

**Appendix E:
Emissions of Atmosphere.**

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F.J. Coyle & Associates

Civil & Environmental Consultants

| | | | | | | |
|-------------------------|--|-----|------|----------------|-----------------|-------------------|
| Client | Basta Parsons Ltd | | | | | |
| Project Title | Atmospheric Emissions Monitoring at Basta Parsons Limited | | | | | |
| Document Title | Monitoring of Emissions to Atmosphere at Basta Parsons Limited, Tubbercurry, Co. Sligo | | | | | |
| Document No. | Final Report | | | | | |
| This Document Comprises | DCS | TOC | Text | List of Tables | List of Figures | No. of Appendices |
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1.0 Introduction

The following report details the findings of atmospheric emissions monitoring carried out on behalf of *Basta Parsons Ltd.* Tubbercurry, Co. Sligo. Atmospheric emissions monitoring from the furnace stack was undertaken on 27th October 2011.

Condition 5.1 of the IPPCL states that No specified emission to the atmosphere shall exceed the emission limit value set out in *Schedule 1(i) Emissions to Atmosphere*, subject to Condition 3 of this licence. There shall be no other emission to the atmosphere of environmental significance.

Monitoring of the stack emissions was carried out in accordance with **Condition 10, Monitoring** of the company I.P.C. licence Reg. No 269

Schedule 1(i) specifies the limits pertaining to emissions from the furnace stack while Schedule 1 (ii) specifies the method of analysis.

Metal emissions and total particulates were monitored.

Emission Point Reference No's.: Furnace A2-1

Location : Process building

Monitoring was carried out Mr. Oliver Fitzsimons B.Sc and Mr. Fergal Coyle B.Sc.

2.0 Methodology

Cognisance was taken of EPA Guidance documents AG1 On Site Safety Requirements and AG2 Air Emissions Monitoring Guidance Note.

Monitoring was undertaken in conditions considered normal and representative of everyday activity at the plant.

Particulate emissions

Reference methods

- ISO 9096. Stationary source emissions – Manual determination of mass concentration of particulate matter
- I.S EN 13284 Part 1 Particulate (low range). Stationary source emissions. Determination of low range mass concentration of dust. Manual gravimetric method

Total particulate matter was determined by sampling a measured volume of stack gas through a pre-weighed filter followed by gravimetric analysis in accordance with standards ISO 9096 and I.S EN 13284 Part 1 Particulate (low range). This European Standard specifies a reference method for the measurement of low dust concentration in ducted gaseous streams.

A representative, integrated sample was extracted from the flue gas and particulate matter entrained in the gas sample is separated by a filter. The pre-weighed filter was subsequently dried and weighed. The relative increase in the mass can be attributed to the collection of particulate matter on the filter. The sample was attained using Isokinetic sampling equipment. The equipment employs a carefully engineered sample nozzle through which the sample stream is drawn at a velocity (V_N) equal to the duct (Stack) velocity (V_a).

Metal emissions

Reference methods:

- VDI 3868 part 1, (sampling).
- VDI 2268 parts 1-4 (analysis)
- I.S EN 14385: Stationary source emissions. Determination of the total emission of As, Cd, Cr, Co, Cu, Mn, Ni, Pb, Sb, Tl and V

Metal concentrations were determined by analytical laboratory analysis while the total particulates are calculated gravimetrically. Analysis has been carried out by **FitzScientific Laboratory**, Unit 35, Boyne Business Park, Drogheda, Co. Louth.

