameter            | (In.)       | 0.210       | 0.210       | 0.210       |
| Avg. Stack Gas Temperature | (°F)        | 133.45      | 137.40      | 134.35      |
| Stack Gas Velocity         | (Ft/Sec)    | 61.61       | 59.5        | 59.63       |
| Volumetric Flow Rate       |             |             |             |             |
| Actual                     | (ACFM)      | 435,670     | 420,800     | 421,679     |
| Dry Standard               | (DSCFM)     | 325,081     | 307,801     | 310,644     |
| Isokinetic Variation       | (%)         | 99.2        | 101.3       | 99.9        |

**Test Number 1**  
**Line 2B Pellet Induration**

**Results of EPA Method 29 Sampling**

|                            |             | <b>Run 1</b> | <b>Run 2</b> | <b>Run 3</b> |
|----------------------------|-------------|--------------|--------------|--------------|
| Date of Test               |             | 03-12-19     | 03-12-19     | 03-12-19     |
| Time of Runs               | (Hrs)       | 0910 / 1145  | 1242 / 1449  | 1610 / 1825  |
| Static Pressure            | (In. of WC) | -0.75        | -0.75        | -0.75        |
| Cross Sectional Area       | (Sq. ft)    | 116.659      | 116.659      | 116.659      |
| Pitot Tube Coefficient     |             | 0.84         | 0.84         | 0.84         |
| Water in Sample Gas        |             |              |              |              |
| Impingers                  | (g)         | 208.0        | 198.6        | 208.8        |
| Desiccant                  | (g)         | 31.1         | 15.9         | 29.4         |
| Total                      | (g)         | 239.1        | 214.5        | 238.2        |
| Gas Meter Coefficient      |             | 1.0006       | 1.0006       | 1.0006       |
| Barometric Pressure        | (In. of Hg) | 28.49        | 28.49        | 28.49        |
| Avg. Orifice Pressure Drop | In. of WC)  | 1.27         | 1.25         | 1.22         |
| Avg. Gas Meter Temperature | (°F)        | 78.5         | 78.7         | 78.5         |
| Volume Through Gas Meter   |             |              |              |              |
| Meter Conditions           | (CF)        | 76.60        | 76.68        | 75.46        |
| Standard Conditions        | (DSCF)      | 71.80        | 71.84        | 70.71        |
| Standard Conditions        | (SCM)       | 2.34         | 2.32         | 2.31         |
| Total Sampling Time        | (Min.)      | 120.00       | 120.00       | 120.00       |
| Nozzle Diameter            | (In.)       | 0.195        | 0.195        | 0.195        |
| Avg. Stack Gas Temperature | (°F)        | 123.29       | 123.75       | 123.83       |
| Stack Gas Velocity         | (Ft/Sec)    | 63.99        | 64.2         | 63.15        |
| Volumetric Flow Rate       |             |              |              |              |
| Actual                     | (ACFM)      | 447,875      | 449,485      | 442,053      |
| Dry Standard               | (DSCFM)     | 333,007      | 338,694      | 327,860      |
| Isokinetic Variation       | (%)         | 100.6        | 99.4         | 100.7        |

#### **4 RESULTS OF FUEL ANALYSIS**



Twin Ports Testing, Inc.  
1301 North 3rd Street  
Superior, WI 54880  
p: 715-392-7114  
p: 800-373-2562  
f: 715-392-7163  
www.twinportstesting.com

## Analytical Test Report

**Report No:** USR:W219-0197-01  
**Issue No:** 1

**Client:** CLIFFS NATURAL RESOURCES INC.  
PO Box 180  
Eveleth, MN  
**Attention:** Jennifer Krause  
**PO No:** U84619

**Signed:** *Katy Jahr*  
Katy Jahr  
Chemistry Lab Supervisor  
**Date of Issue:** 3/1/2019  
THIS DOCUMENT SHALL NOT BE REPRODUCED EXCEPT IN FULL

### Sample Details

**Sample Log No:** W219-0197-01  
**Sample Designation:** L1 Coal  
**Sample Recognized As:** Coal  
**Sample Date:** 2/13/2019  
**Sample Time:** 9:00 AM  
**Arrival Date:** 2/26/2019

### Test Results

|                                   | METHOD     | UNITS    | MOISTURE<br>FREE | AS<br>RECEIVED |
|-----------------------------------|------------|----------|------------------|----------------|
| Moisture - Total                  | ASTM D3173 | wt. %    |                  | 2.50           |
| Ash                               | ASTM D3174 | wt. %    | 7.98             | 7.78           |
| Volatile Matter                   | ASTM D3175 | wt. %    |                  |                |
| Fixed Carbon by Difference        | ASTM D3172 | wt. %    |                  |                |
| Sulfur                            | ASTM D4239 | wt. %    | 0.800            | 0.780          |
| SO <sub>2</sub>                   | Calculated | lb/mmbtu |                  | 1.18           |
| Net Cal. Value at Const. Pressure | ISO 1928   | GJ/tonne |                  |                |
| Net Cal. Value at Const. Pressure | ISO 1928   | J/g      |                  |                |
| Gross Cal. Value at Const. Vol.   | ASTM D5865 | J/g      | 31453            | 30666          |
| Gross Cal. Value at Const. Vol.   | ASTM D5865 | Btu/lb   | 13523            | 13185          |

|           |            |       |
|-----------|------------|-------|
| Carbon    | ASTM D5373 | wt. % |
| Hydrogen* | ASTM D5373 | wt. % |
| Nitrogen  | ASTM D5373 | wt. % |
| Oxygen*   | ASTM D3176 | wt. % |

\*Note: As received values do not include hydrogen and oxygen in the total moisture.

|                              |            |           |
|------------------------------|------------|-----------|
| Chlorine                     | ASTM D6721 | mg/kg     |
| Fluorine                     | ASTM D3761 | mg/kg     |
| Mercury                      | ASTM D6722 | mg/kg     |
| Sodium Oxide in Ash          | ASTM D3682 | wt. %     |
| Hardgrove Grindability Index | ASTM D409  | wt./index |

### Comments



Twin Ports Testing, Inc.  
 1301 North 3rd Street  
 Superior, WI 54880  
 p: 715-392-7114  
 p: 800-373-2562  
 f: 715-392-7163  
 www.twinportstesting.com

## Analytical Test Report

**Report No:** USR:W219-0274-02  
**Issue No:** 1

**Client:** CLIFFS NATURAL RESOURCES INC.  
 PO Box 180  
 Eveleth, MN  
**Attention:** Jennifer Krause  
**PO No:** U84619

**Signed:** *Katy Jahr*  
 Katy Jahr  
 Chemistry Lab Supervisor  
**Date of Issue:** 3/22/2019

THIS DOCUMENT SHALL NOT BE REPRODUCED EXCEPT IN FULL

### Sample Details

**Sample Log No:** W219-0274-02  
**Sample Designation:** SP Test #2 Line  
**Sample Recognized As:** Coal  
**Sample Date:** 3/12/2019  
**Sample Time:**  
**Arrival Date:** 3/19/2019

### Test Results

|                                   | METHOD     | UNITS     | MOISTURE<br>FREE | AS<br>RECEIVED |
|-----------------------------------|------------|-----------|------------------|----------------|
| Moisture - Total                  | ASTM D3173 | wt. %     |                  | 2.21           |
| Ash                               | ASTM D3174 | wt. %     | 8.53             | 8.35           |
| Volatile Matter                   | ASTM D3175 | wt. %     |                  |                |
| Fixed Carbon by Difference        | ASTM D3172 | wt. %     |                  |                |
| Sulfur                            | ASTM D4239 | wt. %     | 0.983            | 0.961          |
| SO <sub>2</sub>                   | Calculated | lb/mmmbtu |                  | 1.46           |
| Net Cal. Value at Const. Pressure | ISO 1928   | GJ/tonne  |                  |                |
| Net Cal. Value at Const. Pressure | ISO 1928   | J/g       |                  |                |
| Gross Cal. Value at Const. Vol.   | ASTM D5865 | J/g       | 31237            | 30546          |
| Gross Cal. Value at Const. Vol.   | ASTM D5865 | Btu/lb    | 13430            | 13133          |

|           |            |       |
|-----------|------------|-------|
| Carbon    | ASTM D5373 | wt. % |
| Hydrogen* | ASTM D5373 | wt. % |
| Nitrogen  | ASTM D5373 | wt. % |
| Oxygen*   | ASTM D3176 | wt. % |

\*Note: As received values do not include hydrogen and oxygen in the total moisture.

|                              |            |           |
|------------------------------|------------|-----------|
| Chlorine                     | ASTM D6721 | mg/kg     |
| Fluorine                     | ASTM D3761 | mg/kg     |
| Mercury                      | ASTM D6722 | mg/kg     |
| Sodium Oxide in Ash          | ASTM D3682 | wt. %     |
| Hardgrove Grindability Index | ASTM D409  | wt./index |

### Comments

## **APPENDIX A**

### **SAMPLING TRAIN CALIBRATION DATA**

INTERPOLL LABORATORIES, INC.  
(763) 786-6020

Stack Sampling Department - QA  
Field Barometer Calibration Sheet

Date: 1/11/2019  
Technician: Ryan Lenski  
Mercury Column Barometer Number: Weighing Room Barometer  
Aneroid Barometer Number: Ultimeter 3, 0011-11

| Reference Mercury Barometer Reading | Ambient Temperature | Temperature Correction Factor | Adjusted Reference Mercury Barometer Reading (Subtract Corr.) | Initial Field Barometer Reading | Adjusted Field Barometer Reading | Difference ( $P_{ba} - P_{bm}$ )<br>(Must be +/- 0.1 in. Hg) |
|-------------------------------------|---------------------|-------------------------------|---|---------------------------------|----------------------------------|--|
| 29.35                               | 72                  | 0.114                         | 29.24   | 29.26                           | 29.24                            | 0.004  |
|                                     |                     |                               |   |                                 |                                  |  |

**Weighing room barometer setup:**

- 1) Using the set screw on the bottom of the barometer, adjust the level of the mercury reservoir to the point that the level indicator makes slight contact with the mercury. A flashlight can aid in seeing the dimple formed when the level indicator makes contact with the mercury.
- 2) Slide the measurement ruler on the barometer to the point where the bottom of the ruler is in line with the top of the mercury column's reverse meniscus. Record the reading (in. Hg)
- 3) Take a temperature reading and record the temperature correction factor (Subtract Correction) from the lookup table near the barometer.
- 4) Apply the temperature correction factor to the mercury barometer.
- 5) Adjust the field barometer reading to within +/- 0.1 in. Hg of the reference barometer reading.

Please note any adjustments that were made to the field barometer to make it fall within the +/- 0.1 in. Hg Specifications.  
Has this barometer shown any consistent problems with calibration? Has the problem been alleviated?

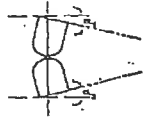


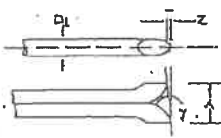
Note: Aneroid barometers will be calibrated periodically against a mercury column barometer.  
The aneroid barometer to be calibrated should be placed in close proximity to the mercury barometer and left to equilibrate for 20 - 30 minutes before calibrating. Aneroid barometer will be calibrated to the adjusted mercury barometer readings.

**Alternative Calibration Procedure:**

- 1) Obtain the station value or absolute barometric pressure  $P_r$  from a nearby National Weather Service station and its elevation (A) in feet above sea level.
- 2) Determine the elevation (B) in feet above sea level of the site of the field barometer. (local airport)
- 3) Calculate the site barometric pressure ( $P_b$ ) as follows:  
$$P_b = P_r + 0.001 (A-B)$$
- 4) Compare the field barometer reading against  $P_b$  obtained in step 3.
- 5) Adjust the field barometer reading to within +/- 0.1 in. Hg.

EPA Method 2 - Type S Pitot Tube Inspection

CALIBRATION DATA SHEET

|   |   |      |
|---|---|------|
|  <p>Degree indicating level position for determining <math>\alpha_1</math> and <math>\alpha_2</math>.</p>  <p>Degree indicating level position for determining <math>\beta_1</math> and <math>\beta_2</math>.</p>  <p>Degree indicating level position for determining Q.</p>  <p>Degree indicating level position for determining Z then calculate Z.</p> | Obstruction? Y/N                                    | No   |
|   | Damaged? Y/N  | No   |
|   | Pitot leak check? Y/N                               | Yes  |
|   | $\alpha_1 (-10^\circ \leq \alpha_1 \leq +10^\circ)$ | 1°   |
|   | $\alpha_2 (-10^\circ \leq \alpha_2 \leq +10^\circ)$ | 1°   |
|   | $\beta_1 (-5^\circ < \beta_1 < +5^\circ)$           | 2°   |
|   | $\beta_2 (-5^\circ < \beta_2 < +5^\circ)$           | 1°   |
|   | $z = (\leq 0.125^\circ)$                            | .008 |
|   | $w = (\leq 0.03125^\circ)$                          | .002 |
|   | $D_1 (3/16" (0.1875") \leq D_1 \leq 3/8" (0.375"))$ | .327 |
| A   | .910  |      |
| $A/2D_1 (1.05 \leq P_1/D_1 \leq 1.5)$   | 1.391   |      |
| Distance from Pitot to probe components (Method 5 Probe)  |   |      |
| Pitot to 0.500 in. nozzle ( $\geq 0.750$ in.)   | 755   |      |
| Pitot to probe sheath ( $\geq 3$ in.)   | 3.697   |      |
| Pitot to thermocouple (parallel to probe)   | 2.633   |      |
| Thermocouple operates properly (Y/N)  | Yes see below                                       |      |

| Thermocouple Calibration |         |             |
|--------------------------|---------|-------------|
| Ref.                     | Ref. °F | In Temp. °F |
| Ice Bath                 | 32      | 32          |
| Boiling Water            | 210     | 210         |

QA/QC Check:

Completeness ☒ Legibility ☒ Accuracy ☒ Specifications ☒ Reasonableness ☒

Certification

I certify that the Type S pitot tube/probe ID # 04-05-A1 meets or exceeds all specifications, criteria and/or applicable design features and is hereby assigned a pitot tube calibration factor Cp of 0.84.

Certified by:

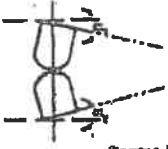
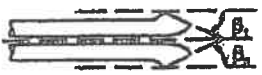

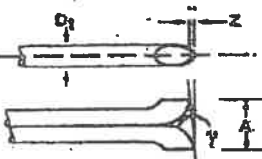
  
(Signature)

12/26/18  
(Date)



# EPA Method 2 - Type S Pitot Tube Inspection

## CALIBRATION DATA SHEET

|   |  |           |
|---|--|-----------|
|  <p>Degree indicating level position for determining <math>\alpha_1</math> and <math>\alpha_2</math>.</p>  <p>Degree indicating level position for determining <math>\beta_1</math> and <math>\beta_2</math>.</p>  <p>Degree indicating level position for determining <math>z</math>.</p>  <p>Degree indicating level position for determining <math>y</math> then calculate <math>z</math>.</p> | Level and Perpendicular? Y/N                             | Y         |
|   | Obstruction? Y/N   | N         |
|   | Damaged? Y/N   | N         |
|   | Pitot leak check? Y/N                                    | Y         |
|   | $\alpha_1$ ( $-10^\circ \leq \alpha_1 \leq +10^\circ$ )  | $0^\circ$ |
|   | $\alpha_2$ ( $-10^\circ \leq \alpha_2 \leq +10^\circ$ )  | $0^\circ$ |
|   | $\beta_1$ ( $-5^\circ < \beta_1 < +5^\circ$ )            | $0^\circ$ |
|   | $\beta_2$ ( $-5^\circ < \beta_2 < +5^\circ$ )            | $0^\circ$ |
|   | $z$ ( $\leq 0.125"$ )                                    | 0.014"    |
|   | $w$ ( $\leq 0.03125"$ )                                  | 0.008"    |
|   | $D_1$ ( $3/16" \leq D_1 \leq 3/8"$ )                     | 0.314"    |
|   | A  | 0.882"    |
|   | $A/2D_1$ ( $1.05 \leq P_A/D_1 \leq 1.5$ )                | 1.404     |
|   | Distance from Pitot to probe components (Method 5 Probe) |           |
|   | Pitot to 0.500 in. nozzle ( $> 0.750$ in.)               | 0.868"    |
| Pitot to probe sheath ( $> 3$ in.)  | 3.416"   |           |
| Pitot to thermocouple (parallel to probe)   | 3.148"   |           |
| Thermocouple operates properly (Y/N)  | Y  |           |

Notes:

### QA/QC Check:

Completeness ☒

Legibility ☒

Accuracy ☒


Specifications ☒

Reasonableness ☒

### Certification

I certify that the Type S pitot tube/probe ID # 02-05-01 meets or exceeds all specifications, criteria and/or applicable design features and is hereby assigned a pitot tube calibration factor  $C_p$  of 0.84.

Certified by:

  
Personnel (Signature)

1-22-2019  
(Date)

**INTERPOLL LABORATORIES, INC.**  
**(763) 786-6020**

**Temperature Measurement Device Calibration Sheet**

**Unit under Test:**

|                     |               |                   |         |
|---------------------|---------------|-------------------|---------|
| Vendor              | Digital Meter | Serial Number     | 1195775 |
| Model               | 6802II        | Thermocouple Type | K       |
| Range               | 0-2100 °F     | Technician        | CK      |
| Date of Calibration | 1/3/2019      | PDT Number        | 197     |

**Method of Calibration:**

Omega Model CL-300 Type K Thermocouple Simulator which provides 22 precise temperature equivalent millivolt signals. The CL-300 is cold junction compensated. Calibration accuracy is +/- 0.1 % of span(2100 oF) +/- 1 degree (for negative temperatures add +/- 2 degrees). The CL-300 simulated exactly the millivoltage of a Type K thermocouple at the indicated temperature.

| Desired Temp.<br>(°F) Nominal | Response of Unit Under<br>Test (°F) | Deviation       |       |
|-------------------------------|-------------------------------------|-----------------|-------|
|                               |                                     | $\Delta t$ (°F) | %     |
| 0                             | 0.1                                 | 0.1             | 0.022 |
| 100                           | 100                                 | 0               | 0.000 |
| 200                           | 199                                 | 1               | 0.152 |
| 300                           | 299                                 | 1               | 0.132 |
| 400                           | 399                                 | 1               | 0.116 |
| 500                           | 498                                 | 2               | 0.208 |
| 600                           | 598                                 | 2               | 0.189 |
| 700                           | 698                                 | 2               | 0.172 |
| 800                           | 797                                 | 3               | 0.238 |
| 900                           | 897                                 | 3               | 0.221 |
| 1000                          | 997                                 | 3               | 0.205 |
| 1100                          | 1097                                | 3               | 0.192 |
| 1200                          | 1197                                | 3               | 0.181 |
| 1300                          | 1295                                | 5               | 0.284 |
| 1400                          | 1395                                | 5               | 0.269 |
| 1500                          | 1495                                | 5               | 0.255 |
| 1600                          | 1595                                | 5               | 0.243 |
| 1700                          | 1694                                | 6               | 0.278 |
| 1800                          | 1794                                | 6               | 0.265 |
| 1900                          | 1894                                | 6               | 0.254 |
| 2000                          | 1994                                | 6               | 0.244 |
| 2100                          | 2093                                | 7               | 0.273 |
|                               |                                     | 3               | 0.200 |

OF = off scale response by unit under test (oF)

☒ **Unit was in tolerance**

( Must be within +/- 1.5% absolute reference temperature)

☐ **Unit was not in tolerance : Recalibrated see new calibration sheet or unit put out of service.**

**INTERPOLL LABORATORIES, INC.**  
**(763) 786-6020**

**Temperature Measurement Device Calibration Sheet**

**Unit under Test:**

Vendor Digital Meter  
Model 6802II  
Range 0-2100 °F  
Date of Calibration 1/3/2019

Serial Number t538247  
Thermocouple Type Type K  
Technician CK  
PDT Number 173

**Method of Calibration:**

Omega Model CL-300 Type K Thermocouple Simulator which provides 22 precise temperature equivalent millivolt signals. The CL-300 is cold junction compensated. Calibration accuracy is +/- 0.1 % of span(2100 oF) +/- 1 degree (for negative temperatures add +/- 2 degrees). The CL-300 simulated exactly the millivoltage of a Type K thermocouple at the indicated temperature.

| Desired Temp.<br>(°F) Nominal | Response of Unit Under<br>Test (°F) | Deviation       |       |
|-------------------------------|-------------------------------------|-----------------|-------|
|                               |                                     | $\Delta t$ (°F) | %     |
| 0                             | -2                                  | 2               | 0.435 |
| 100                           | 98                                  | 2               | 0.357 |
| 200                           | 197                                 | 3               | 0.455 |
| 300                           | 297                                 | 3               | 0.395 |
| 400                           | 397                                 | 3               | 0.349 |
| 500                           | 497                                 | 3               | 0.313 |
| 600                           | 597                                 | 3               | 0.283 |
| 700                           | 697                                 | 3               | 0.259 |
| 800                           | 797                                 | 3               | 0.238 |
| 900                           | 897                                 | 3               | 0.221 |
| 1000                          | 997                                 | 3               | 0.205 |
| 1100                          | 1097                                | 3               | 0.192 |
| 1200                          | 1197                                | 3               | 0.181 |
| 1300                          | 1297                                | 3               | 0.170 |
| 1400                          | 1397                                | 3               | 0.161 |
| 1500                          | 1497                                | 3               | 0.153 |
| 1600                          | 1597                                | 3               | 0.146 |
| 1700                          | 1697                                | 3               | 0.139 |
| 1800                          | 1797                                | 3               | 0.133 |
| 1900                          | 1897                                | 3               | 0.127 |
| 2000                          | 1997                                | 3               | 0.122 |
| 2100                          | 2097                                | 3               | 0.117 |
| Average:                      |                                     | 3               | 0.234 |

OF = off scale response by unit under test (oF)

% dev =  $100\Delta t/(460+t)$

☒ Unit was in tolerance

☐ Unit was not in tolerance : Recalibrated see new calibration sheet or unit put out of service.

( Must be within +/- 1.5% absolute reference temperature)

**INTERPOLL LABORATORIES, INC.**  
**(763) 786-6020**

**Stack Sampling Department - QA**  
**Field Barometer Calibration Sheet**

|                                  |                         |
|----------------------------------|-------------------------|
| Date:                            | 10/23/2018              |
| Technician:                      | Duane Van Hoeve         |
| Mercury Column Barometer Number: | Weighing Room Barometer |
| Aneroid Barometer Number:        | Serial # 21144067       |

| Reference Mercury Barometer Reading | Ambient Temperature | Temperature Correction Factor | Adjusted Mercury Barometer Reading | Initial Field Barometer Reading | Difference ( $P_{ba} - P_{bm}$ ) |
|-------------------------------------|---------------------|-------------------------------|------------------------------------|---------------------------------|----------------------------------|
| 29.59                               | 78                  | 0.129                         | 29.46                              | 29.41                           | -0.051                           |
|                                     |                     |                               |                                    |                                 |                                  |

**Weighing room barometer setup:**

- 1) Using the set screw on the bottom of the barometer, adjust the level of the mercury reservoir to the point that the level indicator makes slight contact with the mercury. A flashlight can aid in seeing the dimple formed when the level indicator makes contact with the mercury.
- 2) Slide the measurement ruler on the barometer to the point where the bottom of the ruler is in line with the top of the mercury column's reverse meniscus. Record the reading (in. Hg)
- 3) Take a temperature reading and record the temperature correction factor from the lookup table near the barometer.
- 4) Apply the temperature correction factor to the mercury barometer.
- 5) Adjust the field barometer reading to within +/- 0.1 in. Hg of the reference barometer reading.

Has this barometer shown any consistent problems with calibration? Has the problem been alleviated? \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

**Note:** Aneroid barometers will be calibrated periodically against a mercury column barometer. The aneroid barometer to be calibrated should be placed in close proximity to the mercury barometer and left to equilibrate for 20 - 30 minutes before calibrating. Aneroid barometer will be calibrated to the adjusted mercury barometer readings.

**Alternative Calibration Procedure:**

- 1) Obtain the station value or absolute barometric pressure  $P_r$  from a nearby National Weather Service station and its elevation (A) in feet above sea level.
- 2) Determine the elevation (B) in feet above sea level of the site of the field barometer.(local airport)
- 3) Calculate the site barometric pressure ( $P_b$ ) as follows:
$$P_b = P_r + 0.001 (A-B)$$
- 4) Compare the field barometer reading against  $P_b$  obtained in step 3.
- 5) Adjust the field barometer reading to within +/- 0.1 in. Hg.

**INTERPOLL LABORATORIES, INC.**  
**(763) 786-6020**

**Temperature Measurement Device Calibration Sheet**

**Unit under Test:**

|                     |               |                   |         |
|---------------------|---------------|-------------------|---------|
| Vendor              | Digital Meter | Serial Number     | T473725 |
| Model               | 6802II        | Thermocouple Type | Type K  |
| Range               | 0-2100 °F     | Technician        | CK      |
| Date of Calibration | 1/3/2019      | PDT Number        | 179     |

**Method of Calibration:**

Omega Model CL-300 Type K Thermocouple Simulator which provides 22 precise temperature equivalent millivolt signals. The CL-300 is cold junction compensated. Calibration accuracy is +/- 0.1 % of span(2100 oF) +/- 1 degree (for negative temperatures add +/- 2 degrees). The CL-300 simulated exactly the millivoltage of a Type K thermocouple at the indicated temperature.

| Desired Temp.<br>(°F) Nominal | Response of Unit Under<br>Test (°F) | Deviation       |       |
|-------------------------------|-------------------------------------|-----------------|-------|
|                               |                                     | $\Delta t$ (°F) | %     |
| 0                             | -0.5                                | 0.5             | 0.109 |
| 100                           | 100                                 | 0               | 0.000 |
| 200                           | 200                                 | 0               | 0.000 |
| 300                           | 301                                 | 1               | 0.132 |
| 400                           | 401                                 | 1               | 0.116 |
| 500                           | 502                                 | 2               | 0.208 |
| 600                           | 602                                 | 2               | 0.189 |
| 700                           | 703                                 | 3               | 0.259 |
| 800                           | 803                                 | 3               | 0.238 |
| 900                           | 904                                 | 4               | 0.294 |
| 1000                          | 1004                                | 4               | 0.274 |
| 1100                          | 1105                                | 5               | 0.321 |
| 1200                          | 1205                                | 5               | 0.301 |
| 1300                          | 1305                                | 5               | 0.284 |
| 1400                          | 1406                                | 6               | 0.323 |
| 1500                          | 1506                                | 6               | 0.306 |
| 1600                          | 1607                                | 7               | 0.340 |
| 1700                          | 1707                                | 7               | 0.324 |
| 1800                          | 1809                                | 9               | 0.398 |
| 1900                          | 1909                                | 9               | 0.381 |
| 2000                          | 2010                                | 10              | 0.407 |
| 2100                          | 2110                                | 10              | 0.391 |
| Average:                      |                                     | 5               | 0.254 |

OF = off scale response by unit under test (oF)


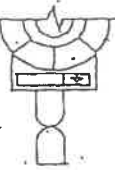
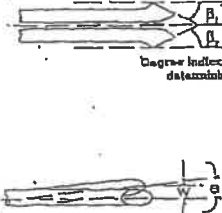
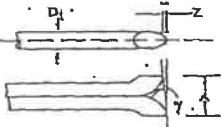
☒ Unit was in tolerance

☐ Unit was not in tolerance : Recalibrated see new calibration sheet or unit put out of service.

( Must be within +/- 1.5% absolute reference temperature)

EPA Method 2 - Type S Pitot Tube Inspection

CALIBRATION DATA SHEET

|  |   |       |
|--|---|-------|
|  <p>Degree indicating level position for determining <math>\alpha</math> and <math>\alpha_2</math>.</p>  <p>Degree indicating level position for determining <math>\beta_1</math> and <math>\beta_2</math>.</p>  <p>Degree indicating level position for determining Q.</p>  <p>Degree indicating level position for determining Z.</p> | Obstruction? Y/N                                    | No    |
|  | Damaged? Y/N  | No    |
|  | Pitot leak check? Y/N                               | No    |
|  | $\alpha_1 (-10^\circ \leq \alpha_1 \leq +10^\circ)$ | 25    |
|  | $\alpha_2 (-10^\circ \leq \alpha_2 \leq +10^\circ)$ | 25    |
|  | $\beta_1 (-5^\circ < \beta_1 < +5^\circ)$           | 25    |
|  | $\beta_2 (-5^\circ < \beta_2 < +5^\circ)$           | 25    |
|  | $Z = (< 0.125)$                                     | .043  |
|  | $W = (< 0.03125)$                                   | .004  |
|  | $D_1 (3/16" (0.1875") \leq D_1 \leq 3/8" (0.375"))$ | .330  |
|  | A   | .908  |
|  | $A/2D_1 (1.05 \leq P_1/D_1 \leq 1.5)$               | 1.375 |
| Distance from Pitot to probe components (Method 5 Probe)   |   |       |
| Pitot to 0.500 in. nozzle ( $> 0.750$ in.)   | 1.95  |       |
| Pitot to probe sheath ( $\geq 3$ in.)  | 3.731   |       |
| Pitot to thermocouple (parallel to probe)  | 2.544   |       |
| Thermocouple operates properly (Y/N)   | Yes see below                                       |       |

| Thermocouple Calibration |         |            |
|--------------------------|---------|------------|
| Ref.                     | Ref. °F | In Temp °F |
| Ice Bath                 | 32      | 32         |
| Boiling Water            | 210     | 210        |

QA/QC Check:

Completeness ☒ Legibility ☒ Accuracy ☒ Specifications ☒ Reasonableness ☒

Certification

I certify that the Type S pitot tube/probe ID # 09-04-A2 meets or exceeds all specifications, criteria and/or applicable design features and is hereby assigned a pitot tube calibration factor Cp of 0.84.

Certified by:



1/3/19

Interpoll Laboratories, Inc.  
(763)786-6020

# Metering System Calibration Sheet-EPA Method 5

Date 6/7/2018 Control Module No. 12  
 Barometric Pressure 29.15 in.Hg Serial No. DTM 1334114  
 Initial Calibration \_\_\_\_\_ Recalibration x WTM No. AL-20  
 Technician D. Van Hoever Capacity:WTM 1cf/rev ( $\geq 1$  cf/rev?)

| ΔH<br>(in. H2O) | WTM                    |                            |                   | Dry Gas Metering System |                         |                        |                            |                            |                                |                       | Time<br>θ<br>(min) | Meter<br>coefficient<br>calibration<br>factor Y <sub>1</sub> | Orifice<br>calibration<br>factor ΔH <sub>90</sub> |      |
|-----------------|------------------------|----------------------------|-------------------|-------------------------|-------------------------|------------------------|----------------------------|----------------------------|--------------------------------|-----------------------|--------------------|--|---|------|
|                 | V <sub>w</sub><br>(cf) | T <sub>w</sub><br>(deg. F) | Cal Index*<br>(%) | V <sub>d1</sub><br>(cf) | V <sub>d2</sub><br>(cf) | V <sub>d</sub><br>(cf) | t <sub>i</sub><br>(deg. F) | t <sub>o</sub><br>(deg. F) | Avg t <sub>d</sub><br>(deg. F) | Delta P*<br>(in. H2O) |                    |  |   |      |
| 0.50            | 5                      | 70.1                       | 99.8%             | 483.155                 |                         | 488.085                | 4.93                       | 69.7                       | 69.5                           | 69.6                  | 0.01               | 13.04.60   | 1.0099  | 1.98 |
| 1.2             | 5                      | 70.1                       | 99.8%             |                         | 477.73                  | 482.66                 | 4.93                       | 69.4                       | 69.3                           | 69.35                 | 0.025              | 8.34.35  | 1.0076  | 2.04 |
| 2.00            | 5                      | 70.2                       | 99.9%             | 486.91                  |                         | 471.845                | 4.935                      | 68.9                       | 68.7                           | 68.8                  | 0.055              | 6.46.25  | 1.0042  | 2.12 |
| 3.3             | 5                      | 70.1                       | 100.0%            | 472.33                  |                         | 477.235                | 4.905                      | 69.1                       | 69                             | 69.05                 | 0.09               | 5.13.22  | 1.0087  | 2.08 |
| Average         |                        |                            |                   |                         |                         |                        |                            |                            |                                |                       |                    | 1.0076   | 2.06  |      |

x Meter was in tolerance ( $Y_1 \leq \pm 0.02$  from average,  $\Delta H @ < \pm 0.20$  from average)

x Positive Pressure Leak Check

x Thermocouple(s) within tolerance

QA/QC Check

Completeness A

Legibility X

Accuracy X

Specifications X

Reasonableness X

Approved By: \_\_\_\_\_

Personnel (Signature/Date)

6/7/18

Note - Calibrate dry gas metering system every 7000 ft<sup>3</sup> of volume, or if meter system post test calibration (EPA/EMC, "Alt-008- Alternative Method 5 Post Test calibration)) indicates a change in the DGM meter coefficient calibration factor of greater than 5%.

\* Based on AL-20 wet test meter calibration in October 2012 against Bell Prover (NBS Traceable)-Carl Poe Co.

| Dry Gas Meter Thermocouple Calibration |     | Meter Inlet / Ice Bath | Meter Inlet/ Ambient | Meter Outlet / Ice Bath | Meter Outlet/ Ambient |
|--|-----|------------------------|----------------------|-------------------------|-----------------------|
| Ref $^{\circ}C$                        | 0.7 | 20.5                   | 0.7                  | 20.5                    | 20.5                  |
| Temp $^{\circ}C$                       | 0.5 | 20.5                   | 0.5                  | 20.6                    | 20.6                  |
| $\Delta$                               | 0.2 | 0                      | 0.2                  | 0.1                     | 0.1                   |

Temperature calibration using a Traceable Reference thermometer. VWR CE sn160618733 Due 12-20-2019

Interpoll Laboratories, Inc.  
(763)786-6020

# Metering System Calibration Sheet-EPA Method 5

Date 7/23/2018 Control Module No. 24

Barometric Pressure 29.13 in. Hg Serial No. DTM 1334120

Initial Calibration                      Recalibration x WTM No. AL-20

Technician D Van Hoever Capacity: WTM                      1 cf/rev                      (≥ 1 cf/rev?)

| WTM                                  |       |      |                   | Dry Gas Metering System |               |                  |               |                   |                   | Time<br>$t_{\theta}$<br>(min) | Meter<br>coefficient<br>calibration<br>factor $Y_1$ | Orifice<br>calibration<br>factor $\Delta H_{rel}$ |
|--------------------------------------|-------|------|-------------------|-------------------------|---------------|------------------|---------------|-------------------|-------------------|-------------------------------|---|---|
| $\Delta H$<br>(in. H <sub>2</sub> O) | $V_w$ | (cf) | $T_w$<br>(deg. F) | Cal Index*<br>(%)       | $V_d$<br>(cf) | $V_{at}$<br>(cf) | $V_d$<br>(cf) | $t_i$<br>(deg. F) | $t_o$<br>(deg. F) |                               |   |   |
| 0.50                                 | 5     |      | 72.6              | 99.8%                   | 328.295       | 333.315          | 5.02          | 75.6              | 75                | 12.32.19                      | 0.9977  | 1.82  |
| 1.2                                  | 5     |      | 72.6              | 99.8%                   | 322.795       | 327.79           | 4.995         | 75                | 74.8              | 8.15.35                       | 1.0002  | 1.90  |
| 2.0                                  | 5     |      | 72.6              | 99.9%                   | 311.84        | 316.82           | 4.98          | 75.2              | 74.5              | 6.15.87                       | 1.0020  | 1.81  |
| 3.30                                 | 5     |      | 72.6              | 100.0%                  | 317.32        | 322.29           | 4.97          | 75.7              | 75                | 4.56.96                       | 1.0026  | 1.88  |
| Average                              |       |      |                   |                         |               |                  |               |                   |                   |                               | 1.0006  | 1.85  |

x Meter was in tolerance ( $Y_1 \leq \pm 0.02$  from average,  $\Delta H @ < \pm 0.20$  from average)

x Positive Pressure Leak Check

Meter was not in tolerance, readjusted linkage.

Meter was not in tolerance, changed dry test meter.

QA/QC Check ☒

Completeness ☒

Legibility ☒

Accuracy ☒

Specifications ☒

Reasonableness ☒

Approved By:                     

Personal (Signature/Date)

7/23/18

Note - Calibrate dry gas metering system every 1000 ft<sup>3</sup> of volume, or if meter system post test calibration (EPA/EMC, "Alt-009- Alternative Method 5 Post Test Calibration") indicates a change in the DGM meter coefficient calibration factor of greater than 5%.

\* Based on AL-20 wet test meter calibration in October 2012 against Bell Prover (NBS Traceable)-Carl Poe Co.

| Dry Gas Meter Thermocouple Calibration |     | Meter Inlet / Ice Bath |     | Meter Inlet / Ambient |     | Meter Outlet / Ice Bath |     | Meter Outlet / Ambient |     |
|--|-----|------------------------|-----|-----------------------|-----|-------------------------|-----|------------------------|-----|
| Ref. °C                                | 0.4 | 21                     | 0.5 | 21                    | 0.5 | 21                      | 0.5 | 21                     | 0.5 |
| Temp. °C                               | 1   | 22                     | 0.8 | 22                    | 0.8 | 22                      | 0.8 | 22                     | 0.8 |
| $\Delta$                               | 0.6 | 1                      | 0.3 | 1                     | 0.3 | 1                       | 0.3 | 1                      | 0.3 |

Temperature calibration using a Tracable Reference thermometer. VWR CE sn160618733 Due 10/14/17



**Interpoll Laboratories**  
(763) 786-6020

**Field Calibration Data Sheet**

Job United Taconite Date 2/13/2019  
Operator Chris Warneke Meter Box Number 17

**Instructions:**

Operate the control module at a flow rate equal to the Delta H@ for 10 minutes before attaching the umbilical.