Equipment used

- 'TCR Tecora' Automatic Isokinetic Sampler.
- Quart Filter paper 45 mm.
- Electronic balance

3.0 Summary Results**Table 1 Metal concentrations.**

| Parameter | ELV. | Conc. (mg/m ³) |
|----------------------------------|--|----------------------------|
| TA Luft Inorganic Dust Class I | 0.2 mg/m ³ (at mass flows >1 g/hr) | < 0.2 |
| TA Luft Inorganic Dust Class II | 1.0 mg/m ³ (at mass flows >5 g/hr) | < 1.0 |
| TA Luft inorganic Dust Class III | 5.0 mg/m ³ (at mass flows >25 g/hr) | < 5.0 |

Table 2 Total Particulates and flow rate

| Parameter | IPPCL Limit |
|---|------------------------|
| Total Particulates | 2.1 mg/ m ³ |
| Volume Emitted Per Hour: | 5144.64 m ³ |
| IPPCL Limit (max discharge rate per hour) | 6000 m ³ |

- The full analytical data is presented in Appendix i
- A copy of the Isokinetic Sampling data can be found in Appendix ii .
- A Copy of the Certificate of Analysis for the analysing laboratory can be found in Appendix iii

4.0 Discussion

Monitoring of the stack emissions was carried out in accordance with **Condition 10, Monitoring** of the company I.P.C. licence Reg. No 269.

The methods of sampling and analysis were carried out as prescribed in **Schedule 1 (ii), Monitoring of Emissions to Atmosphere**.

The results show that for each of Class i , Class ii, and Class iii inorganic dusts the concentrations are below the Emission limit values.

The volume emitted per hour is also within the Maximum hourly limit.

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Appendix i

Table 3. Laboratory Analysis Results

Inorganic Dust Particles

| | | Filter code | | |
|------------------|------|--------------|-------------|---------|
| | | B14 (Sample) | B15 (Blank) | B14 net |
| Class I | | | | |
| Cadmium | ug/l | <0.09 | <0.09 | <0.09 |
| Mercury | ug/l | <0.2 | <0.2 | <0.2 |
| Thallium | ug/l | <0.2 | <0.2 | <0.2 |
| | | | | |
| Class II | | | | |
| | | | | |
| Arsenic | ug/l | <0.96 | <0.96 | <0.96 |
| Cobalt | ug/l | <0.2 | <0.2 | <0.2 |
| Nickel | ug/l | <0.47 | <0.47 | <0.47 |
| Selenium | ug/l | <0.74 | <0.74 | <0.74 |
| Tellurium | ug/l | <5 | <5 | <5 |
| | | | | |
| Class III | | | | |
| | | | | |
| Antimony | ug/l | <0.13 | <0.13 | <0.13 |
| Lead | ug/l | 0.447 | <0.38 | 0.411 |
| Chromium | ug/l | <0.93 | <0.93 | <0.93 |
| Manganese | ug/l | <0.7 | <0.7 | <0.7 |
| Platinum | ug/l | <5 | <5 | <5 |
| Palladium | ug/l | <5 | <5 | <5 |
| Rhodium | ug/l | <5 | <5 | <5 |
| Vanadium | ug/l | <4 | <4 | <4 |
| Tin | ug/l | <2.8 | <2.8 | <2.8 |

Appendix ii

Sampling Data:

Isokinetic sampling

11-10-27 10.23 Thu

| Port | Point | Distance (cm) | ET (hh:mm:ss) | Flow q' Va | Volume Vgn |
|------|-------|------------------|------------------|---------------|---------------|
| 1 | 1 | 8.6 | 00:05:00 | 8.022 | 0.0357 |
| 1 | 2 | 50.4 | 00:05:00 | 10.073 | 0.0449 |
| 2 | 1 | 8.6 | 00:05:00 | 9.741 | 0.043 |
| 2 | 2 | 50.4 | 00:05:00 | 9.829 | 0.0441 |

| Deviation Di | Velocity v'a | Press. diff. Pitot (Pa) | Temperature ta (°C) | Pressure Pa (kPa) |
|-----------------|-----------------|----------------------------------|------------------------|----------------------|
| -19.58 | 5.88 | 28.204 | 24.6 | 98.385 |
| -1.37 | 6.02 | 29.61 | 24.59 | 98.52 |
| -1.34 | 5.82 | 27.379 | 28.11 | 98.631 |
| 0.59 | 5.76 | 27.334 | 23.39 | 98.731 |

FINAL REPORT

Method : ISO 9096 no central point

DUCT AND GAS SPECIFICATION

Circular section

| | | |
|----------------------|---------------------|---------|
| Diameter | m : | 0.590 |
| Port | n° : | 02 |
| Down stream | m : | 1.80000 |
| Up stream | m : | 7.50000 |
| Molecular weight | kg/kmol : | 29.0000 |
| Density | kg/m ³ : | 1.29400 |
| CO ₂ | % : | 1.00000 |
| O ₂ | % : | 1.00000 |
| Water vapor content | kg/m ³ : | 0.0000 |
| Water vapor ratio rw | : | 0.000 |
| Ambient pressure | kPa : | 97.95 |

MEASURE POINT

| | | |
|------------------------------|---|----|
| Suggested point for diameter | : | 02 |
| Selected number of point | : | 02 |

Atmospheric Emissions Monitoring Report

SAMPLED VOLUMES

| | | | | |
|----------------------|------|----------------|---|----------|
| Dry at gas meter | Vg | m ³ | : | 0.1829 |
| Dry derived | Vdn | m ³ | : | 0.0000 |
| Dry std. condition | Vgn | m ³ | : | 0.1678 |
| Wet at measure plain | Vga | m ³ | : | 0.1883 |
| Nozzle diameter | | mm | : | 6.000 |
| Average flow | q'Va | l/min | : | 9.417 |
| Average flow | q'Vn | l/min | : | 8.390 |
| Average nozzle speed | v'N | m/s | : | 5.55 |
| Average duct speed | v'a | m/s | : | 5.87 |
| Total derived time | ETd | hh:mm:ss | : | 00:00:00 |
| Total elapsed time | ETt | hh:mm:ss | : | 00:20:00 |

ISO KINETIC CONDITION

| | | | | |
|---------------|---------|---|------|------|
| ISO rate | v'N/v'a | : | | |
| | | | 0.95 | |
| ISO deviation | DI | % | : | - |
| | | | | 5.44 |

DUCT FLOW RATE

| | | | | |
|----------------|------|-------------------|---|---------|
| Moist actual | Q Va | m ³ /h | : | 5774.50 |
| Moist standard | Q Vn | m ³ /h | : | 5144.64 |
| Dry standard | Q Vn | m ³ /h | : | 5144.64 |

AVERAGE VALUES

| | | | | |
|-----------------------|----------------|-----|---|--------|
| Actual temperature | t _a | °C | : | 25.17 |
| Gas meter temperature | t _g | °C | : | 14.78 |
| Aux. 1 temperature | | °C | : | 300.00 |
| Aux. 2 temperature | | °C | : | 300.00 |
| Actual pressure | | kPa | : | 98.567 |
| Press. diff. Pitot | | Pa | : | 28.124 |

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Appendix iii

Laboratory Certificates of Analysis:

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|---------------------|---|-------------------------------|-----------------------|
| Customer | Fergal Coyle FJ Coyle & Associates Magnet Mall 70/71 Glaslough st Monaghan Co Monaghan | Lab Report Ref. No. | 1760/021/01 |
| Customer PO | | Date of Receipt | 09/11/2011 |
| Customer Ref | B14 | Sampled On | 08/11/2011 |
| | | Date Testing Commenced | 09/11/2011 |
| | | Received or Collected | Delivered by Customer |
| | | Condition on Receipt | Acceptable |
| | | Date of Report | 21/11/2011 |
| | | Sample Type | Other |