**Record the following data:**

Barometric Pressure: 28.47 Meter Coefficient: 1.0039 Gas Meter Delta H: 1.95

| Time<br>(min) | Volume<br>(cf)        | Meter Temperature (°F) |        |
|---------------|-----------------------|------------------------|--------|
|               |                       | Inlet                  | Outlet |
|               | 356.90                |                        |        |
| 2.5           | 358.82                | 56                     | 60     |
| 5.0           | 360.73                | 56                     | 60     |
| 7.5           | 362.65                | 56                     | 60     |
| 10.0          | 364.56                | 56                     | 60     |
|               | V <sub>m</sub> = 7.66 | Average =              | 58.0   |

**Calculate Y<sub>cn</sub> as follows:**

$$Y_{cn} = \frac{10}{V_m} \sqrt{\frac{0.0319 T_m}{P_{bar}}} = 0.9907$$

Note: If Y<sub>cn</sub> is not within the range of 0.97 to 1.03, "the volume metering system should be investigated before beginning."

CFR Title 40, Part 60, Appendix A, Method 5, Section 4.4.1

**Interpoll Laboratories**  
(763) 786-6020

**Method 5 Post Test Meter Calibration**

**United Taconite**

**Forbes, MN**

**Line 1 Pellet Induration (STRU53)**

**Test 1**

**2/13/2019**

|   | <u>Run 1</u> | <u>Run 2</u> | <u>Run 3</u> |
|---|--------------|--------------|--------------|
| $\Delta$ (min) =                            | 60.00        | 60.00        | 60           |
| V <sub>m</sub> (dcf) =                      | 43.94        | 42.99        | 41.21        |
| T <sub>m</sub> (°R) =                       | 521.5        | 525.333      | 528.333      |
| P <sub>b</sub> (in. Hg) =                   | 28.47        | 28.47        | 28.47        |
|   | 0.0319       | 0.0319       | 0.0319       |
| $\Delta$ H <sub>avg</sub> (in. W.C.) =      | 1.82         | 1.72         | 1.58         |
| $\Delta$ H @ (in. W.C.) =                   | 1.95         | 1.95         | 1.95         |
| M <sub>d</sub> (lb/lb-mole) =               | 29.04        | 29.03        | 29.00        |
| Dry Mol wt. <sub>(air)</sub> (lb/lb-mole) = | 29           | 29           | 29           |
| Spec. Grav. Merc. =                         | 13.6         | 13.6         | 13.6         |

$$Y_{qa} = 1.00563 \quad 1.0027 \quad 1.00519$$

$$Y_{qa \text{ (avg.)}} = 1.00451$$

$$Y = 1.0039$$

$$\% \text{ Diff.} = -0.0606$$

Note: If the average Y<sub>qa</sub> does not meet the  $\pm 5$  percent criterion, recalibrate the meter over the full range of orifice settings, as detailed in Section 5.3.1 of Method 5. Then follow the procedure in Section 5.3.3 of Method 5.

\*\* EPA Emission Measurement Center, Approved alternative method (ALT-009)

**Interpoll Laboratories**  
(763) 786-6020

**Field Calibration Data Sheet**

Job United Taconite Date 2/14/2019  
Operator Chris Warneke Meter Box Number 17

**Instructions:**

Operate the control module at a flow rate equal to the Delta H@ for 10 minutes before attaching the umbilical.

**Record the following data:**

Barometric Pressure: 28.11 Meter Coefficient: 1.0039 Gas Meter Delta H: 1.95

| Time<br>(min) | Volume<br>(cf)        | Meter Temperature (°F) |        |
|---------------|-----------------------|------------------------|--------|
|               |                       | Inlet                  | Outlet |
|               | 499.20                |                        |        |
| 2.5           | 501.12                | 58                     | 65     |
| 5.0           | 503.04                | 58                     | 65     |
| 7.5           | 504.96                | 58                     | 65     |
| 10.0          | 506.88                | 58                     | 65     |
|               | V <sub>m</sub> = 7.68 | Average =              | 61.5   |

**Calculate Y<sub>cn</sub> as follows:**

$$Y_{cn} = \frac{10}{V_m} \sqrt{\frac{0.0319 T_m}{P_{bar}}} = 0.9978$$

Note: If Y<sub>cn</sub> is not within the range of 0.97 to 1.03, "the volume metering system should be investigated before beginning."

CFR Title 40, Part 60, Appendix A, Method 5, Section 4.4.1

# Interpoll Laboratories

(763) 786-6020

## Method 5 Post Test Meter Calibration

United Taconite

Forbes, MN

Line 1 Pellet Induration (STRU53)

Test 4

2/14/2019

|   | <u>Run 1</u> | <u>Run 2</u> | <u>Run 3</u> |
|---|--------------|--------------|--------------|
| $\Delta$ (min) =                            | 60.00        | 60.00        | 60           |
| Vm (dcf) =                                  | 44.36        | 44.00        | 44.40        |
| Tm ( $^{\circ}$ R) =                        | 524          | 527          | 527.917      |
| P <sub>b</sub> (in. Hg) =                   | 28.11        | 28.11        | 28.11        |
|   | 0.0319       | 0.0319       | 0.0319       |
| $\Delta$ H <sub>avg</sub> (in. W.C.) =      | 1.81         | 1.77         | 1.80         |
| $\Delta$ H @ (in. W.C.) =                   | 1.95         | 1.95         | 1.95         |
| M <sub>d</sub> (lb/lb-mole) =               | 28.92        | 28.90        | 28.91        |
| Dry Mol wt. <sub>(air)</sub> (lb/lb-mole) = | 29           | 29           | 29           |
| Spec. Grav. Merc. =                         | 13.6         | 13.6         | 13.6         |

$$Y_{qa} = 1.00398 \quad 1.00289 \quad 1.00284$$

$$Y_{qa \text{ (avg.)}} = 1.00324$$

$$Y = 1.0039$$

$$\% \text{ Diff.} = 0.06596$$

Note: If the average Y<sub>qa</sub> does not meet the  $\pm 5$  percent criterion, recalibrate the meter over the full range of orifice settings, as detailed in Section 5.3.1 of Method 5. Then follow the procedure in Section 5.3.3 of Method 5.

\*\* EPA Emission Measurement Center, Approved alternative method (ALT-009)

**Interpoll Laboratories**  
(763) 786-6020

**Field Calibration Data Sheet**

Job United Taconite Date 3/12/2019  
Operator Ed Juers Meter Box Number 24

**Instructions:**

Operate the control module at a flow rate equal to the Delta H@ for 10 minutes before attaching the umbilical.

**Record the following data:**

Barometric Pressure: 28.49 Meter Coefficient: 1.0006 Gas Meter Delta H: 1.85

| Time<br>(min) | Volume<br>(cf)        | Meter Temperature (°F) |        |
|---------------|-----------------------|------------------------|--------|
|               |                       | Inlet                  | Outlet |
|               | 661.70                |                        |        |
| 2.5           | 663.63                | 60                     | 61     |
| 5.0           | 665.55                | 64                     | 64     |
| 7.5           | 667.48                | 64                     | 64     |
| 10.0          | 669.40                | 64                     | 64     |
|               | V <sub>m</sub> = 7.70 | Average =              | 63.1   |

**Calculate Y<sub>cn</sub> as follows:**

$$Y_{cn} = \frac{10}{V_m} \sqrt{\frac{0.0319 T_m}{P_{bar}}} = 0.9933$$

Note: If Y<sub>cn</sub> is not within the range of 0.97 to 1.03, "the volume metering system should be investigated before beginning."

CFR Title 40, Part 60, Appendix A, Method 5, Section 4.4.1

**Interpoll Laboratories**  
(763) 786-6020

**Method 5 Post Test Meter Calibration**

**United Taconite**

**Forbes, MN**

**Line 2B Pellet Induration**

**Test 1**

**3/12/2019**

|   | <u>Run 1</u> | <u>Run 2</u> | <u>Run 3</u> |
|---|--------------|--------------|--------------|
| $\Delta$ (min) =                            | 120.00       | 120.00       | 120          |
| Vm (dcf) =                                  | 76.60        | 76.68        | 75.46        |
| Tm ( $^{\circ}$ R) =                        | 538.479      | 538.708      | 538.542      |
| P <sub>b</sub> (in. Hg) =                   | 28.49        | 28.49        | 28.49        |
|   | 0.0319       | 0.0319       | 0.0319       |
| $\Delta$ H <sub>avg</sub> (in. W.C.) =      | 1.27         | 1.25         | 1.22         |
| $\Delta$ H @ (in. W.C.) =                   | 1.85         | 1.85         | 1.85         |
| M <sub>d</sub> (lb/lb-mole) =               | 28.97        | 28.95        | 28.96        |
| Dry Mol wt. <sub>(air)</sub> (lb/lb-mole) = | 29           | 29           | 29           |
| Spec. Grav. Merc. =                         | 13.6         | 13.6         | 13.6         |

$$Y_{qa} = 1.00575 \quad 0.99918 \quad 1.00389$$

$$Y_{qa \text{ (avg.)}} = 1.00294$$

$$Y = 1.0006$$

$$\% \text{ Diff.} = -0.2336$$

Note: If the average Y<sub>qa</sub> does not meet the  $\pm 5$  percent criterion, recalibrate the meter over the full range of orifice settings, as detailed in Section 5.3.1 of Method 5. Then follow the procedure in Section 5.3.3 of Method 5.

\*\* EPA Emission Measurement Center, Approved alternative method (ALT-009)

**Interpoll Laboratories**  
(763) 786-6020

**Field Calibration Data Sheet**

Job United Taconite Date 3/12/2019  
Operator Ryan Lenski Meter Box Number 12

**Instructions:**

Operate the control module at a flow rate equal to the Delta H@ for 10 minutes before attaching the umbilical.

**Record the following data:**

Barometric Pressure: 28.49 Meter Coefficient: 1.0076 Gas Meter Delta H: 2.06

| Time<br>(min) | Volume<br>(cf)        | Meter Temperature (°F) |        |
|---------------|-----------------------|------------------------|--------|
|               |                       | Inlet                  | Outlet |
|               | 421.82                |                        |        |
| 2.5           | 423.69                | 63                     | 61     |
| 5.0           | 425.57                | 63                     | 61     |
| 7.5           | 427.44                | 63                     | 61     |
| 10.0          | 429.31                | 63                     | 61     |
|               | V <sub>m</sub> = 7.49 | Average =              | 62.0   |

**Calculate Y<sub>cn</sub> as follows:**

$$Y_{cn} = \frac{10}{V_m} \sqrt{\frac{0.0319 T_m}{P_{bar}}} = 1.0130$$

Note: If Y<sub>cn</sub> is not within the range of 0.97 to 1.03, "the volume metering system should be investigated before beginning."

CFR Title 40, Part 60, Appendix A, Method 5, Section 4.4.1

# Interpoll Laboratories

(763) 786-6020

## Method 5 Post Test Meter Calibration

United Taconite

Forbes, MN

Waste Gas 2A

Test 3

3/12/2019

|   | <u>Run 1</u> | <u>Run 2</u> | <u>Run 3</u> |
|---|--------------|--------------|--------------|
| $\Delta$ (min) =                            | 120.00       | 120.00       | 120          |
| Vm (dcf) =                                  | 80.41        | 78.99        | 79.07        |
| Tm ( $^{\circ}$ R) =                        | 517.55       | 525.925      | 529.125      |
| P <sub>b</sub> (in. Hg) =                   | 28.49        | 28.49        | 28.49        |
|   | 0.0319       | 0.0319       | 0.0319       |
| $\Delta$ H <sub>avg</sub> (in. W.C.) =      | 1.62         | 1.54         | 1.54         |
| $\Delta$ H @ (in. W.C.) =                   | 2.06         | 2.06         | 2.06         |
| M <sub>d</sub> (lb/lb-mole) =               | 28.92        | 28.91        | 28.91        |
| Dry Mol wt. <sub>(air)</sub> (lb/lb-mole) = | 29           | 29           | 29           |
| Spec. Grav. Merc. =                         | 13.6         | 13.6         | 13.6         |

$$Y_{qa} = 1.00768 \quad 1.00863 \quad 1.01046$$

$$Y_{qa \text{ (avg.)}} = 1.00892$$

$$Y = 1.0076$$

$$\% \text{ Diff.} = -0.1314$$

Note: If the average Y<sub>qa</sub> does not meet the  $\pm 5$  percent criterion, recalibrate the meter over the full range of orifice settings, as detailed in Section 5.3.1 of Method 5. Then follow the procedure in Section 5.3.3 of Method 5.

\*\* EPA Emission Measurement Center, Approved alternative method (ALT-009)



**Interpoll Laboratories**  
(763) 786-6020

**Field Calibration Data Sheet**

Job United Taconite Date 3/13/2019  
Operator Ed Juers Meter Box Number 24

**Instructions:**

Operate the control module at a flow rate equal to the Delta H@ for 10 minutes before attaching the umbilical.

**Record the following data:**

Barometric Pressure: 28.23 Meter Coefficient: 1.0006 Gas Meter Delta H: 1.85

| Time<br>(min) | Volume<br>(cf)        | Meter Temperature (°F) |        |
|---------------|-----------------------|------------------------|--------|
|               |                       | Inlet                  | Outlet |
|               | 909.20                |                        |        |
| 2.5           | 911.30                | 77                     | 78     |
| 5.0           | 913.40                | 64                     | 64     |
| 7.5           | 915.50                | 64                     | 64     |
| 10.0          | 917.60                | 64                     | 64     |
|               | V <sub>m</sub> = 8.40 | Average =              | 67.4   |

**Calculate Y<sub>cn</sub> as follows:**

$$Y_{cn} = \frac{10}{V_m} \sqrt{\frac{0.0319 T_m}{P_{bar}}} = 0.9184$$

Note: If Y<sub>cn</sub> is not within the range of 0.97 to 1.03, "the volume metering system should be investigated before beginning."

CFR Title 40, Part 60, Appendix A, Method 5, Section 4.4.1

## Interpoll Laboratories

(763) 786-6020

### Method 5 Post Test Meter Calibration

United Taconite

Forbes, MN

Line 2B Pellet Induration

Test 5

3/13/2019

|   | <u>Run 1</u> | <u>Run 2</u> | <u>Run 3</u> |
|---|--------------|--------------|--------------|
| $\Delta$ (min) =                            | 60.00        | 60.00        | 60           |
| Vm (dcf) =                                  | 38.62        | 36.86        | 35.56        |
| Tm ( $^{\circ}$ R) =                        | 538.208      | 536.938      | 535.083      |
| P <sub>b</sub> (in. Hg) =                   | 28.23        | 28.23        | 28.23        |
|   | 0.0319       | 0.0319       | 0.0319       |
| $\Delta$ H <sub>avg</sub> (in. W.C.) =      | 1.10         | 1.10         | 1.08         |
| $\Delta$ H @ (in. W.C.) =                   | 1.85         | 1.85         | 1.85         |
| M <sub>d</sub> (lb/lb-mole) =               | 28.92        | 28.92        | 28.92        |
| Dry Mol wt. <sub>(air)</sub> (lb/lb-mole) = | 29           | 29           | 29           |
| Spec. Grav. Merc. =                         | 13.6         | 13.6         | 13.6         |

$$Y_{qa} = 0.93335 \quad 0.97589 \quad 1.00135$$

$$Y_{qa \text{ (avg.)}} = 0.9702$$

$$Y = 1.0006$$

$$\% \text{ Diff.} = 3.03827$$

Note: If the average Y<sub>qa</sub> does not meet the  $\pm 5$  percent criterion, recalibrate the meter over the full range of orifice settings, as detailed in Section 5.3.1 of Method 5. Then follow the procedure in Section 5.3.3 of Method 5.

\*\* EPA Emission Measurement Center, Approved alternative method (ALT-009)

**Interpoll Laboratories**  
(763) 786-6020

**Field Calibration Data Sheet**

Job \_\_\_\_\_ Date 3/13/2019  
Operator United Taconite Meter Box Number 12  
Ryan Lenski/

**Instructions:**

Operate the control module at a flow rate equal to the Delta H@ for 10 minutes before attaching the umbilical.

**Record the following data:**

Barometric Pressure: 28.23 Meter Coefficient: 1.0076 Gas Meter Delta H: 2.06

| Time<br>(min) | Volume<br>(cf)        | Meter Temperature (°F) |        |
|---------------|-----------------------|------------------------|--------|
|               |                       | Inlet                  | Outlet |
|               | 675.60                |                        |        |
| 2.5           | 677.51                | 63                     | 61     |
| 5.0           | 679.42                | 63                     | 61     |
| 7.5           | 681.32                | 63                     | 61     |
| 10.0          | 683.23                | 63                     | 61     |
|               | V <sub>m</sub> = 7.63 | Average = 62.0         |        |

**Calculate Y<sub>cn</sub> as follows:**

$$Y_{cn} = \frac{10}{V_m} \sqrt{\frac{0.0319 T_m}{P_{bar}}} = 0.9990$$

Note: If Y<sub>cn</sub> is not within the range of 0.97 to 1.03, "the volume metering system should be investigated before beginning."

CFR Title 40, Part 60, Appendix A, Method 5, Section 4.4.1

**Interpoll Laboratories**  
(763) 786-6020

**Method 5 Post Test Meter Calibration**

**United Taconite  
Forbes, MN  
Waste Gas 2A  
Test 8  
3/13/2019**

|   | <u>Run 1</u> | <u>Run 2</u> | <u>Run 3</u> |
|---|--------------|--------------|--------------|
| $\Delta$ (min) =                            | 60.00        | 60.00        | 60           |
| Vm (dcf) =                                  | 39.08        | 40.29        | 37.96        |
| Tm ( $^{\circ}$ R) =                        | 520.675      | 528.4        | 528.075      |
| P <sub>b</sub> (in. Hg) =                   | 28.23        | 28.23        | 28.23        |
|   | 0.0319       | 0.0319       | 0.0319       |
| $\Delta$ H <sub>avg</sub> (in. W.C.) =      | 1.53         | 1.49         | 1.50         |
| $\Delta$ H @ (in. W.C.) =                   | 2.06         | 2.06         | 2.06         |
| M <sub>d</sub> (lb/lb-mole) =               | 28.96        | 28.92        | 28.94        |
| Dry Mol wt. <sub>(air)</sub> (lb/lb-mole) = | 29           | 29           | 29           |
| Spec. Grav. Merc. =                         | 13.6         | 13.6         | 13.6         |

$$Y_{qa} = 1.01243 \quad 0.977 \quad 1.04082$$

$$Y_{qa \text{ (avg.)}} = 1.01009$$

$$Y = 1.0076$$

$$\% \text{ Diff.} = -0.2466$$

Note: If the average Y<sub>qa</sub> does not meet the  $\pm 5$  percent criterion, recalibrate the meter over the full range of orifice settings, as detailed in Section 5.3.1 of Method 5. Then follow the procedure in Section 5.3.3 of Method 5.

\*\* EPA Emission Measurement Center, Approved alternative method (ALT-009)

## **APPENDIX B**

### **TEST PORT LOCATION**

**Interpoll Laboratories****(763) 786-6020****Test Protocol**

Job United Taconite  
Source Line 1 Pellet Induration (STRU53)

Equivalent Diameter ( $D_{eq}$ ) for a Rectangular Stack =

$$D_{eq} = \frac{L \times W \times 2}{(L + W)} =$$

$$A = \frac{\text{Distance from test port to downstream flow disturbance}}{D_s \text{ or } D_{eq}}$$

$$B = \frac{\text{Distance from test port to upstream flow disturbance}}{D_s \text{ or } D_{eq}}$$

|                          |               |                        |
|--------------------------|---------------|------------------------|
| Round Stack Diameter     | <u>121.40</u> | Inches inside diameter |
| Rectangular Stack Length | <u>0.00</u>   | Width <u>0.00</u>      |
| Port Length              | <u>6.00</u>   | inches                 |

|             |        |     |             |
|-------------|--------|-----|-------------|
| <u>246</u>  | inches | A = | <u>2.03</u> |
| <u>1000</u> | inches | B = | <u>8.24</u> |

**Run parameters using A and B dimensions:**

|                                 |    | Run 2 | Run 3 | Run 4 |
|---------------------------------|----|-------|-------|-------|
| Using A dimension               | 12 | 12    | 12    | 12    |
| Using B dimension               | 12 | 12    | 12    | 12    |
| Total number of traverse points | 12 | 12    | 12    | 12    |
| Number of test ports            | 4  | 4     | 4     | 4     |
| Number of points per port       | 3  | 3     | 3     | 3     |
| Time per point (minutes)        | 5  | 5     | 5     | 5     |

**Interpoll Laboratories  
(763) 786-6020**

**Test Protocol**

|        |                                  |
|--------|----------------------------------|
| Job    | <u>United Taconite</u>           |
| Source | <u>Line 2B Pellet Induration</u> |

Equivalent Diameter ( $D_{eq}$ ) for a Rectangular Stack =

$$D_{eq} = \frac{L \times W \times 2}{(L + W)} =$$

$$A = \frac{\text{Distance from test port to downstream flow disturbance}}{D_s \text{ or } D_{eq}}$$

$$B = \frac{\text{Distance from test port to upstream flow disturbance}}{D_s \text{ or } D_{eq}}$$

|                          |               |                        |
|--------------------------|---------------|------------------------|
| Round Stack Diameter     | <u>146.25</u> | Inches inside diameter |
| Rectangular Stack Length | <u>-</u>      | Width <u>-</u>         |
| Port Length              | <u>6.50</u>   | inches                 |

|            |        |     |             |
|------------|--------|-----|-------------|
| <u>312</u> | inches | A = | <u>2.13</u> |
| <u>960</u> | inches | B = | <u>6.56</u> |

**Run parameters using A and B dimensions:**

|                                 |     | Run 2 | Run 3 | Run 4 |
|---------------------------------|-----|-------|-------|-------|
| Using A dimension               | 12  | 12    | 12    | 12    |
| Using B dimension               | 16  | 16    | 16    | 16    |
| Total number of traverse points | 24  | 24    | 24    | 24    |
| Number of test ports            | 4   | 4     | 4     | 4     |
| Number of points per port       | 6   | 6     | 6     | 6     |
| Time per point (minutes)        | 2.5 | 2.5   | 2.5   | 2.5   |

**Interpoll Laboratories**  
**(763) 786-6020**

**Test Protocol**

|        |                 |
|--------|-----------------|
| Job    | United Taconite |
| Source | Waste Gas 2A    |

Equivalent Diameter ( $D_{eq}$ ) for a Rectangular Stack =

$$D_{eq} = \frac{L \times W \times 2}{(L + W)} =$$

$$A = \frac{\text{Distance from test port to downstream flow disturbance}}{D_s \text{ or } D_{eq}}$$

$$B = \frac{\text{Distance from test port to upstream flow disturbance}}{D_s \text{ or } D_{eq}}$$

|                          |        |                        |   |
|--------------------------|--------|------------------------|---|
| Round Stack Diameter     | 147.00 | Inches inside diameter |   |
| Rectangular Stack Length | -      | Width                  | - |
| Port Length              | 6.50   | inches                 |   |

|     |        |     |      |  |
|-----|--------|-----|------|--|
| 312 | inches | A = | 2.12 |  |
| 916 | inches | B = | 6.23 |  |

**Run parameters using A and B dimensions:**

|                                     |        | Run 2  | Run 3  | Run 4  |
|-------------------------------------|--------|--------|--------|--------|
| Using A dimension                   | 12     | 12     | 12     | 12     |
| Using B dimension                   | 16     | 16     | 16     | 16     |
| <br>Total number of traverse points | <br>20 | <br>20 | <br>20 | <br>20 |
| Number of test ports                | 4      | 4      | 4      | 4      |
| Number of points per port           | 5      | 5      | 5      | 5      |
| Time per point (minutes)            | 6      | 6      | 6      | 6      |



**APPENDIX C**

**FIELD DATA SHEETS**

|                     |                                   |               |      |                |   |
|---------------------|-----------------------------------|---------------|------|----------------|---|
| Job                 | United Taconite                   |               |      |                | <div>Cross-section View</div> <div>Elevation View</div> |
| Source              | Line 1 Pellet Induration (STRU53) |               |      |                |   |
| Test                | 1                                 | Run           | 1    | Date 2/13/2019 |   |
| Duct Diameter (in.) | 121.40                            |               |      |                |   |
| Dry Bulb (°F)       | 133                               | Wet Bulb (°F) |      |                |   |
| Moisture Content    | 14.01%                            |               |      |                |   |
| Manometer           | Inclined                          |               |      |                |   |
| Barometric Pressure | 28.47                             |               |      |                |   |
| Static Pressure +/- | -1.20                             |               |      |                |   |
| Operators           | Chris Warneke / Colin Kelly       |               |      |                |   |
| Pitot No.           | 09-04-A2                          | Pitot Coeff.  | 0.84 |                |   |

1

Interpoll Laboratories  
(763) 786-6020  
Interpoll Laboratories Condensate Sample Log Sheet

|             |                                   |                           |          |     |   |
|-------------|-----------------------------------|---------------------------|----------|-----|---|
| Job         | United Taconite                   | Test                      | 1        | Run | 1 |
| Source      | Line 1 Pellet Induration (STRU53) | Number of Traverse Points | 12       |     |   |
| Date        | 2/13/2019                         | Filter Holder Type        | Glass    |     |   |
| Method Used | Method 29                         | Filter Type               | Pallflex |     |   |

**Sample Train Leak Check:**

Pre-test: 0.02 cfm @ 15 in. Hg (vac)  
Post test: 0.02 cfm @ 16 in. Hg (vac)

**Post test Pitot Leak Check:**

Positive 0 in W.C. @ 3.7 in. W.C.  
Negative 0 in W.C. @ 3.8 in. W.C.

**Particulate Catch Data**

No. of Filter Used:

NA

**Recovery Solvents:**

0.1 N HNO3

6N HCl

Number of Probe wash bottles:

1

Sample recovered by:

Chris Warneke

**Condensate Data:**

| Item                 | Weight (grams) |       |            |
|----------------------|----------------|-------|------------|
|                      | Final          | Tare  | Difference |
| Jar #1               | 609.5          | 478.7 | 130.8      |
| Jar #2               | 496.1          | 494   | 2.1        |
| Jar #3               | 178.8          | 175.2 | 3.6        |
| Jar #4               |                |       |            |
| Desiccant            | 1722           | 1711  | 11         |
| Total Grams of Water |                |       | 147.5      |

147.7821

| Job    | United Taconite                   | Operators            | CW / CK | Nozzle No.  | Glass | Pilot No.        |
|--------|-----------------------------------|----------------------|---------|-------------|-------|------------------|
| Source | Line 1 Pellet Induration (STRU53) | Meter Box No.        | 17      | Nozzle Dia. | 0.185 | Cp               |
| Date   | 2/13/2019                         | Gas Meter Coeff.     | 1.0039  | Bar. Press. | 28.47 | H <sub>2</sub> O |
| Test   | 1 Run                             | 1 Gas Meter Delta H@ | 1.95    |             |       |                  |
|        |                                   |                      |         |             |       | 09-04-A2         |
|        |                                   |                      |         |             |       | 0.84             |
|        |                                   |                      |         |             |       | 13.00            |

[illegible]

Interpoll Laboratories  
(763) 786-6020  
Interpoll Laboratories Condensate Sample Log Sheet

|             |                                   |                           |          |     |   |
|-------------|-----------------------------------|---------------------------|----------|-----|---|
| Job         | United Taconite                   | Test                      | 1        | Run | 2 |
| Source      | Line 1 Pellet Induration (STRU53) | Number of Traverse Points | 12       |     |   |
| Date        | 2/13/2019                         | Filter Holder Type        | Glass    |     |   |
| Method Used | Method 29                         | Filter Type               | Pallflex |     |   |

**Sample Train Leak Check:**

Pre-test: 0.02 cfm @ 15 in. Hg (vac)  
Post test: 0.02 cfm @ 15 in. Hg (vac)

**Post test Pitot Leak Check:**

Positive 0 in W.C. @ 3.6 in. W.C.  
Negative 0 in W.C. @ 3.8 in. W.C.

**Particulate Catch Data**

No. of Filter Used:

NA

**Recovery Solvents:**

0.1 N HNO3

6N HCl

Number of Probe wash bottles:

1

Sample recovered by:

Chris Warneke

**Condensate Data:**

| Item                 | Weight (grams) |       |            |
|----------------------|----------------|-------|------------|
|                      | Final          | Tare  | Difference |
| Jar #1               | 593.1          | 474.3 | 118.8      |
| Jar #2               | 179.7          | 177.6 | 2.1        |
| Jar #3               | 460.6          | 463.9 | -3.3       |
| Jar #4               |                |       |            |
| Desiccant            | 1653           | 1641  | 12         |
| Total Grams of Water |                |       | 129.6      |

129.8479

## EPA Method 29 Field Data Sheet

| Job    | United Taconite                   | Operators          | CW / CK | Nozzle No.  | Glass | Pitot No.        |
|--------|-----------------------------------|--------------------|---------|-------------|-------|------------------|
| Source | Line 1 Pellet Induration (STRU53) | Meter Box No.      | 17      | Nozzle Dia. | 0.185 | Cp               |
| Date   | 2/13/2019                         | Gas Meter Coeff.   | 1.0039  | Bar. Press. | 28.47 | H <sub>2</sub> O |
| Test   | 1 Run 2                           | Gas Meter Delta H@ | 1.95    |             |       |                  |

[illegible]

Interpoll Laboratories  
(763) 786-6020  
Interpoll Laboratories Condensate Sample Log Sheet

|             |                                   |                           |          |     |   |
|-------------|-----------------------------------|---------------------------|----------|-----|---|
| Job         | United Taconite                   | Test                      | 1        | Run | 3 |
| Source      | Line 1 Pellet Induration (STRU53) | Number of Traverse Points | 12       |     |   |
| Date        | 2/13/2019                         | Filter Holder Type        | Glass    |     |   |
| Method Used | Method 29                         | Filter Type               | Pallflex |     |   |

**Sample Train Leak Check:**

Pre-test: 0.02 cfm @ 15 in. Hg (vac)  
Post test: 0.02 cfm @ 14 in. Hg (vac)

**Post test Pitot Leak Check:**

Positive 0 in W.C. @ 3.9 in. W.C.  
Negative 0 in W.C. @ 4 in. W.C.

**Particulate Catch Data**

No. of Filter Used:

NA

**Recovery Solvents:**

0.1 N HNO3

6N HCl

Number of Probe wash bottles:

1

Sample recovered by:

Chris Warneke

**Condensate Data:**

| Item                 | Weight (grams) |       |            |
|----------------------|----------------|-------|------------|
|                      | Final          | Tare  | Difference |
| Jar #1               | 609.3          | 485.4 | 123.9      |
| Jar #2               | 180.9          | 176.8 | 4.1        |
| Jar #3               | 476.4          | 474.6 | 1.8        |
| Jar #4               |                |       |            |
| Desiccant            | 1729           | 1722  | 7          |
| Total Grams of Water |                |       | 136.8      |

137.0616

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## EPA Method 29 Field Data Sheet

| Job    | United Taconite                   | Operators          | CW / CK | Nozzle No.  | Glass | Pilot No.        |
|--------|-----------------------------------|--------------------|---------|-------------|-------|------------------|
| Source | Line 1 Pellet Induration (STRU53) | Meter Box No.      | 17      | Nozzle Dia. | 0.185 | Cp               |
| Date   | 2/13/2019                         | Gas Meter Coeff.   | 1.0039  | Bar. Press. | 28.47 | H <sub>2</sub> O |
| Test   | 1 Run 3                           | Gas Meter Delta H@ | 1.95    |             |       |                  |
|        |                                   |                    |         |             |       | 09-04-A2         |
|        |                                   |                    |         |             |       | 0.84             |
|        |                                   |                    |         |             |       | 12.85            |

[illegible]



**Interpoll Laboratories**  
**(763) 786-6020**  
**EPA Method 2 Field Data Sheet**

|                     |                            |               |   |      |           |  |
|---------------------|----------------------------|---------------|---|------|-----------|--|
| Job                 | United Taconite            |               |   |      |           |  |
| Source              | Line 2B Pellet Induration  |               |   |      |           |  |
| Test                | 1                          | Run           | 1 | Date | 3/12/2019 |  |
| Duct Diameter (in.) | 146.25                     |               |   |      |           |  |
| Dry Bulb (°F)       | 120                        | Wet Bulb (°F) |   | 120  |           |  |
| Moisture Content    | 12.12%                     |               |   |      |           |  |
| Manometer           | Inclined                   |               |   |      |           |  |
| Barometric Pressure | 28.49                      |               |   |      |           |  |
| Static Pressure +/- | -0.75                      |               |   |      |           |  |
| Operators           | E. Juers/C. Kelly/T. Smith |               |   |      |           |  |
| Pitot No.           | 04-05-A1                   | Pitot Coeff.  |   | 0.84 |           |  |

Cross-section  
View

Elevation  
View

| Traverse Point Number | Fraction of Diameter | Distance From Stack Wall (in.) | Distance From End of Port (in.) | Velocity    | Temperature of Gas (°F) |
|-----------------------|----------------------|--------------------------------|---------------------------------|-------------|-------------------------|
|                       |                      | Port Length (in.):             | 6.50                            | Start Time: | 8:55 AM                 |
| A-1                   | 0.021                | 3.07                           | 9.57                            | 1.200       | 120                     |
| A-2                   | 0.067                | 9.80                           | 16.30                           | 1.200       | 120                     |
| A-3                   | 0.118                | 17.26                          | 23.76                           | 1.100       | 120                     |
| A-4                   | 0.177                | 25.89                          | 32.39                           | 1.050       | 120                     |
| A-5                   | 0.250                | 36.56                          | 43.06                           | 0.980       | 120                     |
| A-6                   | 0.356                | 52.07                          | 58.57                           | 0.850       | 120                     |
| B-1                   |                      |                                |                                 |             |                         |
| B-2                   |                      |                                |                                 |             |                         |
| B-3                   |                      |                                |                                 |             |                         |
| B-4                   |                      |                                |                                 |             |                         |
| B-5                   |                      |                                |                                 |             |                         |
| B-6                   |                      |                                |                                 |             |                         |
| C-1                   |                      |                                |                                 |             |                         |
| C-2                   |                      |                                |                                 |             |                         |
| C-3                   |                      |                                |                                 |             |                         |
| C-4                   |                      |                                |                                 |             |                         |
| C-5                   |                      |                                |                                 |             |                         |
| C-6                   |                      |                                |                                 |             |                         |
| D-1                   |                      |                                |                                 |             |                         |
| D-2                   |                      |                                |                                 |             |                         |
| D-3                   |                      |                                |                                 |             |                         |
| D-4                   |                      |                                |                                 |             |                         |
| D-5                   |                      |                                |                                 |             |                         |
| D-6                   |                      |                                |                                 |             |                         |
|                       |                      |                                |                                 |             |                         |
| Digital Numbers Used: |                      |                                | 173                             | End Time:   | 9:05 AM                 |

Interpoll Laboratories  
(763) 786-6020  
Interpoll Laboratories Condensate Sample Log Sheet

|             |                           |                           |          |     |   |
|-------------|---------------------------|---------------------------|----------|-----|---|
| Job         | United Taconite           | Test                      | 1        | Run | 1 |
| Source      | Line 2B Pellet Induration | Number of Traverse Points | 24       |     |   |
| Date        | 3/12/2019                 | Filter Holder Type        | Glass    |     |   |
| Method Used | Method 29                 | Filter Type               | Pallflex |     |   |

**Sample Train Leak Check:**

Pre-test: 0.02 cfm @ 15 in. Hg (vac)  
Post test: 0.02 cfm @ 7 in. Hg (vac)

**Post test Pitot Leak Check:**

Positive 0 in W.C. @ 2.5 in. W.C.  
Negative 0 in W.C. @ 2.4 in. W.C.

**Particulate Catch Data**

631

**Recovery Solvents:**

Acetone/0.1 N HNO3

8N HCl

Number of Probe wash bottles: 1  
Sample recovered by: Ed Juers

**Condensate Data:**

| Item                 | Weight (grams) |        |            |
|----------------------|----------------|--------|------------|
|                      | Final          | Tare   | Difference |
| Jar #1               | 684.3          | 480.1  | 204.2      |
| Jar #2               | 0              | 0      | 0          |
| Jar #3               | 475.6          | 471.8  | 3.8        |
| Jar #4               |                |        |            |
| Desiccant            | 1584.6         | 1553.5 | 31.1       |
| Total Grams of Water |                |        | 239.1      |

239.5573

Interpoll Laboratories, Inc.  
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EPA Method 29 Field Data Sheet

|            |                           |                 |                    |          |             |       |                  |          |
|------------|---------------------------|-----------------|--------------------|----------|-------------|-------|------------------|----------|
| Job Source | Line 2B Pellet Induration | United Taconite | Operators          | EJ/CK/TS | Nozzle No.  | Glass | Pitot No.        | 04-05-A1 |
| Date       | 3/12/2019                 |                 | Meter Box No.      | 24       | Nozzle Dia. | 0.195 | Cp               | 0.84     |
| Test       | 1                         | Run             | Gas Meter Coeff.   | 1.0006   | Bar. Press. | 28.49 | H <sub>2</sub> O | 12.00    |
|            |                           |                 | Gas Meter Delta H@ | 1.85     |             |       |                  |          |

| Traverse Point Number | Sampling Time Minutes | Sample Volume (cf) | Velocity Head (in. WC) | Orifice Meter (in. WC) | Desired Volume (cf) | Vacuum (in. Hg) | Temperatures (°F) |       |      |      |           |         | Oxygen (% v/v) | Estimated Moisture at Respective Point |
|-----------------------|-----------------------|--------------------|------------------------|------------------------|---------------------|-----------------|-------------------|-------|------|------|-----------|---------|----------------|--|
|                       |                       |                    |                        |                        |                     |                 | Stack             | Probe | Oven | Imp. | Gas/In    | Gas/Out |                |  |
|                       | 9:10                  | 671.15             |                        |                        |                     |                 |                   |       |      |      |           |         |                | Point                                  |
| A-1                   | 5.0                   | 674.55             | 1.150                  | 1.35                   | 674.44              | 4               | 120               | 250   | 244  | 41   | 76        | 76      | 18.0           | 12.00                                  |
| A-2                   | 10.0                  | 677.90             | 1.200                  | 1.42                   | 677.82              | 4               | 124               | 250   | 244  | 41   | 71        | 73      | 18             | 12.00                                  |
| A-3                   | 15.0                  | 681.40             | 1.200                  | 1.41                   | 681.18              | 4               | 123               | 250   | 244  | 41   | 76        | 77      | 18             | 12.00                                  |
| A-4                   | 20.0                  | 684.40             | 1.200                  | 1.42                   | 684.57              | 4               | 123               | 252   | 245  | 43   | 79        | 77      | 18             | 12.00                                  |
| A-5                   | 25.0                  | 687.80             | 1.100                  | 1.31                   | 687.82              | 4               | 124               | 252   | 245  | 43   | 77        | 77      | 18             | 12.00                                  |
| A-6                   | 30.0                  | 690.89             | 1.050                  | 1.25                   | 690.99              | 4               | 123               | 253   | 245  | 45   | 75        | 76      | 18             | 12.00                                  |
| B-1                   | 35.0                  | 694.01             | 1.100                  | 1.30                   | 694.23              | 4               | 123               | 253   | 245  | 45   | 77        | 76      | 18             | 12.00                                  |
| B-2                   | 40.0                  | 697.25             | 1.100                  | 1.30                   | 697.47              | 4               | 124               | 253   | 245  | 45   | 78        | 76      | 18             | 12.00                                  |
| B-3                   | 45.0                  | 700.60             | 1.100                  | 1.31                   | 700.72              | 4               | 123               | 253   | 245  | 45   | 77        | 76      | 18             | 12.00                                  |
| B-4                   | 50.0                  | 703.79             | 1.100                  | 1.30                   | 703.96              | 4               | 124               | 252   | 240  | 46   | 79        | 80      | 18             | 12.00                                  |
| B-5                   | 55.0                  | 707.05             | 1.050                  | 1.25                   | 707.15              | 4               | 124               | 253   | 241  | 47   | 78        | 77      | 18             | 12.00                                  |
| B-6                   | 60.0                  | 710.31             | 1.000                  | 1.19                   | 710.25              | 4               | 123               | 253   | 241  | 46   | 78        | 80      | 18             | 12.00                                  |
| C-1                   | 65.0                  | 713.50             | 1.050                  | 1.25                   | 713.44              | 4               | 123               | 253   | 245  | 45   | 79        | 80      | 18             | 12.00                                  |
| C-2                   | 70.0                  | 716.78             | 1.050                  | 1.25                   | 716.62              | 4               | 125               | 252   | 242  | 45   | 79        | 82      | 18             | 12.00                                  |
| C-3                   | 75.0                  | 719.85             | 1.000                  | 1.19                   | 719.74              | 4               | 124               | 245   | 240  | 46   | 77        | 77      | 18             | 12.00                                  |
| C-4                   | 80.0                  | 722.90             | 1.000                  | 1.19                   | 722.83              | 4               | 123               | 249   | 246  | 45   | 78        | 79      | 18             | 12.00                                  |
| C-5                   | 85.0                  | 726.08             | 0.950                  | 1.13                   | 725.86              | 4               | 123               | 249   | 246  | 45   | 79        | 79      | 18             | 12.00                                  |
| C-6                   | 90.0                  | 728.85             | 0.850                  | 1.01                   | 728.73              | 4               | 122               | 249   | 246  | 45   | 81        | 82      | 18             | 12.00                                  |
| D-1                   | 95.0                  | 731.90             | 1.050                  | 1.26                   | 731.94              | 4               | 122               | 251   | 249  | 46   | 81        | 82      | 18             | 12.00                                  |
| D-2                   | 100.0                 | 735.03             | 1.050                  | 1.25                   | 735.13              | 4               | 125               | 251   | 249  | 46   | 80        | 81      | 18             | 12.00                                  |
| D-3                   | 105.0                 | 738.12             | 1.050                  | 1.25                   | 738.32              | 4               | 124               | 251   | 249  | 46   | 81        | 81      | 18             | 12.00                                  |
| D-4                   | 110.0                 | 741.50             | 1.100                  | 1.31                   | 741.59              | 4               | 124               | 247   | 245  | 45   | 81        | 81      | 18             | 12.00                                  |
| D-5                   | 115.0                 | 744.50             | 1.050                  | 1.25                   | 744.79              | 5               | 124               | 245   | 248  | 44   | 81        | 81      | 18             | 12.00                                  |
| D-6                   | 120.0                 | 747.75             | 1.050                  | 1.26                   | 747.99              | 5               | 122               | 248   | 246  | 46   | 81        | 82      | 18             | 12.00                                  |
|                       |                       |                    |                        |                        |                     |                 |                   |       |      |      |           |         |                |  |
|                       | 11:45                 | V <sub>m</sub> =   |                        | Avg. Δ H               |                     |                 |                   |       |      |      |           |         |                |  |
| Run Time (min)        | 120.0                 | 76.60              |                        | 1.27                   |                     |                 |                   |       |      |      | Avg. Temp | 78.5    |                |  |

Testing paused from 1027-1055 due to process issues

17.5

Interpoll Laboratories  
(763) 786-6020  
Interpoll Laboratories Condensate Sample Log Sheet

|             |                           |                           |          |     |   |
|-------------|---------------------------|---------------------------|----------|-----|---|
| Job         | United Taconite           | Test                      | 1        | Run | 2 |
| Source      | Line 2B Pellet Induration | Number of Traverse Points | 24       |     |   |
| Date        | 3/12/2019                 | Filter Holder Type        | Glass    |     |   |
| Method Used | Method 29                 | Filter Type               | Pallflex |     |   |

**Sample Train Leak Check:**

Pre-test: 0.02 cfm @ 15 in. Hg (vac)  
Post test: 0.02 cfm @ 12 in. Hg (vac)

**Post test Pitot Leak Check:**

Positive 0 in W.C. @ 3 in. W.C.  
Negative 0 in W.C. @ 3.5 in. W.C.

**Particulate Catch Data**

No. of Filter Used:

530

**Recovery Solvents:**

Acetone/0.1 N HNO3

8N HCl

Number of Probe wash bottles:

1

Sample recovered by:

Ed Juers

**Condensate Data:**

| Item                 | Weight (grams) |        |            |
|----------------------|----------------|--------|------------|
|                      | Final          | Tare   | Difference |
| Jar #1               | 696.6          | 498.2  | 198.4      |
| Jar #2               | 480.5          | 480.3  | 0.2        |
| Jar #3               | 0              | 0      | 0          |
| Jar #4               |                |        |            |
| Desiccant            | 1693.7         | 1677.8 | 15.9       |
| Total Grams of Water |                |        | 214.5      |

214.9102

Interpoll Laboratories, Inc.  
(763) 786-6020  
**EPA Method 29 Field Data Sheet**

|                               |                           |  |                    |  |           |  |             |  |       |  |                  |  |          |  |
|-------------------------------|---------------------------|--|--------------------|--|-----------|--|-------------|--|-------|--|------------------|--|----------|--|
| Job<br>Source<br>Date<br>Test | United Taconite           |  | Operators          |  | EJ/CK/TJS |  | Nozzle No.  |  | Glass |  | Pitot No.        |  | 04-05-A1 |  |
|                               | Line 2B Pellet Induration |  | Meter Box No.      |  | 24        |  | Nozzle Dia. |  | 0.195 |  | Cp               |  | 0.84     |  |
|                               | 3/12/2019                 |  | Gas Meter Coeff.   |  | 1.0006    |  | Bar. Press. |  | 28.49 |  | H <sub>2</sub> O |  | 13.21    |  |
|                               | 1      Run      2         |  | Gas Meter Delta H@ |  | 1.85      |  |             |  |       |  |                  |  |          |  |

| Traverse Point Number | Sampling Time Minutes | Sample Volume (cf) | Velocity Head (in. WC) | Orifice Meter (in. WC) | Desired Volume (cf) | Vacuum (in. Hg) | Temperatures (°F) |       |      |           | Oxygen |         | Estimated Moisture at Respective Point |         |
|-----------------------|-----------------------|--------------------|------------------------|------------------------|---------------------|-----------------|-------------------|-------|------|-----------|--------|---------|--|---------|
|                       |                       |                    |                        |                        |                     |                 | Stack             | Probe | Oven | Imp.      | Gas/In | Gas/Out |  | (% v/v) |
| A-1                   | 12.42                 | 748.10             |                        |                        |                     |                 |                   |       |      |           |        |         |  |         |
| A-1                   | 5.0                   | 751.30             | 1.100                  | 1.28                   | 751.32              | 4               | 124               | 238   | 244  | 41        | 75     | 75      | 18.0                                   | 13.21   |
| A-2                   | 10.0                  | 754.50             | 1.100                  | 1.27                   | 754.52              | 4               | 123               | 238   | 244  | 41        | 75     | 75      | 18                                     | 13.21   |
| A-3                   | 15.0                  | 757.71             | 1.100                  | 1.27                   | 757.71              | 4               | 124               | 238   | 244  | 41        | 78     | 78      | 18                                     | 13.21   |
| A-4                   | 20.0                  | 760.90             | 1.100                  | 1.28                   | 760.93              | 4               | 124               | 238   | 244  | 41        | 79     | 80      | 18                                     | 13.21   |
| A-5                   | 25.0                  | 764.12             | 1.150                  | 1.34                   | 764.22              | 4               | 124               | 238   | 244  | 41        | 79     | 80      | 18                                     | 13.21   |
| A-6                   | 30.0                  | 767.40             | 1.150                  | 1.34                   | 767.52              | 4               | 124               | 238   | 244  | 41        | 79     | 80      | 18                                     | 13.21   |
| B-1                   | 35.0                  | 770.78             | 1.100                  | 1.28                   | 770.75              | 4               | 123               | 238   | 244  | 41        | 79     | 80      | 18                                     | 13.21   |
| B-2                   | 40.0                  | 774.00             | 1.050                  | 1.22                   | 773.89              | 4               | 125               | 238   | 244  | 41        | 79     | 80      | 18                                     | 13.21   |
| B-3                   | 45.0                  | 777.20             | 1.050                  | 1.22                   | 777.05              | 4               | 123               | 238   | 244  | 41        | 79     | 80      | 18                                     | 13.21   |
| B-4                   | 50.0                  | 780.25             | 1.000                  | 1.16                   | 780.12              | 4               | 124               | 238   | 244  | 41        | 79     | 80      | 18                                     | 13.21   |
| B-5                   | 55.0                  | 783.45             | 1.000                  | 1.16                   | 783.20              | 4               | 124               | 238   | 244  | 41        | 79     | 80      | 18                                     | 13.21   |
| B-6                   | 60.0                  | 786.50             | 1.050                  | 1.22                   | 786.35              | 4               | 123               | 238   | 244  | 41        | 79     | 80      | 18                                     | 13.21   |
| C-1                   | 65.0                  | 789.65             | 1.100                  | 1.28                   | 789.58              | 4               | 123               | 238   | 244  | 41        | 79     | 80      | 18                                     | 13.21   |
| C-2                   | 70.0                  | 792.58             | 1.150                  | 1.34                   | 792.87              | 4               | 124               | 238   | 244  | 41        | 79     | 80      | 18                                     | 13.21   |
| C-3                   | 75.0                  | 795.90             | 1.100                  | 1.28                   | 796.10              | 4               | 124               | 238   | 244  | 41        | 79     | 80      | 18                                     | 13.21   |
| C-4                   | 80.0                  | 799.27             | 1.100                  | 1.28                   | 799.32              | 4               | 123               | 238   | 244  | 41        | 79     | 80      | 18                                     | 13.21   |
| C-5                   | 85.0                  | 802.54             | 1.050                  | 1.22                   | 802.47              | 4               | 123               | 238   | 244  | 41        | 79     | 80      | 18                                     | 13.21   |
| C-6                   | 90.0                  | 806.00             | 1.050                  | 1.22                   | 805.63              | 4               | 123               | 238   | 244  | 41        | 77     | 79      | 18                                     | 13.21   |
| D-1                   | 95.0                  | 809.03             | 1.200                  | 1.39                   | 808.99              | 4               | 123               | 238   | 244  | 41        | 77     | 79      | 18                                     | 13.21   |
| D-2                   | 100.0                 | 812.30             | 1.250                  | 1.45                   | 812.41              | 4               | 124               | 238   | 244  | 41        | 77     | 79      | 18                                     | 13.21   |
| D-3                   | 105.0                 | 815.65             | 1.100                  | 1.27                   | 815.62              | 4               | 125               | 238   | 244  | 41        | 78     | 79      | 18                                     | 13.21   |
| D-4                   | 110.0                 | 818.68             | 1.100                  | 1.28                   | 818.84              | 4               | 125               | 238   | 244  | 41        | 78     | 79      | 18                                     | 13.21   |
| D-5                   | 115.0                 | 821.75             | 0.950                  | 1.11                   | 821.83              | 4               | 123               | 238   | 244  | 41        | 78     | 79      | 18                                     | 13.21   |
| D-6                   | 120.0                 | 824.78             | 0.750                  | 0.87                   | 824.49              | 4               | 125               | 238   | 244  | 41        | 78     | 79      | 18                                     | 13.21   |
|                       |                       |                    |                        |                        |                     |                 |                   |       |      |           |        |         |  |         |
| Run Time (min)        |                       | V <sub>m</sub> =   |                        | Avg. Δ H               |                     |                 |                   |       |      | Avg. Temp |        |         |  |         |
| 120.0                 |                       | 76.68              |                        | 1.25                   |                     |                 |                   |       |      | 78.7      |        |         |  | 17.5    |
|                       |                       |                    |                        |                        |                     |                 |                   |       |      |           |        |         |  | 1.077   |

Interpoll Laboratories  
(763) 786-6020  
Interpoll Laboratories Condensate Sample Log Sheet

|             |                           |                           |   |     |          |
|-------------|---------------------------|---------------------------|---|-----|----------|
| Job         | United Taconite           | Test                      | 1 | Run | 3        |
| Source      | Line 2B Pellet Induration | Number of Traverse Points |   |     | 24       |
| Date        | 3/12/2019                 | Filter Holder Type        |   |     | Glass    |
| Method Used | Method 29                 | Filter Type               |   |     | Pallflex |

**Sample Train Leak Check:**

Pre-test: 0.02 cfm @ 15 in. Hg (vac)  
 Post test: 0.02 cfm @ 10 in. Hg (vac)

**Post test Pitot Leak Check:**

Positive 0 in W.C. @ 4 in. W.C.  
 Negative 0 in W.C. @ 4 in. W.C.

**Particulate Catch Data**

No. of Filter Used:  
 532

**Recovery Solvents:**

Acetone/0.1 N HNO<sub>3</sub>  
 8N HCl

Number of Probe wash bottles: 1  
 Sample recovered by: Ed Juers

**Condensate Data:**

| Item                 | Weight (grams) |        |            |
|----------------------|----------------|--------|------------|
|                      | Final          | Tare   | Difference |
| Jar #1               | 697.8          | 489.3  | 208.5      |
| Jar #2               | 488.9          | 488.6  | 0.3        |
| Jar #3               | 0              | 0      | 0          |
| Jar #4               |                |        |            |
| Desiccant            | 1614           | 1584.6 | 29.4       |
| Total Grams of Water |                |        | 238.2      |

238.6555



**Interpoll Laboratories**  
**(763) 786-6020**  
**EPA Method 2 Field Data Sheet**

|                     |                             |               |      |           |  |
|---------------------|-----------------------------|---------------|------|-----------|--|
| Job                 | United Taconite             |               |      |           |  |
| Source              | Waste Gas 2A                |               |      |           |  |
| Test                | 3                           | Run 1         | Date | 3/12/2019 |  |
| Duct Diameter (in.) | 147.00                      |               |      |           |  |
| Dry Bulb (°F)       | 139                         | Wet Bulb (°F) |      |           |  |
| Moisture Content    | 11.81%                      |               |      |           |  |
| Manometer           | Regular                     |               |      |           |  |
| Barometric Pressure | 28.49                       |               |      |           |  |
| Static Pressure +/- | -0.50                       |               |      |           |  |
| Operators           | Ryan Lenski/ Taylor Mysliki |               |      |           |  |
| Pitot No.           | 02-05-G1                    | Pitot Coeff.  | 0.84 |           |  |

| Traverse Point Number | Fraction of Diameter | Distance From Stack Wall (in.) | Distance From End of Port (in.) | Velocity    | Temperature of Gas (°F) |
|-----------------------|----------------------|--------------------------------|---------------------------------|-------------|-------------------------|
|                       |                      | Port Length (in.):             | 6.50                            | Start Time: | 7:25 AM                 |
| A-1                   | 0.026                | 3.82                           | 10.32                           | 1.000       | 139                     |
| A-2                   | 0.082                | 12.05                          | 18.55                           | 1.100       | 139                     |
| A-3                   | 0.146                | 21.46                          | 27.96                           | 1.000       | 139                     |
| A-4                   | 0.226                | 33.22                          | 39.72                           | 1.000       | 139                     |
| A-5                   | 0.342                | 50.27                          | 56.77                           | 1.000       | 139                     |
| B-1                   |                      |                                |                                 | 1.000       | 139                     |
| B-2                   |                      |                                |                                 | 1.000       | 139                     |
| B-3                   |                      |                                |                                 | 1.000       | 139                     |
| B-4                   |                      |                                |                                 | 0.900       | 139                     |
| B-5                   |                      |                                |                                 | 0.800       | 139                     |
| C-1                   |                      |                                |                                 | 0.900       | 139                     |
| C-2                   |                      |                                |                                 | 0.950       | 139                     |
| C-3                   |                      |                                |                                 | 1.000       | 139                     |
| C-4                   |                      |                                |                                 | 1.000       | 139                     |
| C-5                   |                      |                                |                                 | 0.800       | 139                     |
| D-1                   |                      |                                |                                 | 0.700       | 139                     |
| D-2                   |                      |                                |                                 |             |                         |
| D-3                   |                      |                                |                                 |             |                         |
| D-4                   |                      |                                |                                 |             |                         |
| D-5                   |                      |                                |                                 |             |                         |
|                       |                      |                                |                                 |             |                         |
|                       |                      |                                |                                 |             |                         |
|                       |                      |                                |                                 |             |                         |
|                       |                      |                                |                                 |             |                         |
|                       |                      |                                |                                 |             |                         |
| Digital Numbers Used: |                      |                                | 197                             | End Time:   | 8:18 AM                 |



Interpoll Laboratories  
(763) 786-6020  
Interpoll Laboratories Condensate Sample Log Sheet

|             |                 |                           |         |     |   |
|-------------|-----------------|---------------------------|---------|-----|---|
| Job         | United Taconite | Test                      | 3       | Run | 1 |
| Source      | Waste Gas 2A    | Number of Traverse Points | 20      |     |   |
| Date        | 3/12/2019       | Filter Holder Type        | Glass   |     |   |
| Method Used | Method 29       | Filter Type               | Palflex |     |   |

**Sample Train Leak Check:**

Pre-test: 0.02 cfm @ 15 in. Hg (vac)  
Post test: 0.02 cfm @ 17 in. Hg (vac)

**Post test Pitot Leak Check:**

Positive 0 in W.C. @ 4.4 in. W.C.  
Negative 0 in W.C. @ 4.2 in. W.C.

**Particulate Catch Data**

No. of Filter Used:

574

**Recovery Solvents:**

0.1 N HNO<sub>3</sub>

8N HCl

Number of Probe wash bottles:

1

Sample recovered by:

Ryan Lenski

**Condensate Data:**

| Item                 | Weight (grams) |       |            |
|----------------------|----------------|-------|------------|
|                      | Final          | Tare  | Difference |
| Jar #1               | 682            | 482   | 200        |
| Jar #2               |                |       |            |
| Jar #3               |                |       |            |
| Jar #4               | 447.4          | 442.4 | 5          |
| Desiccant            | 1485.5         | 1466  | 19.5       |
| Total Grams of Water |                |       | 224.5      |

**Interpoll Laboratories, Inc.**  
**(763) 786-6020**

## EPA Method 29 Field Data Sheet

| Job    | United Taconite | Operators          | RL/TM  | Nozzle No.  | Glass | Pilot No.        | 02-05-G1 |
|--------|-----------------|--------------------|--------|-------------|-------|------------------|----------|
| Source | Waste Gas 2A    | Meter Box No.      | 12     | Nozzle Dia. | 0.210 | Cp               | 0.84     |
| Date   | 3/12/2019       | Gas Meter Coeff.   | 1.0076 | Bar. Press. | 28.49 | H <sub>2</sub> O | 13.00    |
| Test   | 3 Run           | Gas Meter Delta H@ | 2.06   |             |       |                  |          |

[illegible]

Interpoll Laboratories  
(763) 786-6020  
Interpoll Laboratories Condensate Sample Log Sheet

|             |                 |                           |         |     |   |
|-------------|-----------------|---------------------------|---------|-----|---|
| Job         | United Taconite | Test                      | 3       | Run | 2 |
| Source      | Waste Gas 2A    | Number of Traverse Points | 20      |     |   |
| Date        | 3/12/2019       | Filter Holder Type        | Glass   |     |   |
| Method Used | Method 29       | Filter Type               | Palflex |     |   |

**Sample Train Leak Check:**

Pre-test: 0.02 cfm @ 15 in. Hg (vac)  
Post test: 0.02 cfm @ 18 in. Hg (vac)

**Post test Pitot Leak Check:**

Positive 0 in W.C. @ 3.9 in. W.C.  
Negative 0 in W.C. @ 3.2 in. W.C.

**Particulate Catch Data**

No. of Filter Used:

584

**Recovery Solvents:**

0.1 N HNO<sub>3</sub>

8N HCl

Number of Probe wash bottles:

1

Sample recovered by:

Ryan Lenski

**Condensate Data:**

| Item                 | Weight (grams) |        |            |
|----------------------|----------------|--------|------------|
|                      | Final          | Tare   | Difference |
| Jar #1               | 688.2          | 473.9  | 214.3      |
| Jar #2               | 3.6            | 0      | 3.6        |
| Jar #3               |                |        |            |
| Jar #4               | 425.3          | 421    | 4.3        |
| Desiccant            | 1650.5         | 1631.2 | 19.3       |
| Total Grams of Water |                |        | 241.5      |



Interpoll Laboratories  
(763) 786-6020  
Interpoll Laboratories Condensate Sample Log Sheet

|             |                 |                           |         |     |   |
|-------------|-----------------|---------------------------|---------|-----|---|
| Job         | United Taconite | Test                      | 3       | Run | 3 |
| Source      | Waste Gas 2A    | Number of Traverse Points | 20      |     |   |
| Date        | 3/12/2019       | Filter Holder Type        | Glass   |     |   |
| Method Used | Method 29       | Filter Type               | Palflex |     |   |

**Sample Train Leak Check:**

Pre-test: 0.02 cfm @ 15 in. Hg (vac)  
Post test: 0.02 cfm @ 14 in. Hg (vac)

**Post test Pitot Leak Check:**

Positive 0 in W.C. @ 4.5 in. W.C.  
Negative 0 in W.C. @ 4.2 in. W.C.

**Particulate Catch Data**

No. of Filter Used:

564

**Recovery Solvents:**

0.1 N HNO<sub>3</sub>

8N HCl

Number of Probe wash bottles:

1

Sample recovered by:

Ryan Lenski

**Condensate Data:**

| Item                 | Weight (grams) |       |            |
|----------------------|----------------|-------|------------|
|                      | Final          | Tare  | Difference |
| Jar #1               | 664.9          | 461.8 | 203.1      |
| Jar #2               | 2.4            | 0     | 2.4        |
| Jar #3               | 457.4          | 443.3 | 14.1       |
| Jar #4               |                |       |            |
| Desiccant            | 1427           | 1410  | 17         |
| Total Grams of Water |                |       | 236.6      |



## **APPENDIX D**

### **INTERPOLL LABORATORIES ANALYTICAL DATA**

INTERPOLL LABORATORIES, INC.  
(763) 786-6020  
**EPA Method 3A Data Reporting Sheet**

|                   |             |   |
|-------------------|-------------|---|
| Job:              | UTAC        | Fuel Type:                                      |
| Source:           | 2A          | Analyzer: Servomex Model 1400 (O <sub>2</sub> ) |
| Date of Analysis: | 3/14/2019   | Analyzer: Thermo 410i (CO <sub>2</sub> )        |
| Analyst:          | Ryan Lenski | Range: 0-25% O <sub>2</sub>                     |
| Team Leader:      | Ryan Lenski | Date of Test: 3/12/2019                         |
| Test Number       | 3 4         | Range: 0-20% CO <sub>2</sub>                    |

**Calibration Values (%)**

|                            |  | Cylinder Value |                 | Pre-test Readings |                 | Post-test Readings |                 | Cylinder Number |
|----------------------------|--|----------------|-----------------|-------------------|-----------------|--------------------|-----------------|-----------------|
|                            |  | O <sub>2</sub> | CO <sub>2</sub> | O <sub>2</sub>    | CO <sub>2</sub> | O <sub>2</sub>     | CO <sub>2</sub> |                 |
| Zero Gas (N <sub>2</sub> ) |  | 0.00           | 0.00            | 0.10              | 0.06            | 0.10               | 0.10            | -               |
| Upscale (40-60%)           |  | 11.10          | 8.43            | 11.00             | 8.51            | 11.00              | 8.51            | cc461733        |
| Upscale (80-100%)          |  | 20.80          | 17.40           | 21.00             | 17.46           | 20.87              | 17.43           | cc110072        |

| Sample Test/Run |   |   | Dilution Factor | Sample Log Number | CO <sub>2</sub> (%)       |                             |                        |   |                            |
|-----------------|---|---|-----------------|-------------------|---------------------------|-----------------------------|------------------------|---|----------------------------|
|                 |   |   |                 |                   | Average gas concentration | Average of zero calibration | Actual calibration gas | Average of initial and final upscale readings | Effluent gas concentration |
| 0               | / | 1 | 1               | 37473             | 1.42                      | 0.1                         | 8.4                    | 8.5   | 1.34                       |
| 0               | / | 2 | 1               | 37473             | 1.70                      | 0.1                         | 8.4                    | 8.5   | 1.62                       |
| 0               | / | 3 | 1               | 37473             | 1.91                      | 0.1                         | 8.4                    | 8.5   | 1.83                       |
|                 |   |   |                 |                   |                           |                             |                        |   |                            |

**Fuel Type and Fo Range**

|                                |                        |                      |                            |
|--------------------------------|------------------------|----------------------|----------------------------|
| Coal:                          | Oil:                   | Gas:                 | Wood:                      |
| Anthracite/Lignite 1.016-1.130 | Distillate 1.260-1.414 | Natural 1.6000-1.836 | Wood/Wood Bark 1.000-1.130 |
| Bituminous 1.083-1.230         | Residual 1.210-1.37    | Propane 1.434-1.553  |                            |
|                                |                        | Butane 1.405-1.553   |                            |



**Interpoll Laboratories**  
(763) 786-6020

**Sample Chain of Custody**

Job Field Engineer \_\_\_\_\_ United Taconite \_\_\_\_\_ Source \_\_\_\_\_ Line 2B Pellet Induration \_\_\_\_\_ Site \_\_\_\_\_ Stack \_\_\_\_\_ Log Number \_\_\_\_\_ 37473  
 Ed Juers \_\_\_\_\_ Date of Test \_\_\_\_\_ 3/12/2019 \_\_\_\_\_ Test Number \_\_\_\_\_ 1 \_\_\_\_\_ Number of Runs \_\_\_\_\_ 2340

| Number of Items | Sample Type   | Analysis  | Sequence Number                  | Comments  |
|-----------------|---|---|----------------------------------|---|
| 9               | Probe Wash:<br><input checked="" type="checkbox"/> Acetone<br><input checked="" type="checkbox"/> MeCl <sub>2</sub>   | <input checked="" type="checkbox"/> EPA Method 5<br><input checked="" type="checkbox"/> EPA Method 29   | 01-09                            | 5-Acetone (Analyze for M5)<br>4-0.1 NHNO <sub>3</sub>   |
| 5               | Filter:<br><input type="checkbox"/> 4" Glass Fiber<br><input type="checkbox"/> SS Thimble<br><input type="checkbox"/> Quartz Fiber<br><input type="checkbox"/> 2.5" Glass Fiber   | <input checked="" type="checkbox"/> EPA Method 5<br><input checked="" type="checkbox"/> EPA Method 29   | 10-14                            | Analyze Filter for M-5  |
| 10              | Impingers:<br><input type="checkbox"/> DI Water<br><input type="checkbox"/> 3% H <sub>2</sub> O <sub>2</sub><br><input type="checkbox"/> 1N NaOH<br><input type="checkbox"/> 2,4-DNPH<br><input type="checkbox"/> H <sub>2</sub> SO <sub>4</sub><br><input checked="" type="checkbox"/> HNO <sub>3</sub> /H <sub>2</sub> O <sub>2</sub><br><input checked="" type="checkbox"/> KMnO <sub>4</sub> /H <sub>2</sub> SO <sub>4</sub><br><input type="checkbox"/> Sodium bisulfate | <input type="checkbox"/> MN Protocol<br><input type="checkbox"/> WI Protocol<br><input type="checkbox"/> EPA Method 202<br><input type="checkbox"/> EPA Method 6.8<br><input checked="" type="checkbox"/> IA Protocol<br><input type="checkbox"/> Formaldehyde<br><input type="checkbox"/> EPA Method 26<br><input checked="" type="checkbox"/> M-29 Metals | 15-19<br>20-24<br>28-32          | 5-5% HNO <sub>3</sub> /10%H <sub>2</sub> O <sub>2</sub><br>5-KMNO <sub>4</sub><br>Mercury and Lead<br>3/14/19 |
|                 | Integrated Gas:<br><input type="checkbox"/> Tedlar Bag  | <input type="checkbox"/> EPA Method 3<br><input type="checkbox"/> EPA Method 10<br><input type="checkbox"/> EPA Method 7A   |                                  |   |
|                 | Oxides of Nitrogen:<br><input type="checkbox"/>   |   |                                  |   |
|                 | Fuel Lab:<br><input type="checkbox"/> Fuel Sample<br><input type="checkbox"/> Aggregate<br><input type="checkbox"/> Particle Sizing   | <input type="checkbox"/> Per S-0163<br><input type="checkbox"/> X-Ray Sdgraph<br><input type="checkbox"/> Cascade Impactor  |                                  | UTAC with provide<br>Fuel Analysis  |
| 18              | Miscellaneous:<br><input checked="" type="checkbox"/> Impinger Rinses<br>5-0.1N HNO <sub>3</sub> (Imp 1-3)<br>5- KMnO <sub>4</sub> /H <sub>2</sub> O (Imp 5-6 rinse)<br>5- Imp 5-6 Catch<br>3- 0.1 N HNO <sub>3</sub> (Imp 4 Catch and rinse)<br>5- 8N HCL (Imp 5-6 rinse)  | <input checked="" type="checkbox"/> M-29 Metals   | 33-37<br>28-32<br>25-27<br>38-42 | Mercury/Lead<br>(Imp 1-4 rinses combined for blanks)  |

Fuel Type: Coal: ☒ Bituminous ☐ Anthracite ☐ Lignite Wood: ☐ Wood Waste ☐ Dust ☐ Bark Oil: ☐ Waste Oil ☐ No. 2 ☐ No. 6 Miscellaneous: ☒ Natural Gas ☐ RDF ☐ Diesel

Relinquished by/Affiliation: Ed Juers 3/12/19 Accepted by/Affiliation: \_\_\_\_\_ Date: 3/14/19

**INTERPOLL LABORATORIES, INC.**  
(763)786-6020

**Total Mercury by Cold Vapor Atomic Absorption Reporting Form**

Client: United Taconite

Due Date: 3/28/19

Sample Type: M29, Test 1, Fraction 1B, Line 2B Pellet Induration Stack

Analyst's Initials: GWH

Digestion Method: EPA M-29/7470

Analytical Method: EPA 7470

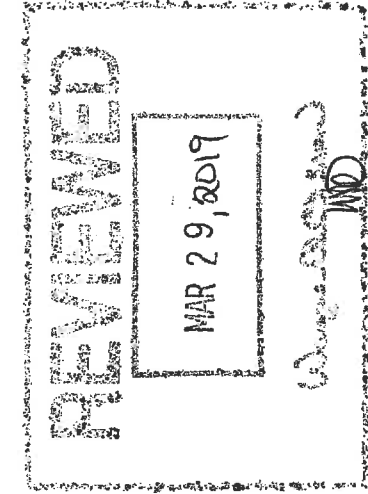
| ILI Log #:   | Run | Digestion Date | Analysis Date | Instru. Reading (ppb) | Instru. Reporting Limit (ppb) | Dilution | Volume of Sample Digested (mL) | Final Volume of Sample Digestate (mL) | Reported Results           |                         |
|--------------|-----|----------------|---------------|-----------------------|-------------------------------|----------|--------------------------------|---------------------------------------|----------------------------|-------------------------|
|              |     |                |               |                       |                               |          |                                |                                       | Total Volume of sample (L) | Analytical Results (ug) |
| -10          | 00  | 3/28/19B       | 3/28/19       | 0.10 <                | 0.10                          | 1        | 10                             | 50                                    | 0.100                      | 0.050 <                 |
| -11          | 0   | 3/28/19B       | 3/28/19       | 0.10 <                | 0.10                          | 1        | 10                             | 50                                    | 0.100                      | 0.050 <                 |
| -12          | 1   | 3/28/19B       | 3/28/19       | 0.10 <                | 0.10                          | 1        | 10                             | 50                                    | 0.100                      | 0.050 <                 |
| -13          | 2   | 3/28/19B       | 3/28/19       | 0.10 <                | 0.10                          | 1        | 10                             | 50                                    | 0.100                      | 0.050 <                 |
| -14          | 3   | 3/28/19B       | 3/28/19       | 0.10 <                | 0.10                          | 1        | 10                             | 50                                    | 0.100                      | 0.050 <                 |
| Method Blank |     | 3/28/19B       | 3/28/19       | 0.10 <                | 0.10                          | 1        | 10                             | 50                                    | 0.100                      | 0.050 <                 |

Footnotes:

In-House Comments:

**Reviewed**

MAR 28 2019



**INTERPOLL LABORATORIES, INC.**  
(763)786-6020

**Total Mercury by Cold Vapor Atomic Absorption Reporting Form**

Client: United Taconite

Sample Type: M29, Test 1, Fraction 2B, Line 2B Pellet Induration Stack  
Digestion Method: EPA M-29/7470

Due Date: 3/28/19

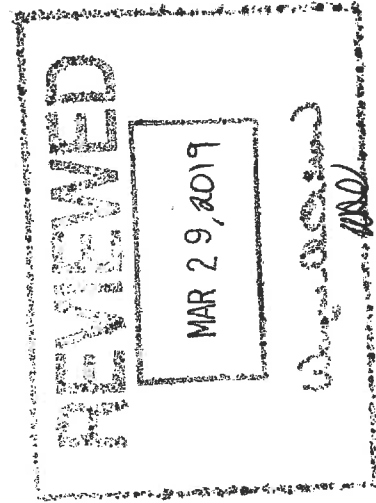
Analyst's Initials: GWH

Analytical Method: EPA 7470

| ILI Log #: | Run | Digestion Date | Analysis Date | Instru. Reading (ppb) | Instru. Reporting Limit (ppb) | Dilution | Volume of Sample Digested (mL) | Final Volume of Sample Digestate (mL) | Total Volume of sample (L) | Reported Results     |                         |
|------------|-----|----------------|---------------|-----------------------|-------------------------------|----------|--------------------------------|---------------------------------------|----------------------------|----------------------|-------------------------|
|            |     |                |               |                       |                               |          |                                |                                       |                            | Reporting Limit (ug) | Analytical Results (ug) |
| -15        | 00  | 3/28/19B       | 3/28/19       | 0.10 <                | 0.10                          | 1        | 10                             | 50                                    | 0.300                      | 0.15                 | 0.15 <                  |
| -16        | 0   | 3/28/19B       | 3/28/19       | 0.10 <                | 0.10                          | 1        | 10                             | 50                                    | 0.300                      | 0.15                 | 0.15 <                  |
| -17        | 1   | 3/28/19B       | 3/28/19       | 0.124                 | 0.10                          | 1        | 10                             | 50                                    | 0.600                      | 0.30                 | 0.37                    |
| -18        | 2   | 3/28/19B       | 3/28/19       | 0.194                 | 0.10                          | 1        | 10                             | 50                                    | 0.500                      | 0.25                 | 0.49                    |
| -19        | 3   | 3/28/19B       | 3/28/19       | 0.200                 | 0.10                          | 1        | 10                             | 50                                    | 0.500                      | 0.25                 | 0.50                    |

Footnotes:

In-House Comments:



**INTERPOLL LABORATORIES, INC.**  
(763)786-6020

**Total Mercury by Cold Vapor Atomic Absorption Reporting Form**

Client: United Taconite

Due Date: 3/28/19

Sample Type: M29, Test 1, Fraction 3A, Line 2B Pellet Induration Stack

Analyst's Initials: GWH

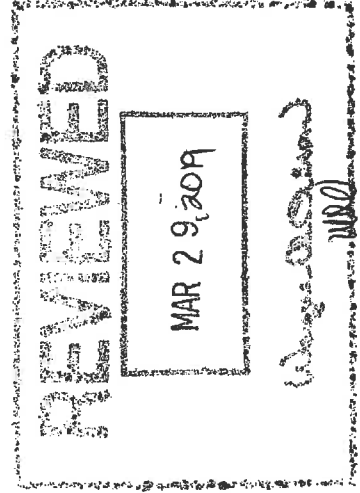
Digestion Method: EPA M-29/7470

Analytical Method: EPA 7470

| ILI Log #: | Run | Digestion Date | Analysis Date | Instru. Reading (ppb) | Instru. Reporting Limit (ppb) | Dilution | Volume of Sample Digested (mL) | Final Volume of Sample Digestate (mL) | Total Volume of sample (L) | Reported Results     |                         |
|------------|-----|----------------|---------------|-----------------------|-------------------------------|----------|--------------------------------|---------------------------------------|----------------------------|----------------------|-------------------------|
|            |     |                |               |                       |                               |          |                                |                                       |                            | Reporting Limit (ug) | Analytical Results (ug) |
| -25        | 1   | 3/28/19B       | 3/28/19       | 0.10 <                | 0.10                          | 1        | 10                             | 50                                    | 0.050                      | 0.025                | 0.025 <                 |
| -26        | 2   | 3/28/19B       | 3/28/19       | 0.10 <                | 0.10                          | 1        | 10                             | 50                                    | 0.050                      | 0.025                | 0.025 <                 |
| -27        | 3   | 3/28/19B       | 3/28/19       | 0.10 <                | 0.10                          | 1        | 10                             | 50                                    | 0.050                      | 0.025                | 0.025 <                 |

Footnotes:

In-House Comments:



**INTERPOLL LABORATORIES, INC.**  
(763)786-6020

**Total Mercury by Cold Vapor Atomic Absorption Reporting Form**

Client: United Taconite

Due Date: 3/28/19

Sample Type: M29, Test 1, Fraction 3B, Line 2B Pellet Induration Stack

Analyst's Initials: GWH

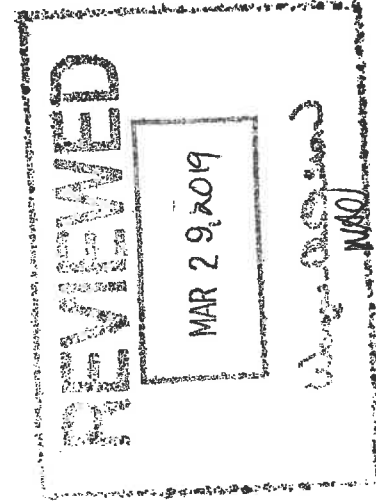
Digestion Method: EPA M-29/7470

Analytical Method: EPA 7470

| ILI Log #: | Run | Digestion Date | Analysis Date | Instru. Reading (ppb) | Instru. Reporting Limit (ppb) | Dilution | Volume of Sample Digested (mL) | Final Volume of Sample Digestate (mL) | Total Volume of sample (L) | Reported Results     |                         |
|------------|-----|----------------|---------------|-----------------------|-------------------------------|----------|--------------------------------|---------------------------------------|----------------------------|----------------------|-------------------------|
|            |     |                |               |                       |                               |          |                                |                                       |                            | Reporting Limit (ug) | Analytical Results (ug) |
| -28        | 00  | 3/28/19B       | 3/28/19       | 0.10 <                | 0.10                          | 1        | 20                             | 50                                    | 0.500                      | 0.13                 | 0.13 <                  |
| -29        | 0   | 3/28/19B       | 3/28/19       | 0.10 <                | 0.10                          | 1        | 20                             | 50                                    | 0.500                      | 0.13                 | 0.13 <                  |
| -30        | 1   | 3/28/19B       | 3/28/19       | 3.17                  | 0.10                          | 1        | 20                             | 50                                    | 0.500                      | 0.13                 | 3.96                    |
| -31        | 2   | 3/28/19B       | 3/28/19       | 2.80                  | 0.10                          | 1        | 20                             | 50                                    | 0.500                      | 0.13                 | 3.50                    |
| -32        | 3   | 3/28/19B       | 3/28/19       | 2.16                  | 0.10                          | 1        | 20                             | 50                                    | 0.500                      | 0.13                 | 2.70                    |

Footnotes:

In-House Comments:



**INTERPOLL LABORATORIES, INC.**  
(763)786-6020

**Total Mercury by Cold Vapor Atomic Absorption Reporting Form**

Client: United Taconite

Due Date: 3/28/19

Sample Type: M29, Test 1, Fraction 3C, Line 2B Pellet Induration Stack

Analyst's Initials: GWH

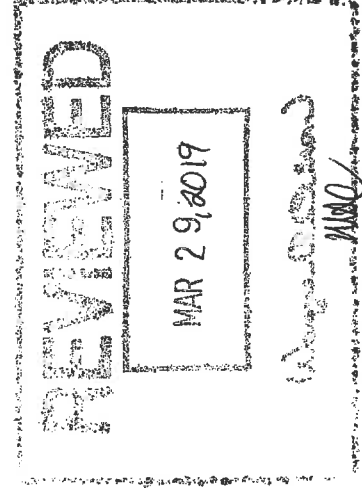
Digestion Method: EPA M-29/7470

Analytical Method: EPA 7470

| ILI Log #:<br>37473 | Run | Digestion Date | Analysis Date | Instru.<br>Reading<br>(ppb) | Instru.<br>Reporting<br>Limit<br>(ppb) | Dilution | Volume<br>of Sample<br>Digested<br>(mL) | Final<br>Volume of<br>Sample<br>Digestate<br>(mL) | Total<br>Volume of<br>sample (L) | Reported Results        |                            |
|---------------------|-----|----------------|---------------|-----------------------------|--|----------|---|---|----------------------------------|-------------------------|----------------------------|
|                     |     |                |               |                             |  |          |   |   |                                  | Reporting<br>Limit (ug) | Analytical Results<br>(ug) |
| -38                 | 00  | 3/28/19B       | 3/28/19       | 0.10 <                      | 0.10                                   | 1        | 10                                      | 50  | 0.200                            | 0.10                    | 0.10 <                     |
| -39                 | 0   | 3/28/19B       | 3/28/19       | 0.10 <                      | 0.10                                   | 1        | 10                                      | 50  | 0.200                            | 0.10                    | 0.10 <                     |
| -40                 | 1   | 3/28/19B       | 3/28/19       | 6.29                        | 0.10                                   | 1        | 10                                      | 50  | 0.200                            | 0.10                    | 6.29                       |
| -41                 | 2   | 3/28/19B       | 3/28/19       | 6.21                        | 0.10                                   | 1        | 10                                      | 50  | 0.200                            | 0.10                    | 6.21                       |
| -42                 | 3   | 3/28/19B       | 3/28/19       | 5.60                        | 0.10                                   | 1        | 10                                      | 50  | 0.200                            | 0.10                    | 5.60                       |

Footnotes:

In-House Comments:



**Interpoll Laboratories**  
(763) 786-6020

**Sample Chain of Custody**

Job: United Taconite Source: Waste Gas 2A Site: 3 Log Number: 37473  
 Field Engineer: Ryan Lenski Date of Test: 3/12/2019 Test Number: 3 Number of Runs: 3

| Number of Items | Sample Type   | Analysis  | Sequence Number                  | Comments                    |
|-----------------|---|---|----------------------------------|-----------------------------|
| 8               | Probe Wash:<br><input checked="" type="checkbox"/> Acetone<br><input type="checkbox"/> MeCl <sub>2</sub>  | <input checked="" type="checkbox"/> EPA Method 5<br><input checked="" type="checkbox"/> EPA Method 29   | 43-46                            |                             |
| 4               | Filter:<br><input type="checkbox"/> 4" Glass Fiber<br><input checked="" type="checkbox"/> SS Thimble<br><input type="checkbox"/> Pallflex<br><input type="checkbox"/> 2.5" Glass Fiber  | <input checked="" type="checkbox"/> EPA Method 5<br><input checked="" type="checkbox"/> EPA Method 29   | 47-50                            |                             |
| 11              | Impingers:<br><input type="checkbox"/> DI Water<br><input type="checkbox"/> H <sub>2</sub> SO <sub>4</sub><br><input checked="" type="checkbox"/> 3% H <sub>2</sub> O <sub>2</sub><br><input checked="" type="checkbox"/> HNO <sub>3</sub> /H <sub>2</sub> O <sub>2</sub><br><input checked="" type="checkbox"/> 1N NaOH<br><input checked="" type="checkbox"/> KMnO <sub>4</sub> /H <sub>2</sub> SO <sub>4</sub><br><input type="checkbox"/> 2,4-DNPH<br><input type="checkbox"/> Sodium bisulfate | <input type="checkbox"/> MN Protocol<br><input type="checkbox"/> WI Protocol<br><input type="checkbox"/> EPA Method 202<br><input checked="" type="checkbox"/> EPA Method 6.8<br><input checked="" type="checkbox"/> Metals | 51-54                            |                             |
| 0               | Integrated Gas:<br><input type="checkbox"/> Tedlar Bag  | <input type="checkbox"/> EPA Method 3<br><input type="checkbox"/> EPA Method 10<br><input type="checkbox"/> EPA Method 7A   | 55-58                            | See Labels                  |
|                 | Oxides of Nitrogen:<br><input type="checkbox"/>   |   | 70-73                            |                             |
|                 | Fuel Lab:<br><input type="checkbox"/> Fuel Sample<br><input type="checkbox"/> Aggregate   | <input type="checkbox"/> Per S-0163   |                                  |                             |
| 3/14/19         | Particle Sizing<br><input type="checkbox"/>   | <input type="checkbox"/> X-Ray Scdgraph<br><input type="checkbox"/> Cascade Impactor  |                                  |                             |
| 16              | Miscellaneous:<br><input checked="" type="checkbox"/> Impinger Rinses<br>0.1 N HNO <sub>3</sub><br>KMnO <sub>4</sub> /H <sub>2</sub> O<br>0.1 N HNO <sub>3</sub><br>6N HCL  | <input checked="" type="checkbox"/> Impinger Rinses   | 59-62<br>74-77<br>63-69<br>78-81 | See labels<br>Imp 4 & Rinse |

Fuel Type: Coal: ☐ Bituminous ☐ Anthracite ☐ Lignite Wood: ☐ Wood Waste ☐ Dust ☐ Bark Oil: ☐ Waste Oil ☐ No. 2 ☐ No. 6 Miscellaneous: ☐ Natural Gas ☐ RDF ☐ Diesel

|   |   |                        |
|---|---|------------------------|
| Relinquished by/Affiliation<br><u>Ryan Lenski</u> | Accepted by/Affiliation<br><u>[Signature]</u> | Date<br><u>3/14/19</u> |
| Interpoll Laboratories                            |   |                        |
| Ryan Lenski                                       |   |                        |

# INTERPOLL LABORATORIES, INC.

(763)786-6020

## Total Mercury by Cold Vapor Atomic Absorption Reporting Form

Client: United Taconite

Sample Type: M29, Test 3, Fraction 1B, Waste Gas 2A Stack

Digestion Method: EPA M-29/7470

Due Date: 3/28/19

Analyst's Initials: GWH

Analytical Method: EPA 7470

| ILI Log #: | Run | Digestion Date | Analysis Date | Instru. Reading (ppb) | Instru. Reporting Limit (ppb) | Dilution | Volume of Sample Digested (mL) | Final Volume of Sample Digestate (mL) | Total Volume of sample (L) | Reported Results     |                         |
|------------|-----|----------------|---------------|-----------------------|-------------------------------|----------|--------------------------------|---------------------------------------|----------------------------|----------------------|-------------------------|
|            |     |                |               |                       |                               |          |                                |                                       |                            | Reporting Limit (ug) | Analytical Results (ug) |
| -51        | 0   | 3/28/19B       | 3/28/19       | 0.10 <                | 0.10                          | 1        | 10                             | 50                                    | 0.100                      | 0.050                | 0.050 <                 |
| -52        | 1   | 3/28/19B       | 3/28/19       | 0.10 <                | 0.10                          | 1        | 10                             | 50                                    | 0.100                      | 0.050                | 0.050 <                 |
| -53        | 2   | 3/28/19B       | 3/28/19       | 0.10 <                | 0.10                          | 1        | 10                             | 50                                    | 0.100                      | 0.050                | 0.050 <                 |
| -54        | 3   | 3/28/19B       | 3/28/19       | 0.150                 | 0.10                          | 1        | 10                             | 50                                    | 0.100                      | 0.050                | 0.075                   |

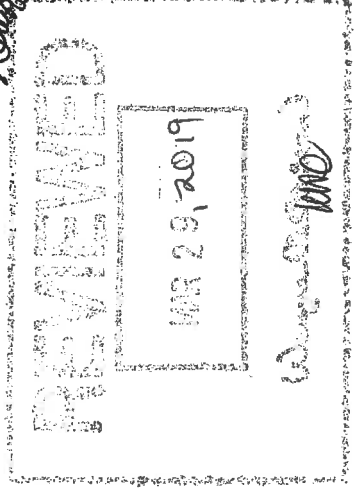
Footnotes:

In-House Comments:

Reviewed

MAR 28 2019

*Greg Adams*





# INTERPOLL LABORATORIES, INC.

(763)786-6020

## Total Mercury by Cold Vapor Atomic Absorption Reporting Form

Client: United Taconite

Sample Type: M29, Test 3, Fraction 2B, Waste Gas 2A Stack

Digestion Method: EPA M-29/7470

Due Date: 3/28/19

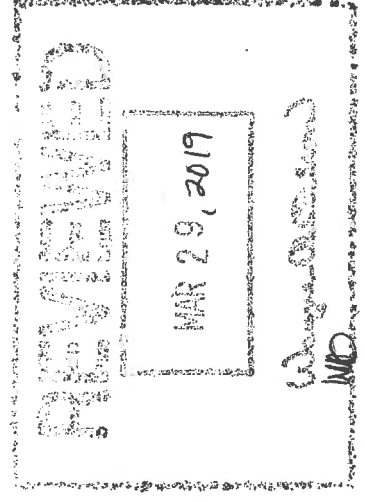
Analyst's Initials: GWH

Analytical Method: EPA 7470

| IL/I Log #: | Run | Digestion Date | Analysis Date | Instru. Reading (ppb) | Instru. Reporting Limit (ppb) | Dilution | Volume of Sample Digested (mL) | Final Volume of Sample Digestate (mL) | Total Volume of sample (L) | Reported Results     |                         |
|-------------|-----|----------------|---------------|-----------------------|-------------------------------|----------|--------------------------------|---------------------------------------|----------------------------|----------------------|-------------------------|
|             |     |                |               |                       |                               |          |                                |                                       |                            | Reporting Limit (ug) | Analytical Results (ug) |
| -55         | 0   | 3/28/19B       | 3/28/19       | 0.10 <                | 0.10                          | 1        | 10                             | 50                                    | 0.300                      | 0.15                 | 0.150 <                 |
| -56         | 1   | 3/28/19B       | 3/28/19       | 0.10 <                | 0.10                          | 1        | 10                             | 50                                    | 0.500                      | 0.25                 | 0.250 <                 |
| -57         | 2   | 3/28/19B       | 3/28/19       | 0.182                 | 0.10                          | 1        | 10                             | 50                                    | 0.500                      | 0.25                 | 0.46                    |
| -58         | 3   | 3/28/19B       | 3/28/19       | 0.119                 | 0.10                          | 1        | 10                             | 50                                    | 0.500                      | 0.25                 | 0.30                    |

Footnotes:

In-House Comments:



**INTERPOLL LABORATORIES, INC.**  
(763)786-6020

**Total Mercury by Cold Vapor Atomic Absorption Reporting Form**

Client: United Taconite

Sample Type: M29, Test 3, Fraction 3A, Waste Gas 2A Stack

Digestion Method: EPA M-29/7470

Due Date: 3/28/19

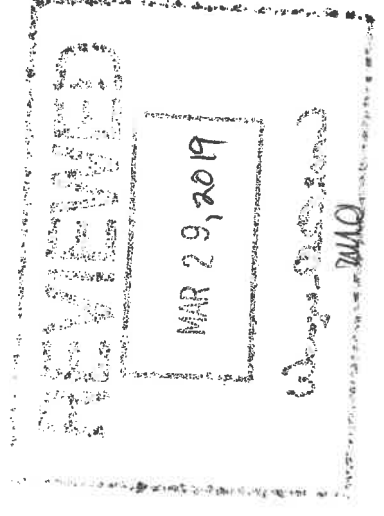
Analyst's Initials: GWH

Analytical Method: EPA 7470

| IL1 Log #: | Run | Digestion Date | Analysis Date | Instru. Reading (ppb) | Instru. Reporting Limit (ppb) | Dilution | Volume of Sample Digested (mL) | Final Volume of Sample Digestate (mL) | Reported Results           |                         |
|------------|-----|----------------|---------------|-----------------------|-------------------------------|----------|--------------------------------|---------------------------------------|----------------------------|-------------------------|
|            |     |                |               |                       |                               |          |                                |                                       | Total Volume of sample (L) | Analytical Results (ug) |
| -66        | 0   | 3/28/19B       | 3/28/19       | 0.10 <                | 0.10                          | 1        | 10                             | 50                                    | 0.150                      | 0.075 <                 |
| -67        | 1   | 3/28/19B       | 3/28/19       | 0.10 <                | 0.10                          | 1        | 10                             | 50                                    | 0.070                      | 0.035 <                 |
| -68        | 2   | 3/28/19B       | 3/28/19       | 0.10 <                | 0.10                          | 1        | 10                             | 50                                    | 0.050                      | 0.025 <                 |
| -69        | 3   | 3/28/19B       | 3/28/19       | 0.10 <                | 0.10                          | 1        | 10                             | 50                                    | 0.050                      | 0.025 <                 |

Footnotes:

In-House Comments:



# INTERPOLL LABORATORIES, INC.

(763)786-6020

## Total Mercury by Cold Vapor Atomic Absorption Reporting Form

Client: United Taconite

Sample Type: M29, Test 3, Fraction 3B, Waste Gas 2A Stack

Digestion Method: EPA M-29/7470

Due Date: 3/28/19

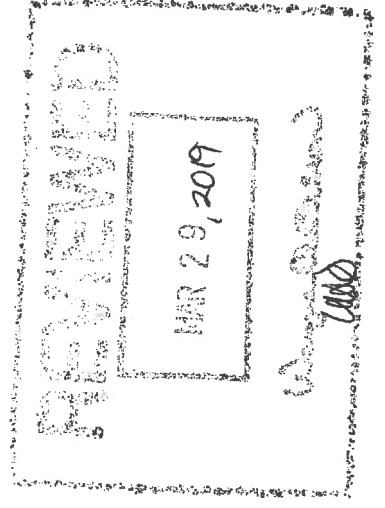
Analyst's Initials: GWH

Analytical Method: EPA 7470

| ILI Log #: | Run | Digestion Date | Analysis Date | Instru. Reading (ppb) | Instru. Reporting Limit (ppb) | Dilution | Volume of Sample Digested (mL) | Final Volume of Sample Digestate (mL) | Total Volume of sample (L) | Reported Results     |                         |
|------------|-----|----------------|---------------|-----------------------|-------------------------------|----------|--------------------------------|---------------------------------------|----------------------------|----------------------|-------------------------|
|            |     |                |               |                       |                               |          |                                |                                       |                            | Reporting Limit (ug) | Analytical Results (ug) |
| -70        | 0   | 3/28/19B       | 3/28/19       | 0.10 <                | 0.10                          | 1        | 20                             | 50                                    | 0.500                      | 0.13                 | 0.13 <                  |
| -71        | 1   | 3/28/19B       | 3/28/19       | 0.628                 | 0.10                          | 1        | 20                             | 50                                    | 0.500                      | 0.13                 | 0.79                    |
| -72        | 2   | 3/28/19B       | 3/28/19       | 0.275                 | 0.10                          | 1        | 20                             | 50                                    | 0.500                      | 0.13                 | 0.34                    |
| -73        | 3   | 3/28/19B       | 3/28/19       | 1.22                  | 0.10                          | 1        | 20                             | 50                                    | 0.500                      | 0.13                 | 1.53                    |

Footnotes:

In-House Comments:



**INTERPOLL LABORATORIES, INC.**  
(763)786-6020

**Total Mercury by Cold Vapor Atomic Absorption Reporting Form**

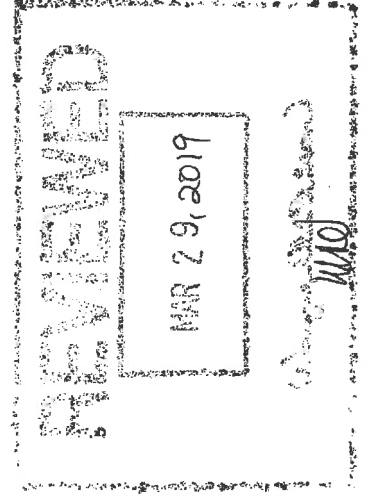
Client: United Taconite  
 Sample Type: M29, Test 3, Fraction 3C, Waste Gas 2A Stack  
 Digestion Method: EPA M-29/7470

Due Date: 3/28/19  
 Analyst's Initials: GWH  
 Analytical Method: EPA 7470

| ILL Log #: | Run | Digestion Date | Analysis Date | Instru. Reading (ppb) | Instru. Reporting Limit (ppb) | Dilution | Volume of Sample Digested (mL) | Final Volume of Sample Digestate (mL) | Reported Results           |                         |
|------------|-----|----------------|---------------|-----------------------|-------------------------------|----------|--------------------------------|---------------------------------------|----------------------------|-------------------------|
|            |     |                |               |                       |                               |          |                                |                                       | Total Volume of sample (L) | Analytical Results (ug) |
| -78        | 0   | 3/28/19B       | 3/28/19       | 0.10 <                | 0.10                          | 1        | 10                             | 50                                    | 0.200                      | 0.10 <                  |
| -79        | 1   | 3/28/19B       | 3/28/19       | 7.14                  | 0.10                          | 1        | 10                             | 50                                    | 0.300                      | 10.7                    |
| -80        | 2   | 3/28/19B       | 3/28/19       | 6.14                  | 0.10                          | 1        | 10                             | 50                                    | 0.300                      | 9.21                    |
| -81        | 3   | 3/28/19B       | 3/28/19       | 6.88                  | 0.10                          | 1        | 10                             | 50                                    | 0.300                      | 10.3                    |

Footnotes:

In-House Comments:



## Sample Chain of Custody

| Fuel Type: | Coal: | Bituminous Anthracite | Wood: | Wood Waste | Oil: | Waste Oil | Miscellaneous: | Natural Gas |
|------------|-------|-----------------------|-------|------------|------|-----------|----------------|-------------|
|            |       |                       |       | Dust       |      | No. 2     |                | RDF         |
|            |       | Lignite               |       | Bark       |      | No. 6     |                | Diesel      |

|                             |                         |         |
|-----------------------------|-------------------------|---------|
| Relinquished by/Affiliation | Accepted by/Affiliation | Date    |
| Chris Warneke               | Interpoll Laboratories  |         |
| <i>Chris Warneke</i>        | <i>[Signature]</i>      | 2/13/19 |

**INTERPOLL LABORATORIES, INC.**

(763)786-6020

**Total Mercury by Cold Vapor Atomic Absorption Reporting Form**

Client: United Taconite

Sample Type: Filter

Digestion Method: EPA M-29/7470

Due Date: 2/28/19

Analyst's Initials: GWH

Analytical Method: EPA 7470

|            |                |               |                       |                               |          |                                |                                       |                            | Reported Result      |                         |
|------------|----------------|---------------|-----------------------|-------------------------------|----------|--------------------------------|---------------------------------------|----------------------------|----------------------|-------------------------|
| ILI Log #: | Digestion Date | Analysis Date | Instru. Reading (ppb) | Instru. Reporting Limit (ppb) | Dilution | Volume of Sample Digested (mL) | Final Volume of Sample Digestate (mL) | Total Volume of sample (L) | Reporting Limit (ug) | Analytical Results (ug) |
| 37384      | 2/21/19A       | 2/21/19       | 3.50                  | 0.10                          | 10       | 10                             | 50                                    | 0.100                      | 0.50                 | 17.5                    |

Footnotes:

In-House Comments:

**Total Mercury by Cold Vapor Atomic Absorption Reporting Form**

Client: United Taconite

Sample Type: Impinger

Digestion Method: EPA M-29/7470

Due Date: 2/28/19

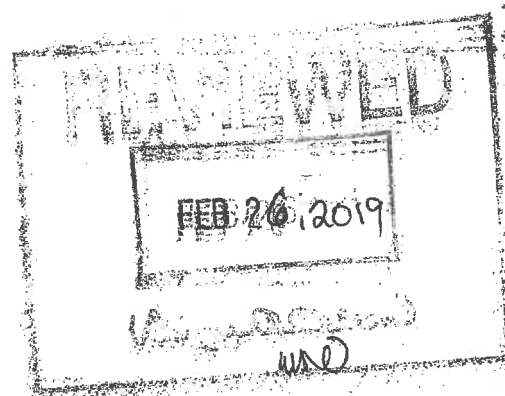
Analyst's Initials: GWH

Analytical Method: EPA 7470

|            |                |               |                        |                                |          |                                |                                       |  | Reported Result        |                           |
|------------|----------------|---------------|------------------------|--------------------------------|----------|--------------------------------|---------------------------------------|--|------------------------|---------------------------|
| ILI Log #: | Digestion Date | Analysis Date | Instru. Reading (ug/L) | Instru. Reporting Limit (ug/L) | Dilution | Volume of Sample Digested (mL) | Final Volume of Sample Digestate (mL) |  | Reporting Limit (ug/L) | Analytical Results (ug/L) |
| 37384      | 2/21/19A       | 2/21/19       | 5.11                   | 0.10                           | 1        | 10                             | 50                                    |  | 0.50                   | 25.6                      |

Footnotes:

In-House Comments:



**INTERPOLL LABORATORIES, INC.**  
(763)786-6020

**Total Mercury by Cold Vapor Atomic Absorption Reporting Form**

Client: United Taconite

Sample Type: M29, Test 1, Fraction 1B, Pellet Induration (STRU) Stack

Digestion Method: EPA M-29/7470

Due Date: 2/28/19

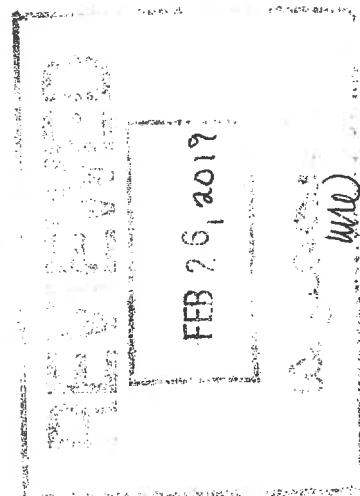
Analyst's Initials: GWH

Analytical Method: EPA 7470

| ILI Log #:   | Run | Digestion Date | Analysis Date | Instru. Reading (ppb) | Instru. Reporting Limit (ppb) | Dilution | Volume of Sample Digested (mL) | Final Volume of Sample Digestate (mL) | Reported Results           |                         |
|--------------|-----|----------------|---------------|-----------------------|-------------------------------|----------|--------------------------------|---------------------------------------|----------------------------|-------------------------|
|              |     |                |               |                       |                               |          |                                |                                       | Total Volume of sample (L) | Analytical Results (ug) |
| -06          | 00  | 2/21/19A       | 2/21/19       | 0.10 <                | 0.10                          | 1        | 10                             | 50                                    | 0.100                      | 0.050 <                 |
| -07          | 0   | 2/21/19A       | 2/21/19       | 0.10 <                | 0.10                          | 1        | 10                             | 50                                    | 0.100                      | 0.050 <                 |
| -08          | 1   | 2/21/19A       | 2/21/19       | 0.10 <                | 0.10                          | 1        | 10                             | 50                                    | 0.100                      | 0.050 <                 |
| -09          | 2   | 2/21/19A       | 2/21/19       | 0.10 <                | 0.10                          | 1        | 10                             | 50                                    | 0.100                      | 0.050 <                 |
| -10          | 3   | 2/21/19A       | 2/21/19       | 0.10 <                | 0.10                          | 1        | 10                             | 50                                    | 0.100                      | 0.050 <                 |
| Method Blank |     | 2/21/19A       | 2/21/19       | 0.10 <                | 0.10                          | 1        | 10                             | 50                                    | 0.100                      | 0.050 <                 |

Footnotes:

In-House Comments:



**INTERPOLL LABORATORIES, INC.**  
(763)786-6020

**Total Mercury by Cold Vapor Atomic Absorption Reporting Form**

Client: United Taconite

Due Date: 2/28/19

Sample Type: M29, Test 1, Fraction 2B, Pellet Induration (STRU) Stack

Analyst's Initials: GWH

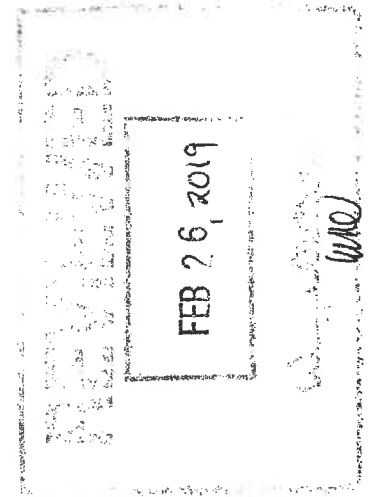
Digestion Method: EPA M-29/7470

Analytical Method: EPA 7470

| ILJ Log #: | Run | Digestion Date | Analysis Date | Instru. Reading (ppb) | Instru. Reporting Limit (ppb) | Dilution | Volume of Sample Digested (mL) | Final Volume of Sample Digestate (mL) | Total Volume of sample (L) | Reported Results     |                         |
|------------|-----|----------------|---------------|-----------------------|-------------------------------|----------|--------------------------------|---------------------------------------|----------------------------|----------------------|-------------------------|
|            |     |                |               |                       |                               |          |                                |                                       |                            | Reporting Limit (ug) | Analytical Results (ug) |
| -12        | 0   | 2/21/19A       | 2/21/19       | 0.10 <                | 0.10                          | 1        | 10                             | 50                                    | 0.300                      | 0.15                 | 0.15 <                  |
| -13        | 1   | 2/21/19A       | 2/21/19       | 0.176                 | 0.10                          | 1        | 10                             | 50                                    | 0.400                      | 0.20                 | 0.352                   |
| -14        | 2   | 2/21/19A       | 2/21/19       | 0.212                 | 0.10                          | 1        | 10                             | 50                                    | 0.400                      | 0.20                 | 0.424                   |
| -15        | 3   | 2/21/19A       | 2/21/19       | 0.205                 | 0.10                          | 1        | 10                             | 50                                    | 0.400                      | 0.20                 | 0.410                   |

Footnotes:

In-House Comments:





**INTERPOLL LABORATORIES, INC.**  
(763)786-6020

**Total Mercury by Cold Vapor Atomic Absorption Reporting Form**

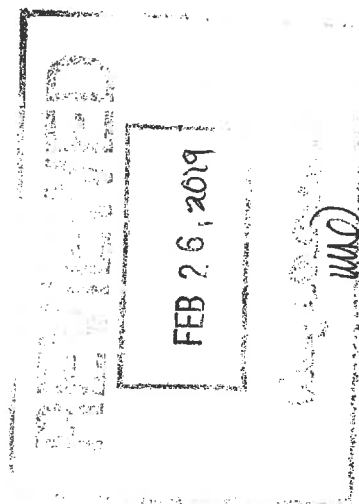
Client: United Taconite  
 Sample Type: M29, Test 1, Fraction 3A, Pellet Induration (STRU) Stack  
 Digestion Method: EPA M-29/7470

Due Date: 2/28/19  
 Analyst's Initials: GWH  
 Analytical Method: EPA 7470

| ILI Log #: | Run | Digestion Date | Analysis Date | Instru. Reading (ppb) | Instru. Reporting Limit (ppb) | Dilution | Volume of Sample Digested (mL) | Final Volume of Sample Digestate (mL) | Total Volume of sample (L) | Reported Results     |                         |
|------------|-----|----------------|---------------|-----------------------|-------------------------------|----------|--------------------------------|---------------------------------------|----------------------------|----------------------|-------------------------|
|            |     |                |               |                       |                               |          |                                |                                       |                            | Reporting Limit (ug) | Analytical Results (ug) |
| -20        | 0   | 2/21/19A       | 2/21/19       | 0.10 <                | 0.10                          | 1        | 10                             | 50                                    | 0.050                      | 0.025                | 0.025 <                 |
| -21        | 1   | 2/21/19A       | 2/21/19       | 0.10 <                | 0.10                          | 1        | 10                             | 50                                    | 0.050                      | 0.025                | 0.025 <                 |
| -22        | 2   | 2/21/19A       | 2/21/19       | 0.10 <                | 0.10                          | 1        | 10                             | 50                                    | 0.050                      | 0.025                | 0.025 <                 |
| -23        | 3   | 2/21/19A       | 2/21/19       | 0.10 <                | 0.10                          | 1        | 10                             | 50                                    | 0.050                      | 0.025                | 0.025 <                 |

Footnotes:

In-House Comments:



**INTERPOLL LABORATORIES, INC.**  
(763)786-6020

**Total Mercury by Cold Vapor Atomic Absorption Reporting Form**

Client: United Taconite

Due Date: 2/28/19

Sample Type: M29, Test 1, Fraction 3B, Pellet Induration (STRU) Stack

Analyst's Initials: GWH

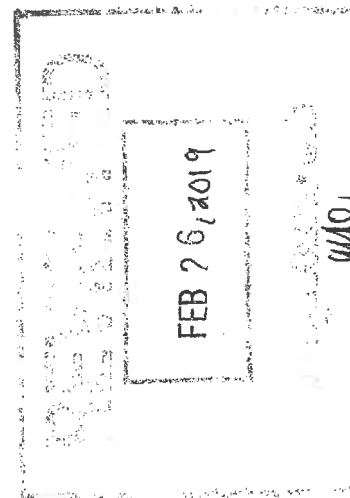
Digestion Method: EPA M-29/7470

Analytical Method: EPA 7470

| ILI Log #:<br>37384 | Run | Digestion Date | Analysis Date | Instru.<br>Reading<br>(ppb) | Instru.<br>Reporting<br>Limit<br>(ppb) | Dilution | Volume<br>of Sample<br>Digested<br>(mL) | Final<br>Volume of<br>Sample<br>Digestate<br>(mL) | Total<br>Volume of<br>sample (L) | Reported Results        |                            |
|---------------------|-----|----------------|---------------|-----------------------------|--|----------|---|---|----------------------------------|-------------------------|----------------------------|
|                     |     |                |               |                             |  |          |   |   |                                  | Reporting<br>Limit (ug) | Analytical Results<br>(ug) |
| -25                 | 0   | 2/21/19A       | 2/21/19       | 0.10 <                      | 0.10                                   | 1        | 20                                      | 50  | 0.500                            | 0.13                    | 0.13 <                     |
| -26                 | 1   | 2/21/19A       | 2/21/19       | 1.10                        | 0.10                                   | 1        | 20                                      | 50  | 0.500                            | 0.13                    | 1.38                       |
| -27                 | 2   | 2/21/19A       | 2/21/19       | 0.179                       | 0.10                                   | 1        | 20                                      | 50  | 0.500                            | 0.13                    | 0.224                      |
| -28                 | 3   | 2/21/19A       | 2/21/19       | 0.305                       | 0.10                                   | 1        | 20                                      | 50  | 0.500                            | 0.13                    | 0.381                      |

Footnotes:

In-House Comments:



# INTERPOLL LABORATORIES, INC.

(763)786-6020

## Total Mercury by Cold Vapor Atomic Absorption Reporting Form

Client: United Taconite

Sample Type: M29, Test 1, Fraction 3C, Pellet Induration (STRU) Stack

Digestion Method: EPA M-29/7470

Due Date: 2/28/19

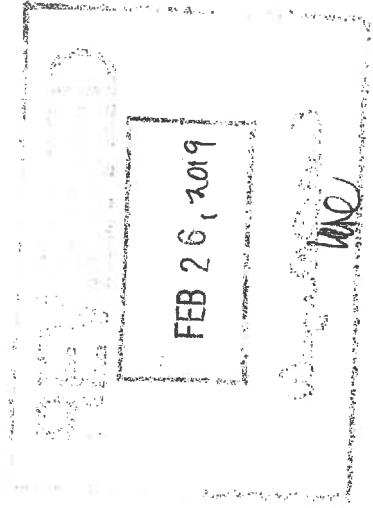
Analyst's Initials: GWH

Analytical Method: EPA 7470

| ILL Log #: | Run | Digestion Date | Analysis Date | Instru. Reading (ppb) | Instru. Limit (ppb) | Dilution | Volume of Sample Digested (mL) | Final Volume of Sample Digestate (mL) | Total Volume of sample (L) | Reported Results     |                         |
|------------|-----|----------------|---------------|-----------------------|---------------------|----------|--------------------------------|---------------------------------------|----------------------------|----------------------|-------------------------|
|            |     |                |               |                       |                     |          |                                |                                       |                            | Reporting Limit (ug) | Analytical Results (ug) |
| -35        | 0   | 2/21/19A       | 2/21/19       | 0.10 <                | 0.10                | 1        | 10                             | 50                                    | 0.200                      | 0.10                 | 0.10 <                  |
| -36        | 1   | 2/21/19A       | 2/21/19       | 5.51                  | 0.10                | 1        | 10                             | 50                                    | 0.200                      | 0.10                 | 5.51                    |
| -37        | 2   | 2/21/19A       | 2/21/19       | 6.35                  | 0.10                | 1        | 10                             | 50                                    | 0.200                      | 0.10                 | 6.35                    |
| -38        | 3   | 2/21/19A       | 2/21/19       | 4.86                  | 0.10                | 1        | 10                             | 50                                    | 0.200                      | 0.10                 | 4.86                    |

Footnotes:

In-House Comments:



## **APPENDIX E**

### **TEST PLAN**

**From:** Place, Andrew (MPCA) <andrew.place@state.mn.us>  
**Sent:** Monday, February 11, 2019 2:02 PM  
**To:** 'Bonham, Michael J'  
**Cc:** Palzkill, Steven (MPCA); Kathy Eickstadt  
**Subject:** Test Plan Approval - Line 1 Waste Gas Stack

**Include a copy of the Test Plan and this Test Plan Approval Email in the Final Report**

## **Test Plan Approval Letter**

Facility: United Taconite LLC  
Address: 1200 West Highway 16, Forbes, MN 55738  
Contact Person/Phone: Mike Bonham, Environmental Coordinator  
Test Date: February 11, 2019  
Test Plan Submittal Date: January 11, 2019  
Pretest Meeting Date: via email week of February 4, 2019  
Units to be Tested: Line 1 Pellet Induration (EQUI 45/STRU 53/CE056)  
Agency Interest ID: 140099

**Your test plan has been approved by the Minnesota Pollution Control Agency (MPCA) as follows:**

Test plan approved with the following provisions:

1. One test plan submitted. MPCA will send out second test plan approval closer to Line 2 test date. Testing of both Lines may be considered a single test event and submitted with one report.
2. Testing for Hg emissions while burning coal and natural gas to meet requirements of Mercury TMDL. Testing of PM, CO, VOC, and Pb on various fuel as needed for emissions inventory data.
3. Test will be completed at operating rates similar to those experienced in 2016 (>250 tons/hour production)
4. Method 29 used rather than Method 30B in order to capture lead results as well as Mercury.
5. Include in the final test report all process and pollution control equipment operating data collected at 15 minute intervals (minimum) and averaged for each test run and test. This information must be clear easily understood by individuals not familiar with the process. All information needed to show process operating rate and pollution control equipment compliant operation must be included. A link to reporting forms can be found below.
6. An acceptable report must comply with Minn. Rule 7017.2035 PERFORMANCE TEST REPORTING REQUIREMENTS. Use of the PTRCC form will help assure that a complete test report is submitted to the MPCA.

**In the event of a failure:**

**Please be aware that enforcement action will be taken for performance test failures, indicating emissions above applicable limits, which can include a monetary penalty. Upon discovery of the test failure, the Regulated Party must take immediate action to reduce emissions to remain in compliance with its permitted limits. The actions taken should be documented, as they will become part of the record of corrective actions. If a monetary penalty is required, the amount of time from the date of the failed test to the date of the passed test, or other compliance demonstration, will be taken into consideration. It is in the Regulated Party's best interest to demonstrate compliance with its permitted emissions limits through a passed retest or other compliance demonstration as soon as possible after a failed test.**

**All periods of noncompliance with emission limits must be reported to the MPCA, this includes any periods of engineering tests. The requirements outlined under the Notification of Deviations Endangering Human Health or the**

**Environment, Minn. R. 7019.1000, subp. 1., shall be followed. This information should also be clearly stated and readily available in the executive summary of the test report.**

The following forms are available at <http://www.pca.state.mn.us/jsrid16>

Operating Data Summary – Combustion Sources

Operating Data Summary – Process Sources

Operating Data Summary – Asphalt Plants

Report Certifications Form

Performance Test Report Completeness Criteria (PTRCC)

**(Preferred)** Electronic copies of the test report submitted to [SubmitStackTest.PCA@state.mn.us](mailto:SubmitStackTest.PCA@state.mn.us)

**If an electronic copy of the complete test report is submitted the paper and CD copies are not required. Please follow requirements outlined in Method 1 of the document found at this link:**

**<https://www.pca.state.mn.us/sites/default/files/aq1-39.pdf>**

Hard Copy Performance Test Reports and Microfiche or CD Copy submittals will be addressed to:

Air Quality Compliance Tracking Coordinator

Industrial Division

Minnesota Pollution Control Agency

520 Lafayette Road North

St. Paul, Minnesota 55155-4194

**Andy Place** | State Program Administrator Principal

Minnesota Pollution Control Agency (MPCA)

Industrial Division

520 Lafayette Road No. | St. Paul, Minnesota | 55155-4194

651-757-2652

Email | [andrew.place@state.mn.us](mailto:andrew.place@state.mn.us)

*Our mission is to protect and improve the environment and human health.*

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## Proposed Test Plan United Taconite, LLC Forbes, Minnesota

Date Test Plan Created/Revised: January 11, 2019

Scheduled Test Dates:

Line 1: Week of February 11, 2019

Line 2: Week of March 11, 2019

### PART I: General Information

| Emissions facility location  | Facility contact   | Testing company contact  |
|--|--|--|
| United Taconite, LLC<br>1200 West Hwy 16<br>Forbes, Minnesota<br>55738 | Mike Bonham<br>Environmental Coordinator<br>United Taconite LLC<br>P.O. Box 180<br>Eveleth, Minnesota 55738<br>(218)744-7840 (7803 GO)<br>(218) 744-7635 (fax) | Ed "EJ" Juers<br>Source Testing Dept.<br>Interpoll Laboratories, Inc.<br>4500 Ball Rd NE, Circle Pines,<br>MN 55014<br>Tel: 763.786.6020 x25   Fax:<br>763.786.7854   mobile<br>651.247.7873 |

### Reason emissions units are to be tested:

Air Emissions Inventory testing will be conducted on Line 1 and Line 2 Waste Gas Stacks. The purpose of the tests is to update Air Emission Inventory factors and to satisfy on going mercury compliance testing requirements.

Mercury emissions testing will be conducted on Line 1 and Line 2 Waste Gas Stacks while burning a mixture of natural gas/coal. The purpose of the tests is to satisfy mercury testing requirements under the Mercury TMDL

Testing will be conducted on each Line (Line 1 and Line 2) at 2 operating scenarios:

- 100% Natural Gas
- Natural Gas/ Coal mixture

The table below provides the emissions units' plant nomenclature and permit identification. Stack drawings showing stack dimensions and test port orientation and locations relative to airflow disturbances will be provided in the final report or upon request.

| Process unit nomenclature | Emissions Source | Stack               | Control Equipment number |
|---------------------------|------------------|---------------------|--------------------------|
| Line 1 Pellet Induration  | EQUI 45          | STRU 53             | CE 056                   |
| Line 2 Pellet Induration  | EQUI 47          | STRU 15,<br>STRU 16 | CE 49, CE 50             |

## PART II: Testing Requirements

The following table identifies pollutants to be determined; applicable emissions limit and units, and associated regulation for each emissions unit and stack vent.

| Process equipment description for units to be tested |              |                   |
|--|--------------|-------------------|
| Emission Unit #(s)                                   | Stack Vent # | Description       |
| EU040/ EQUI 45                                       | STRU 53      | Line 1 Induration |
| EU042/ EQUI 47                                       | STRU 16      | Line 2 Induration |

### Hg Compliance testing

| Process unit nomenclature                               | Limitation Basis of Pollutant Tested | Pollutant Tested/Permit Limit | Specific Methods/Procedures Required Citation  |
|---|--------------------------------------|-------------------------------|--|
| Line 1 Waste Gas Stack (STRU 53)<br>(EQUI 45)           | Minn. R. 7007.0800                   | Mercury                       | EPA Method 29 3 60-minute test runs at each stack<br><br>Line 2 Stacks 2A and 2B to be tested simultaneously |
| Line 2 Waste Gas Stacks<br>(STRU15, STRU16)<br>EQUI 47) | Minn. R. 7007.0800                   |                               |  |

### Control Equipment Parameters to be Monitored

| Control equipment ID | Control equipment description           | Monitoring Parameters                                 | Frequency  |
|----------------------|---|---|------------|
| CE 056               | Wet Scrubber – High Efficiency w/o Lime | Scrubber dP, in w.c<br>Scrubber liquid flow rate, gpm | 15 Minutes |
| CE 049 CE 050        | Wet Scrubber – High Efficiency w/o Lime | Scrubber dP, in w.c<br>Scrubber liquid flow rate, gpm | 15 Minutes |



#### Part IV: Test Methods

| Test methods     |   |
|------------------|---|
| Method 1         | Sample and Velocity Traverses for Stationary Sources. Once per location                                     |
| Method 2         | EPA Method 2 for stack gas velocity and volumetric flow rate.   |
| Method 3 /3A     | EPA Method 3 or modified 3A to determine stack gas molecular weight at the Line 2 Waste Gas stacks.         |
| Method 4         | EPA Method 4 for determination of moisture content in stack gas will be performed in conjunction with test. |
| EPA Method 5     | 3 2 hour runs for the MACT testing  |
| EPA Method 5,202 | 3 one-hour runs per stack using EPA Method 5, 202 (Line 1 and Line 2 while burning natural gas)             |
| EPA Method 10    | Instrumental CO   |
| EPA Method 25A   | Total VOC's (measured as propane)   |
| EPA Method 29    | Pb, Hg (Hg results (natural gas/coal) used for compliance purposes  |

*Please refer to proposed testing scenario for further details*

#### Part V: Continuous Emissions Monitors

SO<sub>2</sub> and NO<sub>x</sub> CEMS systems are located on the Line 1 and Line 2 Waste Gas Stacks.

#### Test Dates: Tests scheduled for:

Line 1- February 11-15, 2019

Line 2- March 11- 15, 2019

United Taconite and Interpoll Laboratories contacts will make themselves available for a pretest meeting prior 7 days in advance of the testing. At the preference of the MPCA, United Taconite suggests the pretest meeting be conducted by telephone.

**Maintenance:** A description of any work done within 30 days prior to the test will be included in the test report.

**Test Reports:** One electronic copy in .pdf format of the test report will be submitted to the MPCA on or before 45 days from last test date of the mobilization.

#### Closing Remarks

If there are questions or comments about the information provided, please contact me by telephone or e-mail.

Mike Bonham

*Michael Bonham*

Environmental Coordinator  
United Taconite LLC

**APPENDIX F**

**OPERATING DATA**

**Hg Compliance/ Pb Air Emission Inventory Testing 2/14/19 (coal/natural gas)**

| Run 1 0800-0904      |               | Greenball | Fired pellet | Line 1 | L1 WG   | Fuel      | Fuel        | coal tph |
|----------------------|---------------|-----------|--------------|--------|---------|-----------|-------------|----------|
| Line 1 (SV046)       |               | LT/hr     | LT/hr        | dP     | Flow 1  | ng BTU/hr | coal BTU/hr |          |
| 2/13/19 8:00         | 2/13/19 8:15  | 300.59    | 242.73       | 19.4   | 4029.29 | 51.4      | 108.64      | 4.03     |
| 2/13/19 8:15         | 2/13/19 8:30  | 299.58    | 237.37       | 19.4   | 4024.59 | 51.5      | 108.64      | 4.03     |
| 2/13/19 8:30         | 2/13/19 8:45  | 299.59    | 235.68       | 19.3   | 4029.96 | 46.9      | 108.64      | 4.03     |
| 2/13/19 8:45         | 2/13/19 9:00  | 299.21    | 236.50       | 19.3   | 4032.86 | 46.7      | 108.66      | 4.03     |
| 2/13/19 9:00         | 2/13/19 9:15  | 301.44    | 242.06       | 19.3   | 4029.81 | 46.1      | 108.63      | 4.03     |
|                      |               | 300.08    | 238.87       | 19.35  | 4029.30 | 48.53     | 108.64      | 4.03     |
| Run 2 0942-1202-1232 |               | Greenball | Fired pellet | Line 1 | L1 WG   | Fuel      | Fuel        | coal tph |
|                      |               | LT/hr     | LT/hr        | dP     | Flow 1  | ng BTU/hr | coal BTU/hr |          |
| 2/13/19 9:42         | 2/13/19 9:57  | 299.9     | 238.00       | 19.4   | 4027.27 | 48.4      | 108.64      | 4.03     |
| 2/13/19 9:55         | 2/13/19 10:10 | 300.90    | 242.03       | 19.6   | 4028.43 | 47.2      | 108.63      | 4.03     |
| 2/13/19 10:10        | 2/13/19 10:25 | 291.96    | 234.68       | 19.2   | 4024.49 | 48.5      | 108.63      | 4.03     |
| 2/13/19 12:02        | 2/13/19 12:17 | 299.60    | 242.98       | 20.3   | 4025.80 | 55.7      | 108.62      | 4.03     |
| 2/13/19 12:17        | 2/13/19 12:32 | 300.60    | 240.37       | 20.4   | 4026.47 | 52.0      | 108.63      | 4.03     |
|                      |               | 298.58    | 239.61       | 19.76  | 4026.49 | 50.38     | 108.63      | 4.03     |
| Run 3 1305-1409      |               | Greenball | Fired pellet | Line 1 | L1 WG   | Fuel      | Fuel        | coal tph |
|                      |               | LT/hr     | LT/hr        | dP     | Flow 1  | ng BTU/hr | coal BTU/hr |          |
| 2/13/19 13:05        | 2/13/19 13:20 | 299.34    | 240.08       | 20.6   | 4019.70 | 51.6      | 108.67      | 4.03     |
| 2/13/19 13:20        | 2/13/19 13:35 | 300.06    | 244.15       | 20.7   | 4014.74 | 48.4      | 108.65      | 4.03     |
| 2/13/19 13:35        | 2/13/19 13:50 | 299.50    | 242.72       | 20.8   | 4009.61 | 47.4      | 108.66      | 4.03     |
| 2/13/19 13:50        | 2/13/19 14:05 | 301.51    | 243.56       | 20.8   | 4006.59 | 49.8      | 108.67      | 4.03     |
| 2/13/19 14:05        | 2/13/19 14:20 | 299.76    | 240.81       | 20.9   | 3994.64 | 48.9      | 108.70      | 4.03     |
| Average              |               | 300.03    | 242.27       | 20.76  | 4009.05 | 49.21     | 108.67      | 4.03     |
| 3 run Average        |               | 299.57    | 240.25       | 19.96  | 4021.62 | 49.37     | 108.65      | 4.03     |

12-Mar

Run 1 0910-1027 paused for process issues resume 1055-1145  
Run 2 1242-1447  
Run 3 1610-1617 paused for process issues resume 1623-1631

paused

resume at 1633-1825

| Line 2 WGS                |               |         |           | SV 048       |           |             |          |
|---------------------------|---------------|---------|-----------|--------------|-----------|-------------|----------|
| Line 2A                   | Line 2A       | Flow    | Greenball | Fired pellet | Fuel      | Fuel        | coal tph |
| dP                        | dP            |         | L/Thr     | L/Thr        | ng BTU/hr | coal BTU/hr |          |
| Run 1 0910-1027 1055-1145 |               |         |           |              |           |             |          |
| 3/12/19 8:10              | 3/12/19 8:25  | 2514    | 670.68    | 543.85       | 75.25     | 162.83      | 6.16     |
| 3/12/19 8:25              | 3/12/19 8:40  | 2515    | 668.42    | 541.90       | 75.53     | 162.94      | 6.18     |
| 3/12/19 8:40              | 3/12/19 8:55  | 2515    | 670.49    | 543.20       | 75.48     | 163.11      | 6.17     |
| 3/12/19 8:55              | 3/12/19 10:10 | 2512    | 669.58    | 543.23       | 72.97     | 163.32      | 6.18     |
| 3/12/19 10:10             | 3/12/19 10:25 | 2510    | 671.15    | 546.33       | 70.50     | 163.53      | 6.19     |
| 3/12/19 10:25             | 3/12/19 11:10 | 2516    | 669.39    | 544.81       | 69.01     | 163.75      | 6.21     |
| 3/12/19 11:10             | 3/12/19 11:25 | 2517    | 669.03    | 545.13       | 63.86     | 164.17      | 6.22     |
| 3/12/19 11:25             | 3/12/19 11:40 | 2519    | 669.58    | 543.88       | 64.06     | 164.39      | 6.23     |
| 3/12/19 11:40             | 3/12/19 11:55 | 2518    | 670.03    | 542.57       | 63.90     | 164.60      | 6.24     |
| Average                   |               | 2516.24 | 669.82    | 543.83       | 70.06     | 163.63      | 6.20     |

| Line 2A         |               |         |           | SV 048       |           |             |          |
|-----------------|---------------|---------|-----------|--------------|-----------|-------------|----------|
| Line 2A         | Line 2A       | Flow    | Greenball | Fired pellet | Fuel      | Fuel        | coal tph |
| dP              | dP            |         | L/Thr     | L/Thr        | ng BTU/hr | coal BTU/hr |          |
| Run 2 1242-1447 |               |         |           |              |           |             |          |
| 3/12/19 12:42   | 3/12/19 12:57 | 2518    | 669.26    | 543.90       | 53.74     | 165.69      | 6.27     |
| 3/12/19 12:57   | 3/12/19 13:12 | 2513    | 671.77    | 544.42       | 55.54     | 165.91      | 6.28     |
| 3/12/19 13:12   | 3/12/19 13:27 | 2514    | 669.49    | 543.42       | 53.45     | 166.12      | 6.29     |
| 3/12/19 13:27   | 3/12/19 13:42 | 2513    | 669.98    | 545.20       | 53.38     | 166.33      | 6.29     |
| 3/12/19 13:42   | 3/12/19 13:57 | 2516    | 668.93    | 545.57       | 55.90     | 166.55      | 6.30     |
| 3/12/19 13:57   | 3/12/19 14:12 | 2516    | 670.14    | 544.90       | 58.30     | 166.78      | 6.31     |
| 3/12/19 14:12   | 3/12/19 14:27 | 2518    | 667.92    | 542.03       | 56.23     | 166.97      | 6.32     |
| 3/12/19 14:27   | 3/12/19 14:42 | 2515    | 667.80    | 541.58       | 56.46     | 167.19      | 6.33     |
| 3/12/19 14:42   | 3/12/19 14:57 | 2513    | 669.47    | 543.53       | 58.41     | 167.40      | 6.33     |
| Average         |               | 2515.06 | 669.42    | 543.64       | 55.93     | 166.55      | 6.30     |

| Line 2A         |               |         |           | SV 048       |           |             |          |
|-----------------|---------------|---------|-----------|--------------|-----------|-------------|----------|
| Line 2A         | Line 2A       | Flow    | Greenball | Fired pellet | Fuel      | Fuel        | coal tph |
| dP              | dP            |         | L/Thr     | L/Thr        | ng BTU/hr | coal BTU/hr |          |
| Run 3 1610-1825 |               |         |           |              |           |             |          |
| 3/12/19 16:10   | 3/12/19 16:25 | 2515    | 670.09    | 544.34       | 59.06     | 165.66      | 6.38     |
| 3/12/19 16:25   | 3/12/19 16:40 | 2515    | 667.71    | 541.89       | 59.66     | 165.87      | 6.39     |
| 3/12/19 16:40   | 3/12/19 16:55 | 2516    | 670.32    | 544.14       | 59.73     | 165.08      | 6.40     |
| 3/12/19 16:55   | 3/12/19 17:10 | 2517    | 670.40    | 544.38       | 59.52     | 165.29      | 6.41     |
| 3/12/19 17:10   | 3/12/19 17:25 | 2510    | 669.05    | 543.07       | 59.44     | 165.51      | 6.41     |
| 3/12/19 17:25   | 3/12/19 17:40 | 2516    | 668.54    | 544.38       | 59.52     | 165.72      | 6.42     |
| 3/12/19 17:40   | 3/12/19 17:55 | 2514    | 667.13    | 543.05       | 59.74     | 165.78      | 6.42     |
| 3/12/19 17:55   | 3/12/19 18:10 | 2514    | 669.21    | 544.67       | 59.80     | 165.73      | 6.42     |
| 3/12/19 18:10   | 3/12/19 18:25 | 2516    | 670.69    | 544.51       | 59.72     | 165.69      | 6.42     |
| Average         |               | 2514.82 | 669.24    | 543.81       | 59.38     | 165.37      | 6.41     |

|               |         |        |        |       |        |      |
|---------------|---------|--------|--------|-------|--------|------|
| 3 run Average | 2515.37 | 669.48 | 543.83 | 61.79 | 166.51 | 6.30 |
|---------------|---------|--------|--------|-------|--------|------|

| Line 2 WGS                |               |         |           | SV 049       |           |             |          |
|---------------------------|---------------|---------|-----------|--------------|-----------|-------------|----------|
| Line 2B                   | Line 2B       | Flow 1  | Greenball | Fired pellet | Fuel      | Fuel        | coal tph |
| dP                        | dP            |         | L/Thr     | L/Thr        | ng BTU/hr | coal BTU/hr |          |
| Run 1 0910-1027 1055-1145 |               |         |           |              |           |             |          |
| 3/12/19 8:10              | 3/12/19 8:25  | 2381    | 670.08    | 543.85       | 75.25     | 162.83      | 6.16     |
| 3/12/19 8:25              | 3/12/19 8:40  | 2381    | 668.42    | 541.90       | 75.53     | 162.94      | 6.18     |
| 3/12/19 8:40              | 3/12/19 8:55  | 2383    | 670.49    | 543.20       | 75.49     | 163.11      | 6.17     |
| 3/12/19 8:55              | 3/12/19 10:10 | 2343    | 669.58    | 543.23       | 72.97     | 163.32      | 6.18     |
| 3/12/19 10:10             | 3/12/19 10:25 | 2343    | 671.15    | 546.33       | 70.50     | 163.53      | 6.19     |
| 3/12/19 10:25             | 3/12/19 11:10 | 2337    | 669.39    | 544.81       | 69.01     | 163.75      | 6.21     |
| 3/12/19 11:10             | 3/12/19 11:25 | 2341    | 669.03    | 545.13       | 63.9      | 164.17      | 6.22     |
| 3/12/19 11:25             | 3/12/19 11:40 | 2342    | 669.58    | 543.88       | 64.1      | 164.39      | 6.23     |
| 3/12/19 11:40             | 3/12/19 11:55 | 2339    | 670.03    | 542.57       | 63.9      | 164.60      | 6.24     |
| Average                   |               | 2345.94 | 669.82    | 543.83       | 70.06     | 163.63      | 6.20     |

| Line 2B         |               |                   |           | SV 049       |           |             |          |
|-----------------|---------------|-------------------|-----------|--------------|-----------|-------------|----------|
| Line 2B         | Line 2B       | Flow 1            | Greenball | Fired pellet | Fuel      | Fuel        | coal tph |
| dP              | dP            |                   | L/Thr     | L/Thr        | ng BTU/hr | coal BTU/hr |          |
| Run 2 1242-1447 |               |                   |           |              |           |             |          |
| 3/12/19 12:42   | 3/12/19 12:57 | 2489              | 669.26    | 543.90       | 53.74     | 165.69      | 6.27     |
| 3/12/19 12:57   | 3/12/19 13:12 | 2492              | 671.77    | 544.42       | 55.54     | 165.91      | 6.28     |
| 3/12/19 13:12   | 3/12/19 13:27 | 2494              | 669.49    | 543.42       | 53.45     | 166.12      | 6.29     |
| 3/12/19 13:27   | 3/12/19 13:42 | 2495              | 669.98    | 545.20       | 53.38     | 166.33      | 6.29     |
| 3/12/19 13:42   | 3/12/19 13:57 | lost flow reading | 668.93    | 545.57       | 55.90     | 166.55      | 6.30     |
| 3/12/19 13:57   | 3/12/19 14:12 | lost flow reading | 670.14    | 544.90       | 58.30     | 166.78      | 6.31     |
| 3/12/19 14:12   | 3/12/19 14:27 | lost flow reading | 667.92    | 542.03       | 56.23     | 166.97      | 6.32     |
| 3/12/19 14:27   | 3/12/19 14:42 | lost flow reading | 667.80    | 541.58       | 56.46     | 167.19      | 6.33     |
| 3/12/19 14:42   | 3/12/19 14:57 | lost flow reading | 669.47    | 543.53       | 58.41     | 167.40      | 6.33     |
| Average         |               | 2492.46           | 669.42    | 543.64       | 55.93     | 166.55      | 6.30     |

| Line 2B         |               |         |           | SV 049       |           |             |          |
|-----------------|---------------|---------|-----------|--------------|-----------|-------------|----------|
| Line 2B         | Line 2B       | Flow 1  | Greenball | Fired pellet | Fuel      | Fuel        | coal tph |
| dP              | dP            |         | L/Thr     | L/Thr        | ng BTU/hr | coal BTU/hr |          |
| Run 3 1610-1825 |               |         |           |              |           |             |          |
| 3/12/19 16:10   | 3/12/19 16:25 | 2431    | 670.09    | 544.34       | 59.06     | 165.66      | 6.38     |
| 3/12/19 16:25   | 3/12/19 16:40 | 2452    | 667.71    | 541.89       | 59.66     | 165.87      | 6.39     |
| 3/12/19 16:40   | 3/12/19 16:55 | 2496    | 670.32    | 544.14       | 59.73     | 165.08      | 6.40     |
| 3/12/19 16:55   | 3/12/19 17:10 | 2491    | 670.40    | 544.38       | 59.52     | 165.29      | 6.41     |
| 3/12/19 17:10   | 3/12/19 17:25 | 2468    | 669.05    | 543.07       | 59.44     | 165.51      | 6.41     |
| 3/12/19 17:25   | 3/12/19 17:40 | 2464    | 668.54    | 544.38       | 59.52     | 165.72      | 6.42     |
| 3/12/19 17:40   | 3/12/19 17:55 | 2497    | 667.13    | 543.05       | 59.74     | 165.78      | 6.42     |
| 3/12/19 17:55   | 3/12/19 18:10 | 2500    | 669.21    | 544.67       | 59.80     | 165.73      | 6.42     |
| 3/12/19 18:10   | 3/12/19 18:25 | 2493    | 670.69    | 544.51       | 59.72     | 165.69      | 6.42     |
| Average         |               | 2483.57 | 669.24    | 543.81       | 59.38     | 165.37      | 6.41     |

|               |         |        |        |       |        |      |
|---------------|---------|--------|--------|-------|--------|------|
| 3 run Average | 2448.68 | 669.48 | 543.83 | 61.79 | 166.51 | 6.30 |
|---------------|---------|--------|--------|-------|--------|------|

Minnesota Pollution  
Control Agency

520 Lafayette Road  
Saint Paul, MN 55155-4194

# Air Performance Test Form

## Operating Data Summary for Process Sources

### Facility Information (please print)

Company Name: Cleveland Cliffs (United Taconite)

Equipment ID No: SV046/STRU 53

Test date(s): 02/13/19

### Equipment and Operating Data

- Process Equipment Description: Line 1 Pellet Induration
- Were the process and control equipment operated consistent with normal procedures? ☒ Yes ☐ No If no, explain: \_\_\_\_\_
- ~~Include copy of production records or instrumentation which indicates rate of production or operation of the equipment, i.e. units per hour, pounds per hour, pressure, air flow, etc.~~
- Date(s) and procedure(s) of last maintenance/cleaning within 6 months:  
☒ Remains unchanged from info. provided in test plan
- Process rate (amount of raw material or finished product per hour, wet or dry basis) while combusting (list fuel type(s) and ratios as appropriate) \_\_\_\_\_

| Process Parameter: list type and units                  | Run 1 | Run 2 | Run 3 | Run 4 | Average |
|---|-------|-------|-------|-------|---------|
| Greenball Feed Rate, LTPH                               | 300   | 299   | 300   |       | 300     |
| Fired Pellet Production, LTPH                           | 239   | 240   | 242   |       | 240     |
| Fuel Input (list units) Gas, CFM                        | 738   | 790   | 801   |       | 776     |
| Fuel Input (list units) Solid Fuel, TPH                 | 4.03  | 4.03  | 4.03  |       | 4.03    |
| Heat Input (10 <sup>6</sup> British thermal units/hour) | 157.2 | 159.0 | 157.9 |       | 158.0   |

- Summarize control equipment operating data documented during testing. Values reported should reflect maximum, minimum, averages, or as approved in the test plan. (See test plan and approval letter)

### Examples of APC equipment and parameters generally monitored. Monitor as in test plan and/or approval letter.

- Scrubber (list type of scrubber): DP (in. w.c.) and feed rate (gpm and psig)
- Baghouse, Cyclone, and Multi-clone: DP (in. w.c.)
- Catalytic Incinerator: (°F<sub>in</sub> / °F<sub>out</sub>) and Thermal Incinerator: (°F<sub>temperature</sub>)
- ESP: Number and identity of operating field(s)

| APC and parameter monitored | Run 1 | Run 2 | Run 3 | Run 4 | Average |
|-----------------------------|-------|-------|-------|-------|---------|
| Scrubber Water Flow, GPM    | 4029  | 4026  | 4009  |       | 4022    |
| Scrubber dP, In. W.C        | 19.4  | 19.8  | 20.8  |       | 20.0    |
|                             |       |       |       |       |         |
|                             |       |       |       |       |         |
|                             |       |       |       |       |         |
|                             |       |       |       |       |         |
|                             |       |       |       |       |         |

| List pollutant & averaging basis.--should reflect permit | Run 1 | Run 2 | Run 3 | Run 4 | Average |
|--|-------|-------|-------|-------|---------|
| Continuous Opacity Monitor(list hourly average)          |       |       |       |       |         |
| Monitor (list averaging basis):                          |       |       |       |       |         |
| Monitor (list averaging basis):                          |       |       |       |       |         |

Abbreviations: APC=air pollution control  
lbs.-pounds

gpm.=gallons per minute  
psig=pressure per square inch gauge

in. w.c.=inches of water column  
ΔP=pressure drop

**Note:** This form provides only a summary of the operating conditions during the performance test. Additional and more detailed records are required to meet the requirements of Minn. R. 7017.2035, subp. 3. This form is to be submitted as part of the performance test report

# Air Performance Test Form

## Operating Data Summary for Process Sources

### Facility Information (please print)

Company Name: Cleveland Cliffs (United Taconite)

Equipment ID No: SV049/STRU 15

Test date(s): 03/12/19

### Equipment and Operating Data

- Process Equipment Description: Line 2 Pellet Induration (EQUI47)
- Were the process and control equipment operated consistent with normal procedures? ☒ Yes ☐ No If no, explain: \_\_\_\_\_
- Include copy of production records or instrumentation which indicates rate of production or operation of the equipment, i.e. units per hour, pounds per hour, pressure, air flow, etc.
- Date(s) and procedure(s) of last maintenance/cleaning within 6 months:  
☒ Remains unchanged from info. provided in test plan
- Process rate (amount of raw material or finished product per hour, wet or dry basis) while combusting (list fuel type(s) and ratios as appropriate) \_\_\_\_\_

| Process Parameter: list type and units                  | Run 1 | Run 2 | Run 3 | Run 4 | Average |
|---|-------|-------|-------|-------|---------|
| Greenball Feed Rate, LTPH                               | 670   | 669   | 669   |       | 669     |
| Fired Pellet Production, LTPH                           | 545   | 544   | 544   |       | 544     |
| Fuel Input (list units) Gas, CFM                        | 1098  | 888   | 943   |       | 976     |
| Fuel Input (list units) Solid Fuel, TPH                 | 6.2   | 6.3   | 6.41  |       | 6.3     |
| Heat Input (10 <sup>6</sup> British thermal units/hour) | 233.7 | 222.5 | 222.8 |       | 228.3   |

- Summarize control equipment operating data documented during testing. Values reported should reflect maximum, minimum, averages, or as approved in the test plan. (See test plan and approval letter)

### Examples of APC equipment and parameters generally monitored. Monitor as in test plan and/or approval letter.

- Scrubber (list type of scrubber): DP (in. w.c.) and feed rate (gpm and psig)
- Baghouse, Cyclone, and Multi-clone: DP (in. w.c.)
- Catalytic Incinerator: (°F<sub>in</sub>, °F<sub>out</sub>) and Thermal Incinerator: (°F<sub>temperature</sub>)
- ESP: Number and identity of operating field(s)

| APC and parameter monitored | Run 1 | Run 2 | Run 3 | Run 4 | Average |
|-----------------------------|-------|-------|-------|-------|---------|
| Scrubber Water Flow, GPM    | 2346  | 2492  | 2484  |       | 2441    |
| Scrubber dP, In. W.C        | 11.4  | 11.5  | 11.6  |       | 11.5    |

| List pollutant & averaging basis.--should reflect permit | Run 1 | Run 2 | Run 3 | Run 4 | Average |
|--|-------|-------|-------|-------|---------|
| Continuous Opacity Monitor(list hourly average)          |       |       |       |       |         |
| Monitor (list averaging basis):                          |       |       |       |       |         |
| Monitor (list averaging basis):                          |       |       |       |       |         |

Abbreviations: APC=air pollution control  
lbs.=pounds

gpm.=gallons per minute  
psig=pressure per square inch gauge

in. w.c.=inches of water column  
ΔP.=pressure drop

**Note:** This form provides only a summary of the operating conditions during the performance test. Additional and more detailed records are required to meet the requirements of Minn. R. 7017.2035, subp. 3. This form is to be submitted as part of the performance test report

# Air Performance Test Form

## Operating Data Summary for Process Sources

### Facility Information (please print)

Company Name: Cleveland Cliffs (United Taconite)

Equipment ID No: SV048/STRU 16

Test date(s): 03/12/19

### Equipment and Operating Data

- Process Equipment Description: Line 2 Pellet Induration (EQUI47)
- Were the process and control equipment operated consistent with normal procedures? ☒ Yes ☐ No If no, explain: \_\_\_\_\_
- Include copy of production records or instrumentation which indicates rate of production or operation of the equipment, i.e. units per hour, pounds per hour, pressure, air flow, etc. \_\_\_\_\_
- Date(s) and procedure(s) of last maintenance/cleaning within 6 months:  
☒ Remains unchanged from info. provided in test plan
- Process rate (amount of raw material or finished product per hour, wet or dry basis) while combusting (list fuel type(s) and ratios as appropriate) \_\_\_\_\_

| Process Parameter: list type and units                  | Run 1 | Run 2 | Run 3 | Run 4 | Average |
|---|-------|-------|-------|-------|---------|
| Greenball Feed Rate, LTPH                               | 670   | 669   | 669   |       | 669     |
| Fired Pellet Production, LTPH                           | 545   | 544   | 544   |       | 544     |
| Fuel Input (list units) Gas, CFM                        | 1098  | 888   | 943   |       | 976     |
| Fuel Input (list units) Solid Fuel, TPH                 | 6.2   | 6.3   | 6.41  |       | 6.3     |
| Heat Input (10 <sup>6</sup> British thermal units/hour) | 233.7 | 222.5 | 222.8 |       | 228.3   |

- Summarize control equipment operating data documented during testing. Values reported should reflect maximum, minimum, averages, or as approved in the test plan. (See test plan and approval letter)

### Examples of APC equipment and parameters generally monitored. Monitor as in test plan and/or approval letter.

- Scrubber (list type of scrubber): DP (in. w.c.) and feed rate (gpm and psig)
- Baghouse, Cyclone, and Multi-clone: DP (in. w.c.)
- Catalytic Incinerator: (°F<sub>in</sub>, °F<sub>out</sub>) and Thermal Incinerator: (°F<sub>temperature</sub>)
- ESP: Number and identity of operating field(s)

| APC and parameter monitored | Run 1 | Run 2 | Run 3 | Run 4 | Average |
|-----------------------------|-------|-------|-------|-------|---------|
| Scrubber Water Flow, GPM    | 2516  | 2515  | 2515  |       | 2515    |
| Scrubber dP, In. W.C        | 12.0  | 12.0  | 12.1  |       | 12.0    |
|                             |       |       |       |       |         |
|                             |       |       |       |       |         |
|                             |       |       |       |       |         |
|                             |       |       |       |       |         |

| List pollutant & averaging basis.--should reflect permit | Run 1 | Run 2 | Run 3 | Run 4 | Average |
|--|-------|-------|-------|-------|---------|
| Continuous Opacity Monitor(list hourly average)          |       |       |       |       |         |
| Monitor (list averaging basis):                          |       |       |       |       |         |
| Monitor (list averaging basis):                          |       |       |       |       |         |

Abbreviations: APC=air pollution control  
lbs.-pounds

gpm.=gallons per minute  
psig=pressure per square inch gauge

in. w.c.=inches of water column  
ΔP=pressure drop

**Note:** This form provides only a summary of the operating conditions during the performance test. Additional and more detailed records are required to meet the requirements of Minn. R. 7017.2035, subp. 3. This form is to be submitted as part of the performance test report

## **APPENDIX G**

### **PROCEDURES**

Please Note: In an effort to conserve paper, the procedure section of the appendix has been reserved for explanations of EPA methodology deviations. Please refer to the specific EPA Methods on the following EPA websites:

<http://www.epa.gov/ttn/emc/>



## **APPENDIX H**

### **CALCULATION EQUATIONS**

INTERPOLL LABORATORIES, INC.  
(763) 786-6020

EPA Method 29/Mercury Calculations

Job \_\_\_\_\_ United Taconite \_\_\_\_\_ Test \_\_\_\_\_ 1 \_\_\_\_\_ Run \_\_\_\_\_ 1 \_\_\_\_\_  
Source \_\_\_\_\_ Line 2B Indurating Furnace (STRU15) \_\_\_\_\_ Test Site \_\_\_\_\_ Stack \_\_\_\_\_ Date of Analysis \_\_\_\_\_  
Date of Test \_\_\_\_\_ 2/12/2019 \_\_\_\_\_ Technician \_\_\_\_\_ E. Juers \_\_\_\_\_

Mass of Mercury:

| Method 29<br>Sampling Train<br>Fraction | M-29<br>Analytical<br>Fraction(s) | M-29<br>Nomenclature     | Analytical<br>Results<br>(ug)<br>Run 1 |
|---|-----------------------------------|--------------------------|--|
| Front Half Probe Wash/Filter            | 1B                                | Hg <sub>fh</sub>         | < 0.05                                 |
| Back Half HNO3 Imp/rinses               | 2B                                | Hg <sub>bh2</sub>        | 0.37                                   |
| Intermediate knockout Imp w/rinse       | 3A*                               |                          | < 0.025                                |
| KMNO4/H2SO4 Imp/Rinses                  | 3B                                |                          | 3.96                                   |
| HCL Rinse/Filter                        | 3C                                |                          | 6.29                                   |
| Back Half                               | 3A, 3B, 3C                        | Hg <sub>bh3(A,B,C)</sub> | ≤ 10.275                               |
| Total Back Half Fraction                | 2B, 3A, 3B, 3C                    | Hg <sub>bh</sub>         | ≤ 10.645                               |
| Total Train Collected                   | Total                             | Hg <sub>t</sub>          | ≤ 10.695                               |

Mercury Concentration ug/dscm(Cs):

Cs =  $\frac{Hg_t}{V_{std}/35.315}$   
Cs =  $\frac{10.695}{2.033}$   
Cs = 5.26

Hg<sub>t</sub> 10.6950 ug  
V<sub>std</sub> 71.8 DSCF

Emission Rate LB/HR (M):

M = (Cs) (Qs)(3.75466E-9)  
M = 0.00656 LB/HR

Cs = 5.260 ug/dscm

Qs = 333007 DSCF/Minute

3.74566E-9 = (1g/1000000ug)\*(1lb/453.59g)\*(1dscm/35.315dscf)

# **APPENDIX I**

## **ANALYZER COMPUTER PRINTOUTS**

United Taconite  
Forbes, MN  
Line 1 Waste Gas (STRU53)

2/12/2019  
Test 2 Run 1  
Natural Gas / Coal Mixture

Volumetric Flow Rate  
Number of Sample Points 12

| Traverse<br>Number | Point<br>Location | Delta p | Sq. Root<br>of Delta p | Stack<br>Temperature | Time    |
|--------------------|-------------------|---------|------------------------|----------------------|---------|
| 1                  | A-1               | 2.000   | 1.414                  | 142                  | 8:00 AM |
| 2                  | A-2               | 1.800   | 1.342                  | 139                  |         |
| 3                  | A-3               | 1.000   | 1.000                  | 137                  |         |
| 4                  | B-1               | 2.200   | 1.483                  | 137                  |         |
| 5                  | B-2               | 2.100   | 1.449                  | 140                  |         |
| 6                  | B-3               | 2.000   | 1.414                  | 140                  |         |
| 7                  | C-1               | 2.100   | 1.449                  | 140                  |         |
| 8                  | C-2               | 2.000   | 1.414                  | 139                  |         |
| 9                  | C-3               | 2.000   | 1.414                  | 142                  |         |
| 10                 | D-1               | 2.100   | 1.449                  | 142                  |         |
| 11                 | D-2               | 2.000   | 1.414                  | 142                  |         |
| 12                 | D-3               | 1.800   | 1.342                  | 140                  | 9:00 AM |
| Average            |                   | 1.925   | 1.382                  | 140                  |         |

#### FIELD CALCULATIONS

| Moisture Content              | Data       | Flow Rate              |           |
|-------------------------------|------------|------------------------|-----------|
| Meter Volume                  | 0.00       | Static Pressure        | -1.20     |
| Grams of Water                | 0.00       | Pitot Coefficient      | 0.84      |
| Average Gas Meter Temperature |            |                        |           |
| Gas Meter Coefficient         | 0.000      | Duct Width (in.)       | 0         |
| Standard Meter Volume         |            | Duct Length (in.)      | 0         |
| Barometric Pressure           | 28.47      | Duct Area (sq. ft.)    |           |
|                               |            | Stack Diameter (in.)   | 121.4     |
|                               |            | Stack Area (sq. ft.)   | 80.38     |
| Moisture Content              | 14.007     |                        |           |
| Oxygen, dry                   | 17.535     | Molecular Weight (dry) | 29.04     |
| CO <sub>2</sub> %, dry        | 2.095      | Molecular Weight (wet) | 27.49     |
|                               |            | Stack Pressure         | 28.38     |
|                               |            | Feet Per Second        | 87.03     |
| Standard CFH                  | 21,024,203 | Actual CFM             | 419766.53 |
| K Standard CFM                | 350.403    | Dry Standard CFM       | 301322.55 |

#### RAW DATA TABLE

| Instrument            | ppm or % | Zero | Span           | Gas  | Gas Corrected<br>For Calibration |
|-----------------------|----------|------|----------------|------|----------------------------------|
| O <sub>2</sub> (dry)  | 17.669   | 0.11 | 11.13          | 11.0 | 17.54                            |
| CO <sub>2</sub> (dry) | 2.097    | 0.03 | 8.31           | 8.4  | 2.10                             |
| Moisture              | 14.01    |      | Standard CFH   |      | 21,024,203                       |
| Fuel Factor d         | N/A      |      | K Standard CFM |      | 350.403                          |
| DSCFM                 | 301,323  |      |                |      |                                  |

#### RESULTS

O<sub>2</sub> % (dry) 17.54  
CO<sub>2</sub> % (dry) 2.1

United Taconite  
Forbes, MN  
Line 1 Waste Gas (STRU53)  
2/12/2019  
Run 1

| <u>Time</u>    | <u>O<sub>2</sub> %, d</u> | <u>CO<sub>2</sub> %, d</u> |
|----------------|---------------------------|----------------------------|
| 8:00 AM        | 17.741                    | 2.096                      |
| 8:01 AM        | 17.686                    | 1.958                      |
| 8:02 AM        | 17.694                    | 2.023                      |
| 8:03 AM        | 17.709                    | 2.093                      |
| 8:04 AM        | 17.718                    | 2.183                      |
| 8:05 AM        | 17.678                    | 2.031                      |
| 8:06 AM        | 17.690                    | 2.131                      |
| 8:07 AM        | 17.665                    | 2.093                      |
| 8:08 AM        | 17.669                    | 2.121                      |
| 8:09 AM        | 17.666                    | 2.094                      |
| 8:10 AM        | 17.649                    | 2.104                      |
| 8:11 AM        | 17.639                    | 2.146                      |
| 8:12 AM        | 17.671                    | 2.224                      |
| 8:13 AM        | 17.614                    | 2.212                      |
| 8:14 AM        | 17.621                    | 2.103                      |
| 8:15 AM        | 17.626                    | 2.189                      |
| 8:16 AM        | 17.642                    | 2.235                      |
| 8:17 AM        | 17.612                    | 2.063                      |
| 8:18 AM        | 17.636                    | 2.127                      |
| 8:19 AM        | 17.630                    | 2.149                      |
| 8:20 AM        | 17.623                    | 2.089                      |
| 8:21 AM        | 17.653                    | 2.146                      |
| 8:22 AM        | 17.659                    | 2.126                      |
| 8:23 AM        | 17.667                    | 2.133                      |
| 8:24 AM        | 17.653                    | 2.088                      |
| 8:25 AM        | 17.670                    | 2.126                      |
| 8:26 AM        | 17.694                    | 2.177                      |
| 8:27 AM        | 17.661                    | 2.094                      |
| 8:28 AM        | 17.673                    | 2.130                      |
| 8:29 AM        | 17.683                    | 2.194                      |
| 8:30 AM        | 17.683                    | 2.194                      |
| 8:31 AM        | 17.658                    | 2.091                      |
| 8:32 AM        | 17.680                    | 2.129                      |
| 8:33 AM        | 17.655                    | 2.086                      |
| 8:34 AM        | 17.666                    | 2.068                      |
| 8:35 AM        | 17.664                    | 2.134                      |
| 8:36 AM        | 17.685                    | 2.137                      |
| 8:37 AM        | 17.651                    | 2.025                      |
| 8:38 AM        | 17.657                    | 2.034                      |
| 8:39 AM        | 17.642                    | 1.980                      |
| 8:40 AM        | 17.667                    | 2.017                      |
| 8:41 AM        | 17.676                    | 2.046                      |
| 8:42 AM        | 17.697                    | 2.084                      |
| 8:43 AM        | 17.681                    | 2.124                      |
| 8:44 AM        | 17.653                    | 2.017                      |
| 8:45 AM        | 17.664                    | 2.068                      |
| 8:46 AM        | 17.679                    | 2.088                      |
| 8:47 AM        | 17.683                    | 2.085                      |
| 8:48 AM        | 17.665                    | 2.016                      |
| 8:49 AM        | 17.673                    | 2.067                      |
| 8:50 AM        | 17.703                    | 2.109                      |
| 8:51 AM        | 17.699                    | 2.138                      |
| 8:52 AM        | 17.685                    | 2.062                      |
| 8:53 AM        | 17.679                    | 2.008                      |
| 8:54 AM        | 17.680                    | 2.042                      |
| 8:55 AM        | 17.695                    | 2.092                      |
| 8:56 AM        | 17.702                    | 2.130                      |
| 8:57 AM        | 17.693                    | 2.022                      |
| 8:58 AM        | 17.665                    | 2.018                      |
| 8:59 AM        | 17.672                    | 2.063                      |
| <b>Average</b> | <b>17.669</b>             | <b>2.097</b>               |

United Taconite  
Forbes, MN  
Line 1 Waste Gas (STRU53)

2/12/2019  
Test 2 Run 2  
Natural Gas / Coal Mixture

Volumetric Flow Rate  
Number of Sample Points 12

| Traverse<br>Number | Point<br>Location | Delta p | Sq. Root<br>of Delta p | Stack<br>Temperature | Time     |
|--------------------|-------------------|---------|------------------------|----------------------|----------|
| 1                  | A-1               | 2.100   | 1.449                  | 139                  | 9:55 AM  |
| 2                  | A-2               | 2.000   | 1.414                  | 139                  |          |
| 3                  | A-3               | 1.800   | 1.342                  | 140                  |          |
| 4                  | B-1               | 1.900   | 1.378                  | 140                  |          |
| 5                  | B-2               | 2.000   | 1.414                  | 142                  |          |
| 6                  | B-3               | 1.900   | 1.378                  | 142                  |          |
| 7                  | C-1               | 1.900   | 1.378                  | 135                  |          |
| 8                  | C-2               | 1.800   | 1.342                  | 141                  |          |
| 9                  | C-3               | 1.600   | 1.265                  | 140                  |          |
| 10                 | D-1               | 1.900   | 1.378                  | 140                  |          |
| 11                 | D-2               | 1.800   | 1.342                  | 139                  |          |
| 12                 | D-3               | 1.400   | 1.183                  | 140                  |          |
|                    |                   |         |                        |                      | 12:32 PM |
| Average            |                   | 1.842   | 1.355                  | 140                  |          |

#### FIELD CALCULATIONS

| <u>Moisture Content</u>       | <u>Data</u> | <u>Flow Rate</u>       |           |
|-------------------------------|-------------|------------------------|-----------|
| Meter Volume                  | 0.00        | Static Pressure        | -1.20     |
| Grams of Water                | 0.00        | Pitot Coefficient      | 0.84      |
| Average Gas Meter Temperature |             |                        |           |
| Gas Meter Coefficient         | 0           | Duct Width (in.)       | 0.00      |
| Standard Meter Volume         |             | Duct Length (in.)      | 0.00      |
| Barometric Pressure           | 28.47       | Duct Area (sq. ft.)    | 0.00      |
|                               |             | Stack Diameter (in.)   | 121.40    |
|                               |             | Stack Area (sq. ft.)   | 80.38     |
| Moisture Content              | 12.846      |                        |           |
| Oxygen                        | 17.508      | Molecular Weight (dry) | 29.03     |
| CO <sub>2</sub> %             | 2.068       | Molecular Weight (wet) | 27.61     |
|                               |             | Stack Pressure         | 28.38     |
|                               |             | Feet Per Second        | 85.14     |
| Standard CFH                  | 20,575,721  | Actual CFM             | 410641.03 |
| K Standard CFM                | 342.929     | Dry Standard CFM       | 298876.14 |

#### RAW DATA TABLE

| <u>Instrument</u>     | <u>ppm or %</u> | <u>Zero</u> | <u>Span</u>    | <u>Gas</u> | <u>Gas Corrected<br/>For Calibration</u> |
|-----------------------|-----------------|-------------|----------------|------------|--|
| O <sub>2</sub> (dry)  | 17.614          | 0.13        | 11.12          | 11.00      | 17.51                                    |
| CO <sub>2</sub> (dry) | 2.051           | 0.03        | 8.21           | 8.37       | 2.07                                     |
| Moisture              | 12.85           |             | Standard CFH   |            | 20,575,721                               |
| Fuel Factor d         | N/A             |             | K Standard CFM |            | 342.929                                  |
| DSCFM                 | 298,876         |             |                |            |  |

#### RESULTS

O<sub>2</sub> % (dry) 17.51  
CO<sub>2</sub> % (dry) 2.07

Note: Run paused from 10:25 to 12:02

**United Taconite**  
**Forbes, MN**  
**Line 1 Waste Gas (STRU53)**  
**2/12/2019**  
**Run 2**

| <u>Time</u>    | <u>O<sub>2</sub> %, d</u> | <u>CO<sub>2</sub> %, d</u> |
|----------------|---------------------------|----------------------------|
| 9:55 AM        | 17.670                    | 2.516                      |
| 9:56 AM        | 17.700                    | 2.549                      |
| 9:57 AM        | 17.692                    | 2.620                      |
| 9:58 AM        | 17.712                    | 2.647                      |
| 9:59 AM        | 17.707                    | 2.673                      |
| 10:00 AM       | 17.725                    | 2.692                      |
| 10:01 AM       | 17.745                    | 2.679                      |
| 10:02 AM       | 17.745                    | 2.657                      |
| 10:03 AM       | 17.764                    | 2.641                      |
| 10:04 AM       | 17.751                    | 2.626                      |
| 10:05 AM       | 17.739                    | 2.608                      |
| 10:06 AM       | 17.725                    | 2.576                      |
| 10:07 AM       | 17.714                    | 2.528                      |
| 10:08 AM       | 17.704                    | 2.476                      |
| 10:09 AM       | 17.682                    | 2.434                      |
| 10:10 AM       | 17.684                    | 2.355                      |
| 10:11 AM       | 17.660                    | 2.316                      |
| 10:12 AM       | 17.568                    | 1.985                      |
| 10:13 AM       | 17.551                    | 1.919                      |
| 10:14 AM       | 17.538                    | 1.860                      |
| 10:15 AM       | 17.509                    | 1.811                      |
| 10:16 AM       | 17.503                    | 1.735                      |
| 10:17 AM       | 17.479                    | 1.685                      |
| 10:18 AM       | 17.485                    | 1.645                      |
| 10:19 AM       | 17.470                    | 1.625                      |
| 10:20 AM       | 17.463                    | 1.602                      |
| 10:21 AM       | 17.459                    | 1.598                      |
| 10:22 AM       | 17.480                    | 1.586                      |
| 10:23 AM       | 17.488                    | 1.602                      |
| 10:24 AM       | 17.572                    | 2.006                      |
| 12:03 PM       | 17.564                    | 2.085                      |
| 12:04 PM       | 17.596                    | 2.120                      |
| 12:05 PM       | 17.606                    | 2.173                      |
| 12:06 PM       | 17.636                    | 2.225                      |
| 12:07 PM       | 17.600                    | 2.024                      |
| 12:08 PM       | 17.615                    | 2.076                      |
| 12:09 PM       | 17.615                    | 2.102                      |
| 12:10 PM       | 17.627                    | 2.053                      |
| 12:11 PM       | 17.613                    | 1.991                      |
| 12:12 PM       | 17.629                    | 1.996                      |
| 12:13 PM       | 17.618                    | 2.006                      |
| 12:14 PM       | 17.627                    | 2.002                      |
| 12:15 PM       | 17.626                    | 1.969                      |
| 12:16 PM       | 17.615                    | 1.948                      |
| 12:17 PM       | 17.615                    | 1.887                      |
| 12:18 PM       | 17.588                    | 1.844                      |
| 12:19 PM       | 17.586                    | 1.816                      |
| 12:20 PM       | 17.578                    | 1.788                      |
| 12:21 PM       | 17.576                    | 1.743                      |
| 12:22 PM       | 17.573                    | 1.669                      |
| 12:23 PM       | 17.564                    | 1.622                      |
| 12:24 PM       | 17.644                    | 1.924                      |
| 12:25 PM       | 17.634                    | 1.886                      |
| 12:26 PM       | 17.637                    | 1.829                      |
| 12:27 PM       | 17.619                    | 1.775                      |
| 12:28 PM       | 17.594                    | 1.723                      |
| 12:29 PM       | 17.590                    | 1.692                      |
| 12:30 PM       | 17.587                    | 1.647                      |
| 12:31 PM       | 17.587                    | 1.618                      |
| 12:32 PM       | 17.589                    | 1.599                      |
| <b>Average</b> | <b>17.614</b>             | <b>2.051</b>               |

United Taconite  
Forbes, MN  
Line 1 Waste Gas (STRU53)

2/12/2019  
Test 2 Run 3  
Natural Gas / Coal Mixture

Volumetric Flow Rate  
Number of Sample Points 12

| Traverse<br>Number | Point<br>Location | Delta p | Sq. Root<br>of Delta p | Stack<br>Temperature | Time    |
|--------------------|-------------------|---------|------------------------|----------------------|---------|
| 1                  | A-1               | 2.000   | 1.414                  | 136                  | 1:05 PM |
| 2                  | A-2               | 1.700   | 1.304                  | 140                  |         |
| 3                  | A-3               | 1.400   | 1.183                  | 139                  |         |
| 4                  | B-1               | 1.900   | 1.378                  | 139                  |         |
| 5                  | B-2               | 1.600   | 1.265                  | 141                  |         |
| 6                  | B-3               | 1.000   | 1.000                  | 139                  |         |
| 7                  | C-1               | 1.800   | 1.342                  | 139                  |         |
| 8                  | C-2               | 1.700   | 1.304                  | 138                  |         |
| 9                  | C-3               | 1.600   | 1.265                  | 142                  |         |
| 10                 | D-1               | 1.900   | 1.378                  | 142                  |         |
| 11                 | D-2               | 1.700   | 1.304                  | 140                  |         |
| 12                 | D-3               | 1.400   | 1.183                  | 138                  | 2:05 PM |
| Average            |                   | 1.642   | 1.277                  | 139                  |         |

#### FIELD CALCULATIONS

| Moisture Content              | Data       | Flow Rate              |           |
|-------------------------------|------------|------------------------|-----------|
| Meter Volume                  | 0.00       | Static Pressure        | -1.20     |
| Grams of Water                | 0.00       | Pitot Coefficient      | 0.84      |
| Average Gas Meter Temperature |            |                        |           |
| Gas Meter Coefficient         | 0          | Duct Width (in.)       | 0         |
| Standard Meter Volume         |            | Duct Length (in.)      | 0         |
| Barometric Pressure           | 28.47      | Duct Area (sq. ft.)    | 0         |
|                               |            | Stack Diameter (in.)   | 121.40    |
|                               |            | Stack Area (sq. ft.)   | 80.38     |
| Moisture Content              | 14.037     |                        |           |
|                               |            | Molecular Weight (dry) | 29.003    |
| Oxygen                        | 17.449     | Molecular Weight (wet) | 27.459    |
| CO <sub>2</sub> %             | 1.907      | Stack Pressure         | 28.382    |
|                               |            | Feet Per Second        | 80.406    |
| Standard CFH                  | 19,441,958 | Actual CFM             | 387798.24 |
| K Standard CFM                | 324.033    | Dry Standard CFM       | 278548.59 |

#### RAW DATA TABLE

| Instrument            | ppm or % | Zero           | Span  | Gas  | Gas Corrected<br>For Calibration |
|-----------------------|----------|----------------|-------|------|----------------------------------|
| O <sub>2</sub> (dry)  | 17.645   | 0.13           | 11.17 | 11.0 | 17.45                            |
| CO <sub>2</sub> (dry) | 1.885    | 0.04           | 8.16  | 8.4  | 1.91                             |
| Moisture              | 14.04    |                |       |      |                                  |
| Fuel Factor d         | N/A      |                |       |      |                                  |
| DSCFM                 | 278,549  |                |       |      |                                  |
|                       |          | Standard CFH   |       |      | 19,441,958                       |
|                       |          | K Standard CFM |       |      | 324.033                          |

#### RESULTS

|                         |       |
|-------------------------|-------|
| O <sub>2</sub> % (dry)  | 17.45 |
| CO <sub>2</sub> % (dry) | 1.91  |



United Taconite  
Forbes, MN  
Line 1 Waste Gas (STRU53)  
2/12/2019  
Run 3

| <u>Time</u>    | <u>O<sub>2</sub> %, d</u> | <u>CO<sub>2</sub> %, d</u> |
|----------------|---------------------------|----------------------------|
| 1:05 PM        | 17.638                    | 2.028                      |
| 1:06 PM        | 17.656                    | 2.084                      |
| 1:07 PM        | 17.682                    | 2.109                      |
| 1:08 PM        | 17.672                    | 2.182                      |
| 1:09 PM        | 17.703                    | 2.217                      |
| 1:10 PM        | 17.665                    | 2.100                      |
| 1:11 PM        | 17.668                    | 2.100                      |
| 1:12 PM        | 17.635                    | 1.969                      |
| 1:13 PM        | 17.636                    | 1.959                      |
| 1:14 PM        | 17.634                    | 1.982                      |
| 1:15 PM        | 17.647                    | 1.988                      |
| 1:16 PM        | 17.648                    | 1.977                      |
| 1:17 PM        | 17.650                    | 1.949                      |
| 1:18 PM        | 17.643                    | 1.921                      |
| 1:19 PM        | 17.665                    | 1.880                      |
| 1:20 PM        | 17.653                    | 1.874                      |
| 1:21 PM        | 17.684                    | 1.933                      |
| 1:22 PM        | 17.688                    | 1.895                      |
| 1:23 PM        | 17.672                    | 1.840                      |
| 1:24 PM        | 17.650                    | 1.807                      |
| 1:25 PM        | 17.647                    | 1.763                      |
| 1:26 PM        | 17.639                    | 1.697                      |
| 1:27 PM        | 17.641                    | 1.647                      |
| 1:28 PM        | 17.615                    | 1.600                      |
| 1:29 PM        | 17.661                    | 1.870                      |
| 1:30 PM        | 17.665                    | 1.806                      |
| 1:31 PM        | 17.646                    | 1.774                      |
| 1:32 PM        | 17.645                    | 1.720                      |
| 1:33 PM        | 17.622                    | 1.680                      |
| 1:34 PM        | 17.611                    | 1.645                      |
| 1:35 PM        | 17.602                    | 1.611                      |
| 1:36 PM        | 17.588                    | 1.603                      |
| 1:37 PM        | 17.563                    | 1.561                      |
| 1:38 PM        | 17.561                    | 1.569                      |
| 1:39 PM        | 17.563                    | 1.579                      |
| 1:40 PM        | 17.584                    | 1.599                      |
| 1:41 PM        | 17.589                    | 1.624                      |
| 1:42 PM        | 17.605                    | 1.673                      |
| 1:43 PM        | 17.617                    | 1.735                      |
| 1:44 PM        | 17.607                    | 1.815                      |
| 1:45 PM        | 17.626                    | 1.887                      |
| 1:46 PM        | 17.645                    | 1.971                      |
| 1:47 PM        | 17.664                    | 1.969                      |
| 1:48 PM        | 17.672                    | 1.962                      |
| 1:49 PM        | 17.679                    | 2.025                      |
| 1:50 PM        | 17.676                    | 1.997                      |
| 1:51 PM        | 17.682                    | 2.023                      |
| 1:52 PM        | 17.670                    | 1.984                      |
| 1:53 PM        | 17.686                    | 2.050                      |
| 1:54 PM        | 17.665                    | 1.983                      |
| 1:55 PM        | 17.681                    | 1.984                      |
| 1:56 PM        | 17.658                    | 1.922                      |
| 1:57 PM        | 17.672                    | 1.957                      |
| 1:58 PM        | 17.653                    | 2.010                      |
| 1:59 PM        | 17.664                    | 1.992                      |
| 2:00 PM        | 17.653                    | 1.991                      |
| 2:01 PM        | 17.648                    | 2.008                      |
| 2:02 PM        | 17.636                    | 2.014                      |
| 2:03 PM        | 17.657                    | 2.015                      |
| 2:04 PM        | 17.662                    | 2.017                      |
| <b>Average</b> | <b>17.645</b>             | <b>1.885</b>               |

United Taconite  
Forbes, MN  
Line 2B

3/12/2019  
Test 2 Run 1

Volumetric Flow Rate  
Number of Sample Points 24

| Traverse<br>Number | Point<br>Location | Delta p | Sq. Root<br>of Delta p | Stack<br>Temperature | Time     |
|--------------------|-------------------|---------|------------------------|----------------------|----------|
| 1                  | A-1               | 1.150   | 1.072                  | 123.3                | 9:10 AM  |
| 2                  | A-2               | 1.200   | 1.095                  | 123.3                |          |
| 3                  | A-3               | 1.200   | 1.095                  | 123.3                |          |
| 4                  | A-4               | 1.200   | 1.095                  | 123.3                |          |
| 5                  | A-5               | 1.100   | 1.049                  | 123.3                |          |
| 6                  | A-6               | 1.050   | 1.025                  | 123.3                |          |
| 7                  | B-1               | 1.100   | 1.049                  | 123.3                |          |
| 8                  | B-2               | 1.100   | 1.049                  | 123.3                |          |
| 9                  | B-3               | 1.100   | 1.049                  | 123.3                |          |
| 10                 | B-4               | 1.100   | 1.049                  | 123.3                |          |
| 11                 | B-5               | 1.050   | 1.025                  | 123.3                | 11:45 AM |
| 12                 | B-6               | 1.000   | 1.000                  | 123.3                |          |
| 13                 | C-1               | 1.050   | 1.025                  | 123.3                |          |
| 14                 | C-2               | 1.050   | 1.025                  | 123.3                |          |
| 15                 | C-3               | 1.000   | 1.000                  | 123.3                |          |
| 16                 | C-4               | 1.000   | 1.000                  | 123.3                |          |
| 17                 | C-5               | 0.950   | 0.975                  | 123.3                |          |
| 18                 | C-6               | 0.850   | 0.922                  | 123.3                |          |
| 19                 | D-1               | 1.050   | 1.025                  | 123.3                |          |
| 20                 | D-2               | 1.050   | 1.025                  | 123.3                |          |
| 21                 | D-3               | 1.050   | 1.025                  | 123.3                |          |
| 22                 | D-4               | 1.100   | 1.049                  | 123.3                |          |
| 23                 | D-5               | 1.050   | 1.025                  | 123.3                |          |
| 24                 | D-6               | 1.050   | 1.025                  | 123.3                |          |
| Average            |                   | 1.067   | 1.032                  | 123                  |          |

#### FIELD CALCULATIONS

| Moisture Content              | Date       | Flow Rate              |           |
|-------------------------------|------------|------------------------|-----------|
| Meter Volume                  | 76.60      | Static Pressure        | -0.75     |
| Grams of Water                | 239.10     | Pitot Coefficient      | 0.84      |
| Average Gas Meter Temperature | 78.5       |                        |           |
| Gas Meter Coefficient         | 1.0006     | Duct Width (in.)       | 0         |
| Standard Meter Volume         | 71.560     | Duct Length (in.)      | 0         |
| Barometric Pressure           | 28.49      | Duct Area (sq. ft.)    |           |
|                               |            | Stack Diameter (in.)   | 146.25    |
|                               |            | Stack Area (sq. ft.)   | 116.66    |
| Moisture Content              | 13.281     |                        |           |
| Oxygen, dry                   | 18.182     | Molecular Weight (dry) | 28.97     |
| CO <sub>2</sub> %, dry        | 1.531      | Molecular Weight (wet) | 27.51     |
|                               |            | Stack Pressure         | 28.43     |
|                               |            | Feet Per Second        | 64.       |
| Standard CFH                  | 23,120,985 | Actual CFM             | 447944.02 |
| K Standard CFM                | 385.35     | Dry Standard CFM       | 334170.16 |

#### RAW DATA TABLE

| Instrument            | ppm or % | Zero | Span           | Gas  | Gas Corrected<br>For Calibration |
|-----------------------|----------|------|----------------|------|----------------------------------|
| O <sub>2</sub> (dry)  | 18.131   | 0.11 | 20.93          | 21.0 | 18.18                            |
| CO <sub>2</sub> (dry) | 1.637    | 0.11 | 8.49           | 8.4  | 1.53                             |
| Moisture              | 13.28    |      | Standard CFH   |      | 23,120,985                       |
| Fuel Factor d         | N/A      |      | K Standard CFM |      | 385.35                           |
| DSCFM                 | 334,170  |      |                |      |                                  |

#### RESULTS

O<sub>2</sub> % (dry) 18.18  
CO<sub>2</sub> % (dry) 1.53

United Taconite  
Forbes, MN  
Line 25  
3/22/2019  
Run 1

| Time        | D <sub>50</sub> % d | CD <sub>50</sub> % d |
|-------------|---------------------|----------------------|
| 8:10:01 AM  | 18.150              | 1.938                |
| 8:11:01 AM  | 18.154              | 1.938                |
| 8:12:01 AM  | 18.159              | 1.886                |
| 8:13:01 AM  | 18.156              | 1.887                |
| 8:14:01 AM  | 18.172              | 1.950                |
| 8:15:01 AM  | 18.176              | 1.945                |
| 8:16:01 AM  | 18.187              | 1.836                |
| 8:17:01 AM  | 18.100              | 1.832                |
| 8:18:01 AM  | 18.174              | 1.848                |
| 8:19:01 AM  | 18.174              | 1.950                |
| 8:20:01 AM  | 18.175              | 1.945                |
| 8:21:01 AM  | 18.195              | 1.982                |
| 8:22:01 AM  | 18.181              | 1.956                |
| 8:23:01 AM  | 18.185              | 1.946                |
| 8:24:01 AM  | 18.194              | 1.945                |
| 8:25:01 AM  | 18.159              | 1.850                |
| 8:26:01 AM  | 18.195              | 1.831                |
| 8:27:01 AM  | 18.174              | 1.844                |
| 8:28:01 AM  | 18.154              | 1.855                |
| 8:29:01 AM  | 18.172              | 1.845                |
| 8:30:01 AM  | 18.170              | 1.843                |
| 8:31:01 AM  | 18.168              | 1.853                |
| 8:32:01 AM  | 18.163              | 1.882                |
| 8:33:01 AM  | 18.160              | 1.843                |
| 8:34:01 AM  | 18.164              | 1.843                |
| 8:35:01 AM  | 18.149              | 1.856                |
| 8:36:01 AM  | 18.127              | 1.870                |
| 8:37:01 AM  | 18.160              | 1.869                |
| 8:38:01 AM  | 18.160              | 1.849                |
| 8:39:01 AM  | 18.156              | 1.860                |
| 8:40:01 AM  | 18.153              | 1.850                |
| 8:41:01 AM  | 18.146              | 1.847                |
| 8:42:01 AM  | 18.145              | 1.854                |
| 8:43:01 AM  | 18.132              | 1.856                |
| 8:44:01 AM  | 18.115              | 1.850                |
| 8:45:01 AM  | 18.123              | 1.882                |
| 8:46:01 AM  | 18.119              | 1.872                |
| 8:47:01 AM  | 18.126              | 1.871                |
| 8:48:01 AM  | 18.119              | 1.883                |
| 8:49:01 AM  | 18.126              | 1.887                |
| 8:50:01 AM  | 18.140              | 1.862                |
| 8:51:01 AM  | 18.140              | 1.882                |
| 8:52:01 AM  | 18.137              | 1.859                |
| 8:53:01 AM  | 18.129              | 1.880                |
| 8:54:01 AM  | 18.144              | 1.855                |
| 8:55:01 AM  | 18.125              | 1.872                |
| 8:56:01 AM  | 18.120              | 1.878                |
| 8:57:01 AM  | 18.120              | 1.872                |
| 8:58:01 AM  | 18.129              | 1.879                |
| 8:59:01 AM  | 18.131              | 1.883                |
| 9:00:01 AM  | 18.133              | 1.883                |
| 9:01:01 AM  | 18.134              | 1.857                |
| 9:02:01 AM  | 18.140              | 1.851                |
| 9:03:01 AM  | 18.140              | 1.880                |
| 9:04:01 AM  | 18.138              | 1.854                |
| 9:05:01 AM  | 18.151              | 1.851                |
| 9:06:01 AM  | 18.144              | 1.855                |
| 9:07:01 AM  | 18.150              | 1.889                |
| 9:08:01 AM  | 18.135              | 1.886                |
| 9:09:01 AM  | 18.124              | 1.884                |
| 9:10:01 AM  | 18.125              | 1.857                |
| 9:11:01 AM  | 18.121              | 1.881                |
| 9:12:01 AM  | 18.130              | 1.881                |
| 9:13:01 AM  | 18.117              | 1.871                |
| 9:14:01 AM  | 18.138              | 1.859                |
| 9:15:01 AM  | 18.128              | 1.881                |
| 9:16:01 AM  | 18.126              | 1.857                |
| 9:17:01 AM  | 18.121              | 1.881                |
| 9:18:01 AM  | 18.105              | 1.885                |
| 9:19:01 AM  | 18.122              | 1.847                |
| 9:20:01 AM  | 18.107              | 1.855                |
| 9:21:01 AM  | 18.085              | 1.886                |
| 9:22:01 AM  | 18.104              | 1.854                |
| 9:23:01 AM  | 18.112              | 1.852                |
| 9:24:01 AM  | 18.117              | 1.844                |
| 9:25:01 AM  | 18.089              | 1.881                |
| 9:26:01 AM  | 18.084              | 1.878                |
| 9:27:01 AM  | 18.081              | 1.875                |
| 9:28:01 AM  | 18.118              | 1.848                |
| 9:29:01 AM  | 18.129              | 1.841                |
| 9:30:01 AM  | 18.139              | 1.834                |
| 9:31:01 AM  | 18.164              | 1.816                |
| 9:32:01 AM  | 18.163              | 1.813                |
| 9:33:01 AM  | 18.145              | 1.818                |
| 9:34:01 AM  | 18.133              | 1.821                |
| 9:35:01 AM  | 18.133              | 1.818                |
| 9:36:01 AM  | 18.135              | 1.815                |
| 9:37:01 AM  | 18.126              | 1.823                |
| 9:38:01 AM  | 18.135              | 1.812                |
| 9:39:01 AM  | 18.140              | 1.803                |
| 9:40:01 AM  | 18.135              | 1.804                |
| 9:41:01 AM  | 18.120              | 1.809                |
| 9:42:01 AM  | 18.110              | 1.812                |
| 9:43:01 AM  | 18.114              | 1.802                |
| 9:44:01 AM  | 18.131              | 1.802                |
| 9:45:01 AM  | 18.112              | 1.807                |
| 9:46:01 AM  | 18.115              | 1.808                |
| 9:47:01 AM  | 18.118              | 1.800                |
| 9:48:01 AM  | 18.112              | 1.807                |
| 9:49:01 AM  | 18.106              | 1.806                |
| 9:50:01 AM  | 18.098              | 1.808                |
| 9:51:01 AM  | 18.109              | 1.808                |
| 9:52:01 AM  | 18.119              | 1.801                |
| 9:53:01 AM  | 18.104              | 1.805                |
| 9:54:01 AM  | 18.100              | 1.812                |
| 9:55:01 AM  | 18.106              | 1.803                |
| 9:56:01 AM  | 18.108              | 1.805                |
| 9:57:01 AM  | 18.105              | 1.812                |
| 9:58:01 AM  | 18.090              | 1.814                |
| 9:59:01 AM  | 18.067              | 1.802                |
| 10:00:01 AM | 18.068              | 1.808                |
| 10:01:01 AM | 18.067              | 1.807                |
| 10:02:01 AM | 18.090              | 1.809                |
| 10:03:01 AM | 18.108              | 1.806                |
| 10:04:01 AM | 18.101              | 1.804                |
| 10:05:01 AM | 18.117              | 1.808                |
| 10:06:01 AM | 18.134              | 1.800                |
| 10:07:01 AM | 18.142              | 1.852                |
| 10:08:01 AM | 18.141              | 1.859                |
| 10:09:01 AM | 18.111              | 1.809                |
| 10:10:01 AM | 18.088              | 1.800                |
| 10:11:01 AM | 18.102              | 1.802                |
| 10:12:01 AM | 18.089              | 1.803                |
| 10:13:01 AM | 18.081              | 1.807                |
| 10:14:01 AM | 18.087              | 1.804                |
| 10:15:01 AM | 18.109              | 1.803                |
| 10:16:01 AM | 18.110              | 1.802                |
| 10:17:01 AM | 18.086              | 1.809                |
| 10:18:01 AM | 18.121              | 1.837                |

United Taconite  
Forbes, MN  
Line 2B

3/12/2019  
Test 2 Run 2

Volumetric Flow Rate  
Number of Sample Points 24

| Traverse<br>Number | Point<br>Location | Delta p | Sq. Root<br>of Delta p | Stack<br>Temperature | Time     |
|--------------------|-------------------|---------|------------------------|----------------------|----------|
| 1                  | A-1               | 1.100   | 1.049                  | 123.8                | 12:42 PM |
| 2                  | A-2               | 1.100   | 1.049                  | 123.8                |          |
| 3                  | A-3               | 1.100   | 1.049                  | 123.8                |          |
| 4                  | A-4               | 1.100   | 1.049                  | 123.8                |          |
| 5                  | A-5               | 1.150   | 1.072                  | 123.8                |          |
| 6                  | A-6               | 1.150   | 1.072                  | 123.8                |          |
| 7                  | B-1               | 1.100   | 1.049                  | 123.8                | 2:49 PM  |
| 8                  | B-2               | 1.050   | 1.025                  | 123.8                |          |
| 9                  | B-3               | 1.050   | 1.025                  | 123.8                |          |
| 10                 | B-4               | 1.000   | 1.000                  | 123.8                |          |
| 11                 | B-5               | 1.000   | 1.000                  | 123.8                |          |
| 12                 | B-6               | 1.050   | 1.025                  | 123.8                |          |
| 13                 | C-1               | 1.100   | 1.049                  | 123.8                |          |
| 14                 | C-2               | 1.150   | 1.072                  | 123.8                |          |
| 15                 | C-3               | 1.100   | 1.049                  | 123.8                |          |
| 16                 | C-4               | 1.100   | 1.049                  | 123.8                |          |
| 17                 | C-5               | 1.050   | 1.025                  | 123.8                |          |
| 18                 | C-6               | 1.050   | 1.025                  | 123.8                |          |
| 19                 | D-1               | 1.200   | 1.095                  | 123.8                |          |
| 20                 | D-2               | 1.250   | 1.118                  | 123.8                |          |
| 21                 | D-3               | 1.100   | 1.049                  | 123.8                |          |
| 22                 | D-4               | 1.100   | 1.049                  | 123.8                |          |
| 23                 | D-5               | 0.950   | 0.975                  | 123.8                |          |
| 24                 | D-6               | 0.750   | 0.866                  | 123.8                |          |
| Average            |                   | 1.077   | 1.037                  | 124                  |          |

#### FIELD CALCULATIONS

| Moisture Content              | Data       | Flow Rate              |           |
|-------------------------------|------------|------------------------|-----------|
| Meter Volume                  | 76.68      | Static Pressure        | -0.75     |
| Grams of Water                | 214.50     | Pitot Coefficient      | 0.84      |
| Average Gas Meter Temperature | 78.7       |                        |           |
| Gas Meter Coefficient         | 1.0006     | Duct Width (in.)       | 0.00      |
| Standard Meter Volume         | 71.61      | Duct Length (in.)      | 0.00      |
| Barometric Pressure           | 28.49      | Duct Area (sq. ft.)    | 0.00      |
|                               |            | Stack Diameter (in.)   | 146.25    |
|                               |            | Stack Area (sq. ft.)   | 116.66    |
| Moisture Content              | 12.376     |                        |           |
| Oxygen                        | 18.126     | Molecular Weight (dry) | 28.95     |
| CO <sub>2</sub> %             | 1.388      | Molecular Weight (wet) | 27.59     |
|                               |            | Stack Pressure         | 28.43     |
|                               |            | Feet Per Second        | 64.22     |
| Standard CFH                  | 23,183,423 | Actual CFM             | 449538.70 |
| K Standard CFM                | 386.39     | Dry Standard CFM       | 338571.55 |

#### RAW DATA TABLE

| Instrument            | ppm or % | Zero | Span           | Gas   | Gas Corrected<br>For Calibration |
|-----------------------|----------|------|----------------|-------|----------------------------------|
| O <sub>2</sub> (dry)  | 18.029   | 0.11 | 20.87          | 21.00 | 18.13                            |
| CO <sub>2</sub> (dry) | 1.509    | 0.15 | 8.38           | 8.38  | 1.39                             |
| Moisture              | 12.38    |      | Standard CFH   |       | 23,183,423                       |
| Fuel Factor d         | N/A      |      | K Standard CFM |       | 386.39                           |
| DSCFM                 | 338,572  |      |                |       |                                  |

#### RESULTS

|                         |       |
|-------------------------|-------|
| O <sub>2</sub> % (dry)  | 18.13 |
| CO <sub>2</sub> % (dry) | 1.39  |

United Taconite  
Forbes, MN  
Line 2B  
3/12/2019  
Run 2

| Time     | CO <sub>2</sub> % d | CO <sub>2</sub> % d |
|----------|---------------------|---------------------|
| 12:42 PM | 18.121              | 1.476               |
| 12:43 PM | 18.132              | 1.468               |
| 12:44 PM | 18.135              | 1.459               |
| 12:45 PM | 18.135              | 1.455               |
| 12:46 PM | 18.120              | 1.463               |
| 12:47 PM | 18.140              | 1.460               |
| 12:48 PM | 18.127              | 1.451               |
| 12:49 PM | 18.122              | 1.470               |
| 12:50 PM | 18.119              | 1.470               |
| 12:51 PM | 18.121              | 1.471               |
| 12:52 PM | 18.119              | 1.482               |
| 12:53 PM | 18.106              | 1.481               |
| 12:54 PM | 18.111              | 1.483               |
| 12:55 PM | 18.127              | 1.471               |
| 12:56 PM | 18.134              | 1.468               |
| 12:57 PM | 18.130              | 1.473               |
| 12:58 PM | 18.124              | 1.478               |
| 12:59 PM | 18.137              | 1.464               |
| 1:00 PM  | 18.132              | 1.460               |
| 1:01 PM  | 18.127              | 1.472               |
| 1:02 PM  | 18.136              | 1.464               |
| 1:03 PM  | 18.130              | 1.465               |
| 1:04 PM  | 18.123              | 1.471               |
| 1:05 PM  | 18.116              | 1.475               |
| 1:06 PM  | 18.117              | 1.469               |
| 1:07 PM  | 18.125              | 1.461               |
| 1:08 PM  | 18.122              | 1.460               |
| 1:09 PM  | 18.123              | 1.462               |
| 1:10 PM  | 18.112              | 1.472               |
| 1:11 PM  | 18.111              | 1.473               |
| 1:12 PM  | 18.112              | 1.470               |
| 1:13 PM  | 18.110              | 1.474               |
| 1:14 PM  | 18.108              | 1.479               |
| 1:15 PM  | 18.118              | 1.467               |
| 1:16 PM  | 18.109              | 1.477               |
| 1:17 PM  | 18.113              | 1.467               |
| 1:18 PM  | 18.100              | 1.478               |
| 1:19 PM  | 18.095              | 1.481               |
| 1:20 PM  | 18.105              | 1.477               |
| 1:21 PM  | 18.101              | 1.476               |
| 1:22 PM  | 18.105              | 1.474               |
| 1:23 PM  | 18.095              | 1.479               |
| 1:24 PM  | 18.084              | 1.483               |
| 1:25 PM  | 18.094              | 1.481               |
| 1:26 PM  | 18.105              | 1.473               |
| 1:27 PM  | 18.128              | 1.451               |
| 1:28 PM  | 18.160              | 1.434               |
| 1:29 PM  | 18.138              | 1.449               |
| 1:30 PM  | 18.129              | 1.453               |
| 1:31 PM  | 18.122              | 1.470               |
| 1:32 PM  | 18.104              | 1.468               |
| 1:33 PM  | 18.099              | 1.516               |
| 1:34 PM  | 18.093              | 1.495               |
| 1:35 PM  | 18.080              | 1.488               |
| 1:36 PM  | 18.100              | 1.472               |
| 1:37 PM  | 18.097              | 1.479               |
| 1:38 PM  | 18.107              | 1.470               |
| 1:39 PM  | 18.090              | 1.484               |
| 1:40 PM  | 18.083              | 1.490               |
| 1:41 PM  | 18.062              | 1.481               |
| 1:42 PM  | 18.061              | 1.484               |
| 1:43 PM  | 18.075              | 1.485               |
| 1:44 PM  | 18.064              | 1.495               |
| 1:45 PM  | 18.066              | 1.496               |
| 1:46 PM  | 18.072              | 1.483               |
| 1:47 PM  | 18.062              | 1.483               |
| 1:48 PM  | 18.042              | 1.511               |
| 1:49 PM  | 18.068              | 1.493               |
| 1:50 PM  | 18.050              | 1.494               |
| 1:51 PM  | 18.048              | 1.487               |
| 1:52 PM  | 18.035              | 1.508               |
| 1:53 PM  | 18.035              | 1.512               |
| 1:54 PM  | 18.041              | 1.508               |
| 1:55 PM  | 18.045              | 1.502               |
| 1:56 PM  | 18.023              | 1.521               |
| 1:57 PM  | 18.032              | 1.511               |
| 1:58 PM  | 18.042              | 1.513               |
| 1:59 PM  | 18.035              | 1.520               |
| 2:00 PM  | 18.025              | 1.514               |
| 2:01 PM  | 18.035              | 1.513               |
| 2:02 PM  | 18.030              | 1.510               |
| 2:03 PM  | 18.043              | 1.510               |
| 2:04 PM  | 18.044              | 1.501               |
| 2:05 PM  | 18.041              | 1.498               |
| 2:06 PM  | 18.048              | 1.493               |
| 2:07 PM  | 18.032              | 1.516               |
| 2:08 PM  | 18.028              | 1.510               |
| 2:09 PM  | 18.015              | 1.517               |
| 2:10 PM  | 18.023              | 1.511               |
| 2:11 PM  | 18.019              | 1.514               |
| 2:12 PM  | 18.029              | 1.515               |
| 2:13 PM  | 18.022              | 1.515               |
| 2:14 PM  | 18.016              | 1.521               |
| 2:15 PM  | 18.014              | 1.523               |
| 2:16 PM  | 18.023              | 1.515               |
| 2:17 PM  | 18.029              | 1.511               |
| 2:18 PM  | 18.017              | 1.516               |
| 2:19 PM  | 18.021              | 1.512               |
| 2:20 PM  | 18.017              | 1.514               |
| 2:21 PM  | 18.012              | 1.518               |
| 2:22 PM  | 18.009              | 1.526               |
| 2:23 PM  | 18.027              | 1.514               |
| 2:24 PM  | 18.028              | 1.503               |
| 2:25 PM  | 18.035              | 1.503               |
| 2:26 PM  | 18.022              | 1.501               |
| 2:27 PM  | 18.027              | 1.500               |
| 2:28 PM  | 18.025              | 1.504               |
| 2:29 PM  | 18.020              | 1.513               |
| 2:30 PM  | 18.005              | 1.520               |
| 2:31 PM  | 18.006              | 1.522               |
| 2:32 PM  | 18.007              | 1.516               |
| 2:33 PM  | 18.014              | 1.514               |
| 2:34 PM  | 18.016              | 1.513               |
| 2:35 PM  | 18.025              | 1.497               |
| 2:36 PM  | 18.019              | 1.510               |
| 2:37 PM  | 17.999              | 1.521               |
| 2:38 PM  | 17.994              | 1.525               |
| 2:39 PM  | 17.999              | 1.519               |
| 2:40 PM  | 18.004              | 1.517               |
| 2:41 PM  | 18.003              | 1.527               |
| 2:42 PM  | 18.007              | 1.513               |
| 2:43 PM  | 17.992              | 1.533               |
| 2:44 PM  | 17.989              | 1.524               |
| 2:45 PM  | 17.993              | 1.517               |
| 2:46 PM  | 18.002              | 1.512               |
| 2:47 PM  | 18.015              | 1.503               |
| 2:48 PM  | 17.987              | 1.522               |
| Average  | 18.029              | 1.509               |

United Taconite  
Forbes, MN  
Line 2B

3/12/2019  
Test 2 Run 3

Volumetric Flow Rate  
Number of Sample Points 24

| Traverse<br>Number | Point<br>Location | Delta p | Sq. Root<br>of Delta p | Stack<br>Temperature | Time    |
|--------------------|-------------------|---------|------------------------|----------------------|---------|
| 1                  | A-1               | 1.150   | 1.072                  | 123.8                | 4:10 PM |
| 2                  | A-2               | 1.100   | 1.049                  | 123.8                |         |
| 3                  | A-3               | 1.050   | 1.025                  | 123.8                |         |
| 4                  | A-4               | 1.100   | 1.049                  | 123.8                |         |
| 5                  | A-5               | 1.000   | 1.000                  | 123.8                |         |
| 6                  | A-6               | 0.850   | 0.922                  | 123.8                |         |
| 7                  | B-1               | 1.150   | 1.072                  | 123.8                |         |
| 8                  | B-2               | 1.050   | 1.025                  | 123.8                |         |
| 9                  | B-3               | 1.050   | 1.025                  | 123.8                |         |
| 10                 | B-4               | 1.050   | 1.025                  | 123.8                |         |
| 11                 | B-5               | 0.950   | 0.975                  | 123.8                | 6:25 PM |
| 12                 | B-6               | 0.850   | 0.922                  | 123.8                |         |
| 13                 | C-1               | 1.100   | 1.049                  | 123.8                |         |
| 14                 | C-2               | 1.100   | 1.049                  | 123.8                |         |
| 15                 | C-3               | 1.050   | 1.025                  | 123.8                |         |
| 16                 | C-4               | 1.000   | 1.000                  | 123.8                |         |
| 17                 | C-5               | 1.050   | 1.025                  | 123.8                |         |
| 18                 | C-6               | 0.950   | 0.975                  | 123.8                |         |
| 19                 | D-1               | 1.050   | 1.025                  | 123.8                |         |
| 20                 | D-2               | 1.100   | 1.049                  | 123.8                |         |
| 21                 | D-3               | 1.100   | 1.049                  | 123.8                |         |
| 22                 | D-4               | 1.100   | 1.049                  | 123.8                |         |
| 23                 | D-5               | 1.000   | 1.000                  | 123.8                |         |
| 24                 | D-6               | 0.990   | 0.995                  | 123.8                |         |
| Average            |                   | 1.039   | 1.019                  | 124                  |         |

#### FIELD CALCULATIONS

| <u>Moisture Content</u>       | <u>Data</u> | <u>Flow Rate</u>       |           |
|-------------------------------|-------------|------------------------|-----------|
| Meter Volume                  | 75.46       | Static Pressure        | -0.75     |
| Grams of Water                | 238.20      | Pitot Coefficient      | 0.84      |
| Average Gas Meter Temperature | 78.5        |                        |           |
| Gas Meter Coefficient         | 1.0006      | Duct Width (in.)       | 0         |
| Standard Meter Volume         | 70.495      | Duct Length (in.)      | 0         |
| Barometric Pressure           | 28.49       | Duct Area (sq. ft.)    | 0         |
|                               |             | Stack Diameter (in.)   | 146.25    |
|                               |             | Stack Area (sq. ft.)   | 116.66    |
| Moisture Content              | 13.465      |                        |           |
| Oxygen                        | 18.189      | Molecular Weight (dry) | 28.957    |
| CO <sub>2</sub> %             | 1.434       | Molecular Weight (wet) | 27.482    |
|                               |             | Stack Pressure         | 26.435    |
|                               |             | Feet Per Second        | 63.227    |
| Standard CFH                  | 22,823,622  | Actual CFM             | 442561.97 |
| K Standard CFM                | 380.394     | Dry Standard CFM       | 329175.46 |

#### RAW DATA TABLE

| <u>Instrument</u>     | <u>ppm or %</u> | <u>Zero</u>    | <u>Span</u> | <u>Gas</u> | <u>Gas Corrected<br/>For Calibration</u> |
|-----------------------|-----------------|----------------|-------------|------------|--|
| O <sub>2</sub> (dry)  | 18.066          | 0.12           | 20.84       | 21.0       | 18.19                                    |
| CO <sub>2</sub> (dry) | 1.520           | 0.12           | 8.31        | 8.4        | 1.43                                     |
| Moisture              | 13.46           |                |             |            |  |
| Fuel Factor d         | N/A             |                |             |            |  |
| DSCFM                 | 329,175         |                |             |            |  |
|                       |                 | Standard CFH   |             |            | 22,823,622                               |
|                       |                 | K Standard CFM |             |            | 380.394                                  |

#### RESULTS

O<sub>2</sub> % (dry) 18.19  
CO<sub>2</sub> % (dry) 1.43

United Taconite  
Forbes, MN  
Line 2B  
3/12/2010  
Run 3

| Time    | O <sub>2</sub> % d | CO <sub>2</sub> % d |
|---------|--------------------|---------------------|
| 4:10 PM | 18.077             | 1.528               |
| 4:11 PM | 18.058             | 1.537               |
| 4:12 PM | 18.066             | 1.529               |
| 4:13 PM | 18.089             | 1.523               |
| 4:14 PM | 18.068             | 1.534               |
| 4:15 PM | 18.071             | 1.535               |
| 4:16 PM | 18.070             | 1.525               |
| 4:22 PM | 18.083             | 1.521               |
| 4:23 PM | 18.072             | 1.533               |
| 4:24 PM | 18.057             | 1.543               |
| 4:25 PM | 18.048             | 1.543               |
| 4:26 PM | 18.063             | 1.533               |
| 4:27 PM | 18.059             | 1.533               |
| 4:28 PM | 18.048             | 1.545               |
| 4:29 PM | 18.051             | 1.542               |
| 4:30 PM | 18.067             | 1.535               |
| 4:33 PM | 18.072             | 1.531               |
| 4:34 PM | 18.063             | 1.539               |
| 4:35 PM | 18.063             | 1.541               |
| 4:36 PM | 18.064             | 1.539               |
| 4:37 PM | 18.062             | 1.539               |
| 4:38 PM | 18.077             | 1.535               |
| 4:39 PM | 18.090             | 1.526               |
| 4:40 PM | 18.064             | 1.537               |
| 4:41 PM | 18.058             | 1.536               |
| 4:42 PM | 18.072             | 1.526               |
| 4:43 PM | 18.063             | 1.531               |
| 4:44 PM | 18.065             | 1.530               |
| 4:45 PM | 18.060             | 1.533               |
| 4:46 PM | 18.057             | 1.537               |
| 4:47 PM | 18.057             | 1.534               |
| 4:48 PM | 18.065             | 1.534               |
| 4:49 PM | 18.058             | 1.539               |
| 4:50 PM | 18.062             | 1.539               |
| 4:51 PM | 18.076             | 1.532               |
| 4:52 PM | 18.059             | 1.539               |
| 4:53 PM | 18.049             | 1.544               |
| 4:54 PM | 18.065             | 1.524               |
| 4:55 PM | 18.074             | 1.519               |
| 4:56 PM | 18.082             | 1.526               |
| 4:57 PM | 18.041             | 1.532               |
| 4:58 PM | 18.045             | 1.532               |
| 4:59 PM | 18.045             | 1.533               |
| 5:00 PM | 18.050             | 1.527               |
| 5:01 PM | 18.057             | 1.527               |
| 5:02 PM | 18.058             | 1.528               |
| 5:03 PM | 18.073             | 1.518               |
| 5:04 PM | 18.060             | 1.522               |
| 5:05 PM | 18.063             | 1.520               |
| 5:06 PM | 18.070             | 1.525               |
| 5:07 PM | 18.058             | 1.527               |
| 5:08 PM | 18.075             | 1.519               |
| 5:09 PM | 18.070             | 1.518               |
| 5:10 PM | 18.082             | 1.521               |
| 5:11 PM | 18.070             | 1.515               |
| 5:12 PM | 18.070             | 1.514               |
| 5:13 PM | 18.073             | 1.516               |
| 5:14 PM | 18.066             | 1.528               |
| 5:15 PM | 18.075             | 1.511               |
| 5:16 PM | 18.090             | 1.512               |
| 5:17 PM | 18.053             | 1.520               |
| 5:18 PM | 18.046             | 1.533               |
| 5:19 PM | 18.053             | 1.521               |
| 5:20 PM | 18.058             | 1.520               |
| 5:21 PM | 18.078             | 1.512               |
| 5:22 PM | 18.063             | 1.521               |
| 5:23 PM | 18.040             | 1.537               |
| 5:24 PM | 18.043             | 1.537               |
| 5:25 PM | 18.049             | 1.532               |
| 5:26 PM | 18.041             | 1.535               |
| 5:27 PM | 18.042             | 1.536               |
| 5:28 PM | 18.046             | 1.534               |
| 5:29 PM | 18.055             | 1.533               |
| 5:30 PM | 18.055             | 1.532               |
| 5:31 PM | 18.062             | 1.524               |
| 5:32 PM | 18.073             | 1.522               |
| 5:33 PM | 18.129             | 1.469               |
| 5:34 PM | 18.123             | 1.464               |
| 5:35 PM | 18.107             | 1.478               |
| 5:36 PM | 18.104             | 1.466               |
| 5:37 PM | 18.067             | 1.504               |
| 5:38 PM | 18.076             | 1.518               |
| 5:39 PM | 18.082             | 1.518               |
| 5:40 PM | 18.081             | 1.524               |
| 5:41 PM | 18.085             | 1.525               |
| 5:42 PM | 18.062             | 1.520               |
| 5:43 PM | 18.058             | 1.536               |
| 5:44 PM | 18.068             | 1.525               |
| 5:45 PM | 18.065             | 1.522               |
| 5:46 PM | 18.073             | 1.518               |
| 5:47 PM | 18.082             | 1.521               |
| 5:48 PM | 18.078             | 1.514               |
| 5:49 PM | 18.075             | 1.520               |
| 5:50 PM | 18.068             | 1.522               |
| 5:51 PM | 18.075             | 1.512               |
| 5:52 PM | 18.084             | 1.500               |
| 5:53 PM | 18.082             | 1.502               |
| 5:54 PM | 18.089             | 1.516               |
| 5:55 PM | 18.088             | 1.519               |
| 5:56 PM | 18.081             | 1.523               |
| 5:57 PM | 18.051             | 1.529               |
| 5:58 PM | 18.047             | 1.536               |
| 5:59 PM | 18.055             | 1.531               |
| 6:00 PM | 18.064             | 1.520               |
| 6:01 PM | 18.067             | 1.520               |
| 6:02 PM | 18.062             | 1.530               |
| 6:03 PM | 18.057             | 1.536               |
| 6:04 PM | 18.080             | 1.511               |
| 6:05 PM | 18.081             | 1.524               |
| 6:06 PM | 18.043             | 1.543               |
| 6:07 PM | 18.048             | 1.540               |
| 6:08 PM | 18.053             | 1.532               |
| 6:09 PM | 18.041             | 1.537               |
| 6:10 PM | 18.051             | 1.527               |
| 6:11 PM | 18.074             | 1.509               |

### Volumetric Flow Rate Data

Number of Sample Points

20

| Point Number |     | Delta p | Sq. root<br>delta p | Temperature | Time     |
|--------------|-----|---------|---------------------|-------------|----------|
| 1            | A-1 | 1.000   | 1.000               | 133         | 9:10 AM  |
| 2            | A-2 | 1.000   | 1.000               | 133         |          |
| 3            | A-3 | 1.000   | 1.000               | 133         |          |
| 4            | A-4 | 1.000   | 1.000               | 133         |          |
| 5            | A-5 | 1.000   | 1.000               | 133         |          |
| 6            | B-1 | 1.000   | 1.000               | 133         |          |
| 7            | B-2 | 0.960   | 0.980               | 133         |          |
| 8            | B-3 | 0.890   | 0.943               | 133         |          |
| 9            | B-4 | 0.950   | 0.975               | 133         |          |
| 10           | B-5 | 0.750   | 0.866               | 133         |          |
| 11           | C-1 | 1.000   | 1.000               | 133         |          |
| 12           | C-2 | 0.970   | 0.985               | 133         |          |
| 13           | C-3 | 1.000   | 1.000               | 133         |          |
| 14           | C-4 | 1.000   | 1.000               | 133         |          |
| 15           | C-5 | 1.000   | 1.000               | 133         |          |
| 16           | D-1 | 1.000   | 1.000               | 133         |          |
| 17           | D-2 | 1.000   | 1.000               | 133         |          |
| 18           | D-3 | 1.000   | 1.000               | 133         |          |
| 19           | D-4 | 1.000   | 1.000               | 133         |          |
| 20           | D-5 | 1.000   | 1.000               | 133         | 11:45 AM |
| Average      |     | 0.976   | 0.987               | 133         |          |

#### Moisture Content Data

|                               |            |
|-------------------------------|------------|
| Meter Volume                  | 80.41      |
| Average Gas Meter Temperature | 57.6       |
| Gas Meter Coefficient         | 1.0076     |
| Gas Meter Delta H             | 1.74       |
| Grams of Water                | 224.5      |
| Barometric Pressure           | 28.49      |
| Standard Meter Volume         | 79.021     |
| Moisture Content              | 11.802     |
| O <sub>2</sub> %              | 18.496     |
| CO <sub>2</sub> %             | 1.34       |
| Standard CFH                  | 22,088,759 |
| K Standard CFH                | 368.146    |

#### Flow Rate Data

|                               |           |
|-------------------------------|-----------|
| Static Pressure               | -1.34     |
| Pitot Coefficient             | 0.84      |
| Duct Width (in.)              | 0         |
| Duct Length (in.)             | 0         |
| Duct Area (ft <sup>2</sup> )  |           |
| Stack Diameter (in.)          | 147       |
| Stack Area (ft <sup>2</sup> ) | 117.86    |
| Molecular Weight (dry)        | 28.954    |
| Molecular Weight (wet)        | 27.661    |
| Stack Pressure                | 28.391    |
| Feet per Second               | 61.617    |
| Actual CFM                    | 435727.06 |
| DSCFM                         | 324697.44 |

#### Field Calculations

##### Raw Data Table

| Instrument           | ppm or % | Zero | Span           | Cylinder<br>Value | Gas Corrected<br>for Calibration |
|----------------------|----------|------|----------------|-------------------|----------------------------------|
| O <sub>2</sub> (dry) | 18.35    | 0.09 | 11.05          | 11.10             | 18.50                            |
| Moisture             | 11.80    |      | Standard CFH   |                   | 22,088,759                       |
| F-Factor             | 9190     |      | K Standard CFM |                   | 368.146                          |
| DSCFM                | 324697   |      |                |                   |                                  |



UTAC  
Forbes, MN  
Waste Gas 2A  
3/12/2019  
Run 1

| <u>Time</u> | <u>% O<sub>2</sub> d</u> |
|-------------|--------------------------|
| 9:10        | 18.37                    |
| 9:11        | 18.36                    |
| 9:12        | 18.37                    |
| 9:13        | 18.40                    |
| 9:14        | 18.40                    |
| 9:15        | 18.42                    |
| 9:16        | 18.39                    |
| 9:17        | 18.38                    |
| 9:18        | 18.37                    |
| 9:19        | 18.37                    |
| 9:20        | 18.39                    |
| 9:21        | 18.39                    |
| 9:22        | 18.39                    |
| 9:23        | 18.38                    |
| 9:24        | 18.39                    |
| 9:25        | 18.38                    |
| 9:26        | 18.37                    |
| 9:27        | 18.36                    |
| 9:28        | 18.37                    |
| 9:29        | 18.37                    |
| 9:30        | 18.36                    |
| 9:31        | 18.35                    |
| 9:32        | 18.36                    |
| 9:33        | 18.38                    |
| 9:34        | 18.38                    |
| 9:35        | 18.35                    |
| 9:36        | 18.36                    |
| 9:37        | 18.36                    |
| 9:38        | 18.33                    |
| 9:39        | 18.33                    |
| 9:40        | 18.36                    |
| 9:41        | 18.36                    |
| 9:42        | 18.35                    |
| 9:43        | 18.34                    |
| 9:44        | 18.32                    |
| 9:45        | 18.35                    |
| 9:46        | 18.34                    |
| 9:47        | 18.33                    |
| 9:48        | 18.35                    |
| 9:49        | 18.36                    |
| 9:50        | 18.33                    |
| 9:51        | 18.33                    |
| 9:52        | 18.31                    |
| 9:53        | 18.33                    |
| 9:54        | 18.33                    |
| 9:55        | 18.35                    |
| 9:56        | 18.34                    |
| 9:57        | 18.35                    |
| 9:58        | 18.35                    |
| 9:59        | 18.34                    |
| 10:00       | 18.35                    |
| 10:01       | 18.37                    |
| 10:02       | 18.38                    |
| 10:03       | 18.35                    |
| 10:04       | 18.36                    |
| 10:05       | 18.35                    |
| 10:06       | 18.37                    |
| 10:07       | 18.36                    |
| 10:08       | 18.36                    |
| 10:09       | 18.36                    |
| 10:10       | 18.39                    |
| 10:11       | 18.34                    |
| 10:12       | 18.33                    |
| 10:13       | 18.35                    |
| 10:14       | 18.37                    |
| 10:15       | 18.35                    |
| 10:16       | 18.35                    |
| 10:17       | 18.35                    |
| 10:18       | 18.36                    |

|         |       |
|---------|-------|
| 10:19   | 18.33 |
| 10:20   | 18.33 |
| 10:21   | 18.34 |
| 10:22   | 18.37 |
| 10:23   | 18.37 |
| 10:24   | 18.35 |
| 10:25   | 18.34 |
| 10:26   | 18.33 |
|         |       |
| 10:57   | 18.38 |
| 10:58   | 18.39 |
| 10:59   | 18.37 |
| 11:00   | 18.35 |
| 11:01   | 18.36 |
| 11:02   | 18.36 |
| 11:03   | 18.38 |
| 11:04   | 18.37 |
| 11:05   | 18.37 |
| 11:06   | 18.37 |
| 11:07   | 18.36 |
| 11:08   | 18.36 |
| 11:09   | 18.34 |
| 11:10   | 18.36 |
| 11:11   | 18.35 |
| 11:12   | 18.33 |
| 11:13   | 18.33 |
| 11:14   | 18.35 |
| 11:15   | 18.33 |
| 11:16   | 18.35 |
| 11:17   | 18.36 |
| 11:18   | 18.35 |
| 11:19   | 18.33 |
| 11:20   | 18.32 |
| 11:21   | 18.32 |
| 11:22   | 18.33 |
| 11:23   | 18.32 |
| 11:24   | 18.31 |
| 11:25   | 18.32 |
| 11:26   | 18.31 |
| 11:27   | 18.31 |
| 11:28   | 18.33 |
| 11:29   | 18.33 |
| 11:30   | 18.34 |
| 11:31   | 18.35 |
| 11:32   | 18.37 |
| 11:33   | 18.36 |
| 11:34   | 18.33 |
| 11:35   | 18.34 |
| 11:36   | 18.33 |
| 11:37   | 18.33 |
| 11:38   | 18.33 |
| 11:39   | 18.33 |
| 11:40   | 18.33 |
| 11:41   | 18.33 |
| 11:42   | 18.33 |
| 11:43   | 18.33 |
|         |       |
| Average | 18.35 |

Volumetric Flow Rate Data

Number of Sample Points

20

| Point Number |     | Delta p | Sq. root<br>delta p | Temperature | Time     |
|--------------|-----|---------|---------------------|-------------|----------|
| 1            | A-1 | 1.000   | 1.000               | 140         | 12:42 PM |
| 2            | A-2 | 1.000   | 1.000               | 141         |          |
| 3            | A-3 | 1.000   | 1.000               | 138         |          |
| 4            | A-4 | 0.990   | 0.995               | 134         |          |
| 5            | A-5 | 1.000   | 1.000               | 140         |          |
| 6            | B-1 | 0.930   | 0.964               | 136         |          |
| 7            | B-2 | 0.960   | 0.980               | 141         |          |
| 8            | B-3 | 0.970   | 0.985               | 139         |          |
| 9            | B-4 | 0.980   | 0.990               | 140         |          |
| 10           | B-5 | 0.980   | 0.990               | 135         |          |
| 11           | C-1 | 0.900   | 0.949               | 138         | 2:47 PM  |
| 12           | C-2 | 0.730   | 0.854               | 136         |          |
| 13           | C-3 | 0.750   | 0.866               | 131         |          |
| 14           | C-4 | 0.740   | 0.860               | 136         |          |
| 15           | C-5 | 0.740   | 0.860               | 135         |          |
| 16           | D-1 | 0.900   | 0.949               | 138         |          |
| 17           | D-2 | 0.960   | 0.980               | 139         |          |
| 18           | D-3 | 0.860   | 0.927               | 140         |          |
| 19           | D-4 | 0.850   | 0.922               | 135         |          |
| 20           | D-5 | 0.800   | 0.894               | 136         |          |
| Average      |     | 0.902   | 0.948               | 137         |          |

Moisture Content Data

Flow Rate Data

|                               |            |
|-------------------------------|------------|
| Meter Volume                  | 78.99      |
| Average Gas Meter Temperature | 65.9       |
| Gas Meter Coefficient         | 1.0076     |
| Gas Meter Delta H             | 1.74       |
| Grams of Water                | 241.5      |
| Barometric Pressure           | 28.49      |
| Standard Meter Volume         | 76.4       |
| Moisture Content              | 12.959     |
| O <sub>2</sub> %              | 18.245     |
| CO <sub>2</sub> %             | 1.62       |
| Standard CFH                  | 21,170,237 |
| K Standard CFH                | 352.837    |

|                               |           |
|-------------------------------|-----------|
| Static Pressure               | -1.39     |
| Pitot Coefficient             | 0.84      |
| Duct Width (in.)              | 0         |
| Duct Length (in.)             | 0         |
| Duct Area (ft <sup>2</sup> )  | -         |
| Stack Diameter (in.)          | 147       |
| Stack Area (ft <sup>2</sup> ) | 117.86    |
| Molecular Weight (dry)        | 28.989    |
| Molecular Weight (wet)        | 27.565    |
| Stack Pressure                | 28.388    |
| Feet per Second               | 59.501    |
| Actual CFM                    | 420761.22 |
| DSCFM                         | 307113.43 |

Field Calculations

Raw Data Table

| Instrument           | ppm or % | Zero | Span           | Cylinder<br>Value | Gas Corrected<br>for Calibration |
|----------------------|----------|------|----------------|-------------------|----------------------------------|
| O <sub>2</sub> (dry) | 18.02    | 0.10 | 11.00          | 11.10             | 18.24                            |
| Moisture             | 12.96    |      | Standard CFH   |                   | 21,170,237                       |
| F-Factor             | 9190     |      | K Standard CFM |                   | 352.837                          |
| DSCFM                | 307113   |      |                |                   |                                  |

| UTAC<br>Forbes,IN<br>White Oak SA<br>average<br>Run 2 |                   |
|---|-------------------|
| Time  | %O <sub>2</sub> d |
| 12:42   | 16.14             |
| 12:43   | 16.12             |
| 12:44   | 16.12             |
| 12:45   | 16.11             |
| 12:46   | 16.13             |
| 12:47   | 16.11             |
| 12:48   | 16.12             |
| 12:49   | 16.10             |
| 12:50   | 16.08             |
| 12:51   | 16.09             |
| 12:52   | 16.08             |
| 12:53   | 16.08             |
| 12:54   | 16.12             |
| 12:55   | 16.11             |
| 12:56   | 16.10             |
| 12:57   | 16.09             |
| 12:58   | 16.12             |
| 12:59   | 16.10             |
| 13:00   | 16.09             |
| 13:01   | 16.11             |
| 13:02   | 16.10             |
| 13:03   | 16.11             |
| 13:04   | 16.07             |
| 13:05   | 16.08             |
| 13:06   | 16.10             |
| 13:07   | 16.11             |
| 13:08   | 16.09             |
| 13:09   | 16.10             |
| 13:10   | 16.09             |
| 13:11   | 16.09             |
| 13:12   | 16.10             |
| 13:13   | 16.10             |
| 13:14   | 16.09             |
| 13:15   | 16.10             |
| 13:16   | 16.10             |
| 13:17   | 16.08             |
| 13:18   | 16.07             |
| 13:19   | 16.07             |
| 13:20   | 16.09             |
| 13:21   | 16.09             |
| 13:22   | 16.08             |
| 13:23   | 16.09             |
| 13:24   | 16.07             |
| 13:25   | 16.09             |
| 13:26   | 16.09             |
| 13:27   | 16.08             |
| 13:28   | 16.12             |
| 13:29   | 16.10             |
| 13:30   | 16.10             |
| 13:31   | 16.09             |
| 13:32   | 16.04             |
| 13:33   | 16.05             |
| 13:34   | 16.07             |
| 13:35   | 16.07             |
| 13:36   | 16.10             |
| 13:37   | 16.07             |
| 13:38   | 16.07             |
| 13:39   | 16.09             |
| 13:40   | 16.07             |
| 13:41   | 16.08             |
| 13:42   | 16.08             |
| 13:43   | 16.09             |
| 13:44   | 16.04             |
| 13:45   | 16.04             |
| 13:46   | 16.08             |
| 13:47   | 16.05             |
| 13:48   | 16.03             |
| 13:49   | 16.05             |
| 13:50   | 16.03             |
| 13:51   | 16.02             |
| 13:52   | 16.02             |
| 13:53   | 16.04             |
| 13:54   | 16.05             |
| 13:55   | 16.03             |
| 13:56   | 16.02             |
| 13:57   | 16.02             |
| 13:58   | 16.04             |
| 13:59   | 16.03             |
| 14:00   | 16.03             |
| 14:01   | 16.04             |
| 14:02   | 16.04             |
| 14:03   | 16.04             |
| 14:04   | 16.03             |
| 14:05   | 16.04             |
| 14:06   | 16.02             |
| 14:07   | 16.01             |
| 14:08   | 16.01             |
| 14:09   | 16.02             |
| 14:10   | 16.02             |
| 14:11   | 16.03             |
| 14:12   | 16.02             |
| 14:13   | 16.01             |
| 14:14   | 16.03             |
| 14:15   | 16.00             |
| 14:16   | 16.01             |
| 14:17   | 16.00             |
| 14:18   | 16.01             |
| 14:19   | 16.01             |
| 14:20   | 16.02             |
| 14:21   | 16.00             |
| 14:22   | 17.69             |
| 14:23   | 16.01             |
| 14:24   | 16.01             |
| 14:25   | 16.02             |
| 14:26   | 16.02             |
| 14:27   | 16.02             |
| 14:28   | 17.69             |
| 14:29   | 17.68             |
| 14:30   | 17.69             |
| 14:31   | 16.01             |
| 14:32   | 16.01             |
| 14:33   | 16.01             |
| 14:34   | 16.00             |
| 14:35   | 16.00             |
| 14:36   | 17.69             |
| 14:37   | 17.68             |
| 14:38   | 17.68             |
| 14:39   | 16.01             |
| 14:40   | 17.68             |
| 14:41   | 16.00             |
| 14:42   | 17.67             |
| 14:43   | 17.68             |
| 14:44   | 17.68             |
| 14:45   | 17.69             |
| 14:46   | 17.69             |
| 14:47   | 17.69             |
| Average   | 16.92             |
| Average   | 16.96             |

### Volumetric Flow Rate Data

Number of Sample Points

20

| Point Number |     | Delta p | Sq. root<br>delta p | Temperature | Time    |
|--------------|-----|---------|---------------------|-------------|---------|
| 1            | A-1 | 0.940   | 0.970               | 134         | 4:10 PM |
| 2            | A-2 | 0.900   | 0.949               | 135         |         |
| 3            | A-3 | 0.900   | 0.949               | 131         |         |
| 4            | A-4 | 0.870   | 0.933               | 134         |         |
| 5            | A-5 | 0.870   | 0.933               | 132         |         |
| 6            | B-1 | 1.000   | 1.000               | 135         |         |
| 7            | B-2 | 1.000   | 1.000               | 138         |         |
| 8            | B-3 | 1.000   | 1.000               | 137         |         |
| 9            | B-4 | 1.000   | 1.000               | 134         |         |
| 10           | B-5 | 1.000   | 1.000               | 136         |         |
| 11           | C-1 | 0.955   | 0.977               | 132         |         |
| 12           | C-2 | 0.980   | 0.990               | 133         |         |
| 13           | C-3 | 0.960   | 0.980               | 136         |         |
| 14           | C-4 | 0.950   | 0.975               | 136         |         |
| 15           | C-5 | 0.960   | 0.980               | 134         |         |
| 16           | D-1 | 0.780   | 0.883               | 132         |         |
| 17           | D-2 | 0.760   | 0.872               | 134         |         |
| 18           | D-3 | 0.780   | 0.883               | 133         |         |
| 19           | D-4 | 0.800   | 0.894               | 136         |         |
| 20           | D-5 | 0.800   | 0.894               | 135         | 6:26 PM |
| Average      |     | 0.910   | 0.953               | 134         |         |

### Moisture Content Data

|                               |            |
|-------------------------------|------------|
| Meter Volume                  | 79.07      |
| Average Gas Meter Temperature | 69.1       |
| Gas Meter Coefficient         | 1.0076     |
| Gas Meter Delta H             | 1.74       |
| Grams of Water                | 236.6      |
| Barometric Pressure           | 28.49      |
| Standard Meter Volume         | 76.015     |
| Moisture Content              | 12.786     |
| O <sub>2</sub> %              | 18.301     |
| CO <sub>2</sub> %             | 1.83       |
| Standard CFH                  | 21,312,861 |
| K Standard CFH                | 355.214    |

### Flow Rate Data

|                               |           |
|-------------------------------|-----------|
| Static Pressure               | -1.34     |
| Pitot Coefficient             | 0.84      |
| Duct Width (in.)              | 0         |
| Duct Length (in.)             | 0         |
| Duct Area (ft <sup>2</sup> )  | .         |
| Stack Diameter (in.)          | 147       |
| Stack Area (ft <sup>2</sup> ) | 117.86    |
| Molecular Weight (dry)        | 29.025    |
| Molecular Weight (wet)        | 27.615    |
| Stack Pressure                | 28.391    |
| Feet per Second               | 59.588    |
| Actual CFM                    | 421378.66 |
| DSCFM                         | 309797.73 |

### Field Calculations

#### Raw Data Table

| Instrument           | ppm or % | Zero | Span                | Cylinder<br>Value | Gas Corrected<br>for Calibration |
|----------------------|----------|------|---------------------|-------------------|----------------------------------|
| O <sub>2</sub> (dry) | 17.94    | 0.06 | 10.90               | 11.10             | 18.30                            |
| Moisture             | 12.79    |      |                     |                   |                                  |
| F-Factor             | 9190     |      |                     |                   |                                  |
| DSCFM                | 309798   |      |                     |                   |                                  |
|                      |          |      | <b>Standard CFH</b> |                   | <b>21,312,861</b>                |
|                      |          |      | K Standard CFM      |                   | <b>355.214</b>                   |

UTAC  
Fortuna.MN  
White Oak 2A  
3/13/2019  
Run 3

| Time  | %O <sub>2</sub> |
|-------|-----------------|
| 16:10 | 17.83174        |
| 16:11 | 17.95274        |
| 16:12 | 17.956916       |
| 16:13 | 17.905912       |
| 16:14 | 17.915032       |
| 16:15 | 17.95596        |
| 16:16 | 17.821372       |
| 16:17 | 17.963379       |
| 16:18 | 17.935439       |
| 16:19 | 17.884869       |
| 16:20 | 17.948552       |
| 16:21 | 17.975882       |
| 16:22 | 17.937906       |
| 16:23 | 17.953812       |
| 16:24 | 17.93697        |
| 16:25 | 17.916366       |
| 16:26 | 17.917132       |
| 16:27 | 17.938268       |
| 16:28 | 17.919954       |
| 16:29 | 17.93396        |
| 16:30 | 17.961769       |
| 16:31 | 17.914692       |
| 16:32 | 17.933294       |
| 16:33 | 17.929772       |
| 16:34 | 17.92223        |
| 16:35 | 17.96528        |
| 16:36 | 17.988459       |
| 16:37 | 17.918482       |
| 16:38 | 17.92031        |
| 16:39 | 17.90344        |
| 16:40 | 17.9411         |
| 16:41 | 17.937084       |
| 16:42 | 17.96429        |
| 16:43 | 17.954628       |
| 16:44 | 17.98307        |
| 16:45 | 17.936982       |
| 16:46 | 17.919534       |
| 16:47 | 17.927506       |
| 16:48 | 17.959144       |
| 16:49 | 17.948818       |
| 16:50 | 17.992722       |
| 16:51 | 17.94341        |
| 16:52 | 17.902464       |
| 16:53 | 17.919004       |
| 16:54 | 17.957614       |
| 16:55 | 17.947302       |
| 16:56 | 17.92593        |
| 16:57 | 17.948288       |
| 16:58 | 17.933092       |
| 16:59 | 17.908512       |
| 17:00 | 17.933409       |
| 17:01 | 17.92413        |
| 17:02 | 17.887324       |
| 17:03 | 17.94468        |
| 17:04 | 17.945528       |
| 17:05 | 17.910392       |
| 17:06 | 17.922864       |
| 17:07 | 17.976246       |
| 17:08 | 17.931176       |
| 17:09 | 17.951092       |
| 17:10 | 17.912306       |
| 17:11 | 17.937342       |
| 17:12 | 17.945686       |
| 17:13 | 17.89869        |
| 17:14 | 17.896616       |
| 17:15 | 17.939352       |
| 17:16 | 17.946772       |
| 17:17 | 17.92993        |
| 17:18 | 17.921582       |
| 17:19 | 17.947598       |
| 17:20 | 17.931784       |
| 17:21 | 17.958486       |
| 17:22 | 17.968382       |
| 17:23 | 17.903804       |
| 17:24 | 17.890344       |
| 17:25 | 17.905906       |
| 17:26 | 17.927782       |
| 17:27 | 17.91965        |
| 17:28 | 17.924984       |
| 17:29 | 17.94967        |
| 17:30 | 17.9171         |
| 17:31 | 17.906434       |
| 17:32 | 18.030762       |
| 17:33 | 17.991674       |
| 17:34 | 17.986422       |
| 17:35 | 17.990966       |
| 17:36 | 17.985966       |
| 17:37 | 17.915576       |
| 17:38 | 17.994576       |
| 17:39 | 17.914494       |
| 17:40 | 17.934116       |
| 17:41 | 17.950482       |
| 17:42 | 17.926328       |
| 17:43 | 17.904902       |
| 17:44 | 17.979956       |
| 17:45 | 17.937052       |
| 17:46 | 17.946316       |
| 17:47 | 17.969872       |
| 17:48 | 17.973756       |
| 17:49 | 17.94281        |
| 17:50 | 17.958144       |
| 17:51 | 17.956164       |
| 17:52 | 17.944464       |
| 17:53 | 17.95774        |
| 17:54 | 17.942696       |
| 17:55 | 17.929064       |
| 17:56 | 17.90935        |
| 17:57 | 17.947892       |
| 17:58 | 17.925436       |
| 17:59 | 17.963756       |
| 18:00 | 17.958184       |
| 18:01 | 17.954912       |
| 18:02 | 17.91895        |
| 18:03 | 17.910918       |
| 18:04 | 17.957256       |
| 18:05 | 17.93673        |
| 18:06 | 17.92269        |
| 18:07 | 17.927142       |
| 18:08 | 17.90762        |
| 18:09 | 17.907204       |
| 18:10 | 17.93919        |
| 18:11 | 17.948228       |
| 18:12 | 17.909268       |
| 18:13 | 17.930966       |
| 18:14 | 17.956548       |
| 18:15 | 17.909222       |
| 18:16 | 17.932374       |
| 18:17 | 17.92187        |
| 18:18 | 17.94102        |
| 18:19 | 17.962912       |
| 18:20 | 17.91028        |
| 18:21 | 17.94071        |
| 18:22 | 17.93515        |
| 18:23 | 17.908114       |
| 18:24 | 17.935152       |
| 18:25 | 17.898688       |
| 18:26 | 17.954916       |

Average 17.936

# **APPENDIX J**

## **CALIBRATION GAS CERTIFICATION SHEETS**



TIER 5 LABS  
5353 W. SOUTHERN AVE.  
INDIANAPOLIS, IN 46241  
317-536-6690

|                     |                                   |                       |                 |
|---------------------|-----------------------------------|-----------------------|-----------------|
| Cylinder Number:    | CC480254                          | Certification Date:   | 13 August 2018  |
| Mixture Grade:      | EPA Protocol Standard Gas Mixture | Expiration Date:      | 14 August 2026  |
| Certificate Number: | 2198A-03T5-C01                    | Lot Number:           | 2198A-03T5      |
| Cylinder Pressure:  | 2015 PSIG                         | Customer Part Number: | EPA 307-020085C |

Do not use below 100 psi (0.7 megapascals)

EPA Traceability Protocol for Gaseous Calibration Standards Procedure G2, EPA/600/R-12/531 May 2012

### Certified Concentrations

| Component      | Concentration | Uncertainty           | Assay Dates |
|----------------|---------------|-----------------------|-------------|
| Oxygen         | 21.0%         | +/- 0.10 % (absolute) | 8/13/2018   |
| Carbon Dioxide | 17.1%         | +/- 0.10 % (absolute) | 8/13/2018   |
| Nitrogen       | Balance       |                       |             |

### Analytical Instrumentation

| Component      | Analytical Principle | Make     | Model | Serial         | MPC Date  |
|----------------|----------------------|----------|-------|----------------|-----------|
| Oxygen         | GC-TCD               | Shimadzu | GC-8A | C10495021497SA | 8/10/2018 |
| Carbon Dioxide | GC-TCD               | Shimadzu | GC-8A | C10495021497SA | 7/23/2018 |

### Reference Standards

| Serial Number | Lot     | Expiration | Type | Component | Balance | Concentration | Uncertainty (%) | NIST Reference |
|---------------|---------|------------|------|-----------|---------|---------------|-----------------|----------------|
| FF22304       | 71-E-25 | 8/23/2021  | SRM  | O2        | N2      | 20.86%        | 0.101           | 2659a          |
| D506186       | VSL     | 11/8/2021  | PRM  | CO2       | N2      | 11.005%       | 0.100           |                |

The calibration results published in this certificate were obtained using equipment and standards capable of producing results that are traceable to National Institute of Standards and Technology (NIST) and through NIST to the International System of Units (SI). The expanded uncertainties, if included on this certificate, use a coverage factor of  $k=2$  to approximate the 95% confidence level of the measurement, unless otherwise noted. If uncertainties are not included on this certificate, they are available upon request. The nitrogen used as a component or balance gas as well as the oxygen used in air mixtures meets the requirements set forth in EPA 1065.750. This calibration certificate applies only to the item described and shall not be reproduced other than in full, without written approval from the calibration facility. Calibration certificates without signatures are not valid. This calibration meets the requirements of ISO/IEC 17025-2005

Analyst: Abby Helman

Reviewer: Jeff Lynn

Production Laboratory:  
Tier 5 Labs, LLC  
5353 W. Southern Ave.  
Indianapolis, IN 46241  
PGVP Vendor ID R12018





TIER 5 LABS  
5353 W. SOUTHERN AVE.  
INDIANAPOLIS, IN 46241  
317-636-6690

|                     |                                   |                       |                 |
|---------------------|-----------------------------------|-----------------------|-----------------|
| Cylinder Number:    | CC461849                          | Certification Date:   | 16 January 2019 |
| Mixture Grade:      | EPA Protocol Standard Gas Mixture | Expiration Date:      | 17 January 2027 |
| Certificate Number: | 0119C-02T5-C07                    | Lot Number:           | 0119C-02T5      |
| Cylinder Pressure:  | 2015 PSIG                         | Customer Part Number: | EPA 307-020085C |

Do not use below 100 psi (0.7 megapascals)

EPA Traceability Protocol for Gaseous Calibration Standards Procedure G1, EPA/600/R-12/531 May 2012

### Certified Concentrations

| Component      | Concentration | Uncertainty          | Assay Dates |
|----------------|---------------|----------------------|-------------|
| Carbon Dioxide | 8.38%         | +/- 0.04% (absolute) | 1/16/2019   |
| Oxygen         | 11.0%         | +/- 0.10% (absolute) | 1/16/2019   |
| Nitrogen       | Balance       |                      |             |

### Analytical Instrumentation

| Component      | Analytical Principle | Make     | Model | Serial         | MPC Date   |
|----------------|----------------------|----------|-------|----------------|------------|
| Carbon Dioxide | GC-TCD               | Shimadzu | GC-8A | C10495021497SA | 12/31/2018 |
| Oxygen         | GC-TCD               | Shimadzu | GC-8A | C10495021497SA | 12/18/2018 |

### Reference Standards

| Serial Number | Lot        | Expiration | Type | Component | Balance | Concentration | Uncertainty (%) | NIST Reference |
|---------------|------------|------------|------|-----------|---------|---------------|-----------------|----------------|
| CC478894      | 1976A-05T5 | 10/26/2024 | GMIS | CO2       | N2      | 16.12%        | 0.328           | 2745           |
| FF22304       | 71-E-25    | 8/23/2021  | SRM  | O2        | N2      | 20.86%        | 0.101           | 2659a          |

The calibration results published in this certificate were obtained using equipment and standards capable of producing results that are traceable to National Institute of Standards and Technology (NIST) and through NIST to the International System of Units (SI). The expanded uncertainties, if included on this certificate, use a coverage factor of  $k=2$  to approximate the 95% confidence level of the measurement, unless otherwise noted. If uncertainties are not included on this certificate, they are available upon request. The nitrogen used as a component or balance gas as well as the oxygen used in air mixtures meets the requirements set forth in EPA 1065.750. This calibration certificate applies only to the item described and shall not be reproduced other than in full, without written approval from the calibration facility. Calibration certificates without signatures are not valid. This calibration meets the requirements of ISO/IEC 17025-2005

Analyst: Allison Hanover

Reviewer: Abigail Helman

Production Laboratory:  
Tier 5 Labs, LLC  
5353 W. Southern Ave.  
Indianapolis, IN 46241  
PGVP Vendor ID R12019



Tier 5 Labs  
5353 W. Southern Ave.  
Indianapolis, IN 46241  
(630) 961-6227

Cylinder Number:

CC50596

Mixture Grade:

EPA Protocol Standard Gas Mixture

Certificate Number:

1227A-01T5-C01

Cylinder Pressure:

2015 PSIG

Certification Date:

10 May 2017

Expiration Date:

11 May 2025

Lot Number:

1227A-01T5

Customer Part Number:

SPC NAE03001

Do not use below 100 psi (0.7 megapascals)

EPA Traceability Protocol for Gaseous Calibration Standards Procedure G1, EPA/600/R-12/531 May 2012

### Certified Concentrations

| Component      | Concentration | Uncertainty         | Assay Dates |
|----------------|---------------|---------------------|-------------|
| Oxygen         | 20.9%         | +/- 0.1% (absolute) | 5/10/2017   |
| Carbon Dioxide | 16.9%         | +/- 0.1% (absolute) | 5/8/2017    |
| Nitrogen       | Balance       |                     |             |

### Analytical Instrumentation

| Component      | Analytical Principle  | Make     | Model   | Serial        | MPC Date  |
|----------------|-----------------------|----------|---------|---------------|-----------|
| Oxygen         | Zirconia Transduction | Servomex | 5400    | 05410A1/11223 | 4/14/2017 |
| Carbon Dioxide | NDIR                  | Horiba   | VA-3111 | PC062W1E      | 5/8/2017  |

### Reference Standards

| Serial Number | Lot        | Expiration | Type | Component | Balance | Concentration | Uncertainty (%) | NIST Reference |
|---------------|------------|------------|------|-----------|---------|---------------|-----------------|----------------|
| FF22304       | 71-E-25    | 8/23/2021  | SRM  | O2        | N2      | 20.86%        | 0.101           | 2659a          |
| CC478894      | 1976A-05T5 | 10/26/2024 | GMIS | CO2       | N2      | 16.12%        | 0.328           | 2745           |

The calibration results published in this certificate were obtained using equipment and standards capable of producing results that are traceable to National Institute of Standards and Technology (NIST) and through NIST to the International System of Units (SI). The expanded uncertainties, if included on this certificate, use a coverage factor of  $k=2$  to approximate the 95% confidence level of the measurement, unless otherwise noted. If uncertainties are not included on this certificate, they are available upon request. This calibration certificate applies only to the item described and shall not be reproduced other than in full, without written approval from the calibration facility. Calibration certificates without signatures are not valid.

This calibration meets the requirements of ISO/IEC 17025-2005

  
Analyst: Allison Hanover

  
Reviewer: Jeff Lynn

Production Laboratory:

Tier 5 Labs, LLC

5353 W. Southern Ave.

Indianapolis, IN 46241

PGVP Vendor ID R12017



TIER 5 LABS  
5353 W. SOUTHERN AVE.  
INDIANAPOLIS, IN 46241  
317-536-5590

|                     |                                   |                       |                   |
|---------------------|-----------------------------------|-----------------------|-------------------|
| Cylinder Number:    | CC480165                          | Certification Date:   | 25 September 2018 |
| Mixture Grade:      | EPA Protocol Standard Gas Mixture | Expiration Date:      | 26 September 2026 |
| Certificate Number: | 2618A-03T5-C03                    | Lot Number:           | 2618A-03T5        |
| Cylinder Pressure:  | 2015 PSIG                         | Customer Part Number: | EPA 307-020085C   |

Do not use below 100 psi (0.7 megapascals)

EPA Traceability Protocol for Gaseous Calibration Standards Procedure G2, EPA/600/R-12/531 May 2012

### Certified Concentrations

| Component      | Concentration | Uncertainty          | Assay Dates |
|----------------|---------------|----------------------|-------------|
| Carbon Dioxide | 8.37%         | +/- 0.05% (absolute) | 9/25/2018   |
| Oxygen         | 11.0%         | +/- 0.10% (absolute) | 9/25/2018   |
| Nitrogen       | Balance       |                      |             |

### Analytical Instrumentation

| Component      | Analytical Principle | Make     | Model | Serial         | MPC Date  |
|----------------|----------------------|----------|-------|----------------|-----------|
| Carbon Dioxide | GC-TCD               | Shimadzu | GC-8A | C10495021497SA | 9/14/2018 |
| Oxygen         | GC-TCD               | Shimadzu | GC-8A | C10495021497SA | 9/5/2018  |

### Reference Standards

| Serial Number | Lot        | Expiration | Type | Component | Balance | Concentration | Uncertainty (%) | NIST Reference |
|---------------|------------|------------|------|-----------|---------|---------------|-----------------|----------------|
| FF13624       | 9-D-37     | 3/8/2021   | SRM  | CO2       | N2      | 16.08%        | 0.124           | 2745           |
| CC480398      | 1027A-01T5 | 6/6/2025   | GMIS | O2        | N2      | 20.97%        | 0.095           | 2659a          |

The calibration results published in this certificate were obtained using equipment and standards capable of producing results that are traceable to National Institute of Standards and Technology (NIST) and through NIST to the International System of Units (SI). The expanded uncertainties, if included on this certificate, use a coverage factor of  $k=2$  to approximate the 95% confidence level of the measurement, unless otherwise noted. If uncertainties are not included on this certificate, they are available upon request. The nitrogen used as a component or balance gas as well as the oxygen used in air mixtures meets the requirements set forth in EPA 1065.750. This calibration certificate applies only to the item described and shall not be reproduced other than in full, without written approval from the calibration facility. Calibration certificates without signatures are not valid. This calibration meets the requirements of ISO/IEC 17025-2005

Analyst: Allison Hanover

Reviewer: Jeff Lynn

Production Laboratory:

Tier 5 Labs, LLC  
5353 W. Southern Ave.  
Indianapolis, IN 46241  
PGVP Vendor ID R12018

# **APPENDIX K**

## **MEASUREMENT SYSTEMS PERFORMANCE SPECIFICATIONS**

## Analyzer Calibration Error Check

United Taconite  
Forbes, MN  
Line 1 Waste Gas (STRU53)  
2/12/2019  
Test 2

Time of Linearity : 7:35

### CO<sub>2</sub> (Servomex Series 1440)

|            | Cylinder<br>Value<br>(%) | Analyzer<br>Response<br>(%) | Difference<br>(%) | Span<br>Value<br>(%) | %<br>of<br>Span |
|------------|--------------------------|-----------------------------|-------------------|----------------------|-----------------|
| Zero       | 0.00                     | -0.01                       | 0.01              | 16.90                | 0.06            |
| Mid Level  | 8.37                     | 8.50                        | 0.13              | 16.90                | 0.77            |
| High Level | 16.90                    | 16.93                       | 0.03              | 16.90                | 0.18            |

### O<sub>2</sub> (Servomex Series 1440)

|            | Cylinder<br>Value<br>(%) | Analyzer<br>Response<br>(%) | Difference<br>(%) | Span<br>Value<br>(%) | %<br>of<br>Span |
|------------|--------------------------|-----------------------------|-------------------|----------------------|-----------------|
| Zero       | 0.00                     | 0.00                        | 0.00              | 20.90                | 0.00            |
| Mid Level  | 11.00                    | 11.19                       | 0.19              | 20.90                | 0.91            |
| High Level | 20.90                    | 20.93                       | 0.03              | 20.90                | 0.14            |

\*\*\*\* All Calibrations must be within 2% of the span value...

United Taconite  
Forbes, MN  
Line 1 Waste Gas (STRU53)  
2/12/2019  
Test 2

O<sub>2</sub>

|  |   |         | Initial | Pre-Cal<br>Bias | Final | Post-Cal<br>Bias | Avg.  | Drift<br>of<br>Span |  |
|--|---|---------|---------|-----------------|-------|------------------|-------|---------------------|--|
|  | 1 | Zero    | 0.10    | 0.5%            | 0.12  | 0.6%             | 0.11  | 0.10%               |  |
|  |   | Upscale | 11.15   | -0.2%           | 11.10 | -0.4%            | 11.13 | 0.24%               |  |
|  | 2 | Zero    | 0.12    | 0.6%            | 0.14  | 0.7%             | 0.13  | 0.10%               |  |
|  |   | Upscale | 11.10   | -0.4%           | 11.13 | -0.3%            | 11.12 | 0.14%               |  |
|  | 3 | Zero    | 0.14    | 0.7%            | 0.11  | 0.5%             | 0.13  | 0.14%               |  |
|  |   | Upscale | 11.13   | -0.3%           | 11.21 | 0.1%             | 11.17 | 0.38%               |  |

|         | Cylinder<br>Value |   | Analyzer<br>Value |   |
|---------|-------------------|---|-------------------|---|
| Zero    | 0.00              | % | 0.00              | % |
| Upscale | 11.00             | % | 11.19             | % |
| Span    | 20.90             | % | 20.9              | % |

All Bias values must be within 5% of the span value.

All Drift values must be within 3% of the span value.

**United Taconite**  
**Forbes, MN**  
**Line 1 Waste Gas (STRU53)**  
**2/12/2019**  
**Test 2**

**CO<sub>2</sub>**

|  |          | <u>Initial</u> | <u>Pre-Cal Bias</u> | <u>Final</u> | <u>Post-Cal Bias</u> | <u>Avg.</u> | <u>Drift of Span</u> |              |
|--|----------|----------------|---------------------|--------------|----------------------|-------------|----------------------|--------------|
|  | <b>1</b> | <b>Zero</b>    | 0.02                | 0.2%         | 0.03                 | 0.2%        | <b>0.03</b>          | <b>0.06%</b> |
|  |          | <b>Upscale</b> | 8.35                | -0.9%        | 8.26                 | -1.4%       | <b>8.31</b>          | <b>0.53%</b> |
|  | <b>2</b> | <b>Zero</b>    | 0.03                | 0.2%         | 0.03                 | 0.2%        | <b>0.03</b>          | <b>0.00%</b> |
|  |          | <b>Upscale</b> | 8.26                | -1.4%        | 8.16                 | -2.0%       | <b>8.21</b>          | <b>0.59%</b> |
|  | <b>3</b> | <b>Zero</b>    | 0.03                | 0.2%         | 0.04                 | 0.3%        | <b>0.04</b>          | <b>0.06%</b> |
|  |          | <b>Upscale</b> | 8.16                | -2.0%        | 8.15                 | -2.1%       | <b>8.16</b>          | <b>0.06%</b> |

|                | <u>Cylinder Value</u> |   | <u>Analyzer Value</u> |   |
|----------------|-----------------------|---|-----------------------|---|
| <b>Zero</b>    | 0.00                  | % | -0.01                 | % |
| <b>Upscale</b> | 8.37                  | % | 8.50                  | % |
| <b>Span</b>    | 16.9                  | % | 16.9                  | % |

All Bias values must be within 5% of the span value.

All Drift values must be within 3% of the span value.

## Analyzer Calibration Error Check

United Taconite

Forbes, MN

Line 2B

3/12/2019

Test 2

Time of Linearity : 8:15

### CO<sub>2</sub> (Servomex Series 1440)

|            | Cylinder<br>Value<br>(%) | Analyzer<br>Response<br>(%) | Difference<br>(%) | Span<br>Value<br>(%) | %<br>of<br>Span |
|------------|--------------------------|-----------------------------|-------------------|----------------------|-----------------|
| Zero       | 0.00                     | 0.03                        | 0.03              | 17.10                | 0.18            |
| Mid Level  | 8.38                     | 8.42                        | 0.04              | 17.10                | 0.23            |
| High Level | 17.10                    | 17.01                       | 0.09              | 17.10                | 0.53            |

### O<sub>2</sub> (Servomex Series 1440)

|            | Cylinder<br>Value<br>(%) | Analyzer<br>Response<br>(%) | Difference<br>(%) | Span<br>Value<br>(%) | %<br>of<br>Span |
|------------|--------------------------|-----------------------------|-------------------|----------------------|-----------------|
| Zero       | 0.00                     | 0.12                        | 0.12              | 21.00                | 0.57            |
| Mid Level  | 11.00                    | 10.80                       | 0.20              | 21.00                | 0.95            |
| High Level | 21.00                    | 21.15                       | 0.15              | 21.00                | 0.71            |

\*\*\*\* All Calibrations must be within 2% of the span value...



United Taconite  
Forbes, MN  
Line 2B  
3/12/2019  
Test 2

O<sub>2</sub>

|  |   |         | Initial | Pre-Cal<br>Bias | Final | Post-Cal<br>Bias | Avg.  | Drift<br>of<br>Span |  |
|--|---|---------|---------|-----------------|-------|------------------|-------|---------------------|--|
|  | 1 | Zero    | 0.10    | -0.1%           | 0.11  | 0.0%             | 0.11  | 0.05%               |  |
|  |   | Upscale | 20.97   | -0.9%           | 20.88 | -1.3%            | 20.93 | 0.43%               |  |
|  | 2 | Zero    | 0.11    | 0.0%            | 0.11  | 0.0%             | 0.11  | 0.00%               |  |
|  |   | Upscale | 20.88   | -1.3%           | 20.86 | -1.4%            | 20.87 | 0.10%               |  |
|  | 3 | Zero    | 0.11    | 0.0%            | 0.13  | 0.0%             | 0.12  | 0.10%               |  |
|  |   | Upscale | 20.86   | -1.4%           | 20.82 | -1.6%            | 20.84 | 0.19%               |  |

|         | Cylinder<br>Value |   | Analyzer<br>Value |   |
|---------|-------------------|---|-------------------|---|
| Zero    | 0.00              | % | 0.12              | % |
| Upscale | 21.00             | % | 21.15             | % |
| Span    | 21.00             | % | 21                | % |

All Bias values must be within 5% of the span value.

All Drift values must be within 3% of the span value.

United Taconite  
Forbes, MN  
Line 2B  
3/12/2019  
Test 2

CO<sub>2</sub>

|  |   |         | Initial | Pre-Cal<br>Bias | Final | Post-Cal<br>Bias | Avg. | Drift<br>of<br>Span |  |
|--|---|---------|---------|-----------------|-------|------------------|------|---------------------|--|
|  | 1 | Zero    | 0.05    | 0.1%            | 0.16  | 0.8%             | 0.11 | 0.64%               |  |
|  |   | Upscale | 8.43    | 0.1%            | 8.55  | 0.8%             | 8.49 | 0.70%               |  |
|  | 2 | Zero    | 0.16    | 0.8%            | 0.13  | 0.6%             | 0.15 | 0.18%               |  |
|  |   | Upscale | 8.55    | 0.8%            | 8.21  | -1.2%            | 8.38 | 1.99%               |  |
|  | 3 | Zero    | 0.13    | 0.6%            | 0.11  | 0.5%             | 0.12 | 0.12%               |  |
|  |   | Upscale | 8.21    | -1.2%           | 8.40  | -0.1%            | 8.31 | 1.11%               |  |

|         | Cylinder<br>Value |   | Analyzer<br>Value |   |
|---------|-------------------|---|-------------------|---|
| Zero    | 0.00              | % | 0.03              | % |
| Upscale | 8.38              | % | 8.42              | % |
| Span    | 17.1              | % | 17.1              | % |

All Bias values must be within 5% of the span value.  
All Drift values must be within 3% of the span value.

Calibration Error

UTAC  
Forbes,MN  
Waste Gas 2A  
3/12/2019  
Test 4

O<sub>2</sub> (Servomex Series 1400)

|                   | Cylinder<br>Value<br>(%) | Analyzer<br>Response<br>(%) | Difference<br>(%) | Span<br>Value<br>(%) | %<br>of<br>Span |
|-------------------|--------------------------|-----------------------------|-------------------|----------------------|-----------------|
| <b>Zero</b>       | 0.00                     | -0.03                       | 0.03              | 25                   | 0.12            |
| <b>Mid Level</b>  | 11.10                    | 11.00                       | 0.10              | 25                   | 0.40            |
| <b>High Level</b> | 20.80                    | 20.90                       | 0.10              | 25                   | 0.40            |

\*\*\*\* All Calibrations must be within 2% of the span value...

Calibration Drift

Calibration Drift

UTAC  
Forbes,MN  
Waste Gas 2A  
3/12/2019  
Test 4

O<sub>2</sub>

|   |         | Initial | Pre-Cal Bias | Final | Post-cal Bias | Avg.  | % Drift of Span |
|---|---------|---------|--------------|-------|---------------|-------|-----------------|
| 1 | Zero    | 0.01    | 0.16%        | 0.17  | 0.80%         | 0.09  | 0.64%           |
|   | Upscale | 11.00   | 0.00%        | 11.10 | 0.40%         | 11.05 | 0.40%           |
| 2 | Zero    | 0.17    | 0.80%        | 0.02  | 0.20%         | 0.10  | -0.60%          |
|   | Upscale | 11.10   | 0.40%        | 10.90 | -0.40%        | 11.00 | -0.80%          |
| 3 | Zero    | 0.02    | 0.20%        | 0.09  | 0.48%         | 0.06  | 0.28%           |
|   | Upscale | 10.90   | -0.40%       | 10.90 | -0.40%        | 10.90 | 0.00%           |

|         | Cylinder Value |   | Analyzer Value |   |
|---------|----------------|---|----------------|---|
| Zero    | 0.00           | % | -0.03          | % |
| Upscale | 11.10          | % | 11.00          | % |
| Span    | 25             | % | 25             | % |

All drift calibrations must be within 3 % of the span value.  
All bias calibrations must be within 5 % of the span value.

# **APPENDIX L**

## **STATIONARY SOURCE AUDIT SAMPLE PROGRAM**



February 27, 2019

Ed Juers  
Interpoll Laboratories Inc.  
4500 Ball Road NE  
Circle Pines, MN 55014

Enclosed is your final report for ERA's Stationary Source Audit Sample (SSAS) Program. Your final report includes an evaluation of all results submitted by your laboratory to ERA.

Data Evaluation Protocols: All analytes in ERA's SSAS Program have been evaluated comparing the reported result to the acceptance limits generated using the criteria contained in the TNI SSAS Table.

For any "Not Acceptable" results, please contact your state regulator for any corrective action requirements.

Thank you for your participation in ERA's SSAS Program. If you have any questions, please contact our Proficiency Testing Department at 1-800-372-0122.

Sincerely,



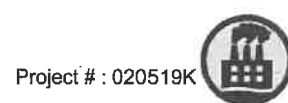
Matthew Seebeck  
Quality Officer

cc: Project File Number 020519K



A Waters Company

| Recipient Type | Report Recipient   | Contact  | Project ID |
|----------------|--|--|------------|
| Agency         | MN-MPCA (SSAS)<br>520 Lafayette Road<br>St Paul, MN 55155 USA                  | Andrew Place<br>andrew.place@state.mn.us<br>Phone: 651-757-2652  |            |
| Facility       | United Taconite, LLC<br>1200 West Highway 16<br>Forbes, MN 55738 USA           | Mike Bonham<br>michael.bonham@clevelandcliffs.com<br>Phone: (218) 744-7840   |            |
| Lab            | Interpoll Laboratories Inc.<br>4500 Ball Road NE<br>Circle Pines, MN 55014 USA | Wayne Olson<br>Quality Assurance Officer<br>wayne.olson@interpoll-labs.com<br>Phone: 763-786-6020<br>Fax: 763-786-7854 |            |
| Tester         | Interpoll Laboratories Inc.<br>4500 Ball Road NE<br>Circle Pines, MN 55014 USA | Ed Juers<br>ed.juers@interpoll-labs.com<br>Phone: 763-786-6020   |            |





A Waters Company

Wayne Olson  
Quality Assurance Officer  
Interpoll Laboratories Inc.  
4500 Ball Road NE  
Circle Pines, MN 55014  
763-786-6020

EPA ID:  
ERA Customer Number:

Not Reported  
I008063

# 020519K Laboratory Exception Report

## Evaluation Checks

There are no values reported with < where the assigned value was greater than 0.

## Not Acceptable Evaluations

There were no Not Acceptable evaluations for this study.







A Waters Company

## Final Report Results For Laboratory Interpoll Laboratories Inc.





A Waters Company

**SSAP Evaluation Report**  
**Project Number: 020519K**  
**ERA Customer Number: I008063**  
**Laboratory Name: Interpoll Laboratories**  
**Inc.**

**Inorganic Results**





A Waters Company

Wayne Olson  
Quality Assurance Officer  
Interpoll Laboratories Inc.  
4500 Ball Road NE  
Circle Pines, MN 55014  
763-786-6020

EPA ID:  
ERA Customer Number:

Not Reported  
1008063

# 020519K Evaluation Final Complete Report

Ver. 1  
Page 6 of 6

| TNI Analyte Code   | Analyte | Units     | Reported Value | Assigned Value | Acceptance Limits | Performance Evaluation | Method Description | Analysis Date | Analyst Name |
|--|---------|-----------|----------------|----------------|-------------------|------------------------|--------------------|---------------|--------------|
| SSAP Mercury on Filter Paper (cat# 1427, lot# 020519K) Study Dates: 02/05/19 - 02/27/19      |         |           |                |                |                   |                        |                    |               |              |
| 1095   | Mercury | µg/Filter | 17.5           | 18.3           | 13.7 - 22.9       | Acceptable             | EPA Method 23 2000 | 2/21/2019     | G Horman     |
| SSAP Mercury in Impinger Solution (cat# 1428, lot# 020519K) Study Dates: 02/05/19 - 02/27/19 |         |           |                |                |                   |                        |                    |               |              |
| 1095   | Mercury | ng/mL     | 25.6           | 25.5           | 19.1 - 31.9       | Acceptable             | EPA Method 23 2000 | 2/21/2019     | G Horman     |