CERTIFICATE OF ANALYSIS

| Test Parameter | SOP | Analytical Technique | Result | Units | Acc. |
|--------------------|-----|----------------------|--------|-----------|------|
| Antimony (Filter) | 177 | ICPMS | <0.13 | ug/Filter | |
| Arsenic (Filter) | 177 | ICPMS | <0.96 | ug/Filter | |
| Cadmium (Filter) | 177 | ICPMS | <0.09 | ug/Filter | |
| Chromium (Filter) | 177 | ICPMS | <0.93 | ug/Filter | |
| Cobalt (Filter) | 177 | ICPMS | <0.2 | ug/Filter | |
| Copper (Filter) | 177 | ICPMS | 0.752 | ug/Filter | |
| Lead (Filter) | 177 | ICPMS | 0.447 | ug/Filter | |
| Manganese (Filter) | 177 | ICPMS | <0.7 | ug/Filter | |
| Mercury (Filter) | 178 | ICPMS | <0.2 | ug/Filter | |
| Nickel (Filter) | 177 | ICPMS | <0.47 | ug/Filter | |
| Palladium (Filter) | 227 | ICPMS | <5 | ug/Filter | |
| Platinum (Filter) | 227 | ICPMS | <5 | ug/Filter | |
| Rhodium (Filter) | 227 | ICPMS | <5 | ug/Filter | |
| Selenium (Filter) | 177 | ICPMS | <0.74 | ug/Filter | |
| Tellurium (Filter) | 227 | ICPMS | <5 | ug/Filter | |
| Thallium (Filter) | 177 | ICPMS | <0.2 | ug/Filter | |
| Tin (Filter) | 177 | ICPMS | <2.8 | ug/Filter | |
| Vanadium (Filter) | 177 | ICPMS | <4 | ug/Filter | |

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Signed: A Harmon
Aoife Harmon - Technical Supervisor

Date: 21/11/11

Acc. Accredited Parameters by ISO 17025 2005

All organic results are analysed as received and all results are corrected for dry weight at 104 C
Results shall not be reproduced, except in full, without the approval of Fitz Scientific
Results contained in this report relate only to the samples tested

**The analytical result for this parameter may not be reflective of the concentration present at the time of sampling. The maximum recommended preservation time for this parameter has been exceeded



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| | | | |
|---------------------|--|-------------------------------|-----------------------|
| Customer | Fergal Coyle F J Coyle & Associates Magnet Mall 70/71 Glaslough st Monaghan Co Monaghan | Lab Report Ref. No. | 1760/021/02 |
| Customer PO | B15 | Date of Receipt | 09/11/2011 |
| Customer Ref | B15 | Sampled On | 08/11/2011 |
| | | Date Testing Commenced | 09/11/2011 |
| | | Received or Collected | Delivered by Customer |
| | | Condition on Receipt | Acceptable |
| | | Date of Report | 21/11/2011 |
| | | Sample Type | Other |

CERTIFICATE OF ANALYSIS

| Test Parameter | SOP | Analytical Technique | Result | Units | Acc. |
|--------------------|-----|----------------------|--------|-----------|------|
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| Arsenic (Filter) | 177 | ICPMS | <0.96 | ug/Filter | |
| Cadmium (Filter) | 177 | ICPMS | <0.09 | ug/Filter | |
| Chromium (Filter) | 177 | ICPMS | <0.93 | ug/Filter | |
| Cobalt (Filter) | 177 | ICPMS | <0.2 | ug/Filter | |
| Copper (Filter) | 177 | ICPMS | 0.469 | ug/Filter | |
| Lead (Filter) | 177 | ICPMS | <0.38 | ug/Filter | |
| Manganese (Filter) | 177 | ICPMS | <0.7 | ug/Filter | |
| Mercury (Filter) | 178 | ICPMS | <0.2 | ug/Filter | |
| Nickel (Filter) | 177 | ICPMS | <0.47 | ug/Filter | |
| Palladium (Filter) | 227 | ICPMS | <5 | ug/Filter | |
| Platinum (Filter) | 227 | ICPMS | <5 | ug/Filter | |
| Rhodium (Filter) | 227 | ICPMS | <5 | ug/Filter | |
| Selenium (Filter) | 177 | ICPMS | <0.74 | ug/Filter | |
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| Thallium (Filter) | 177 | ICPMS | <0.2 | ug/Filter | |
| Tin (Filter) | 178 | ICPMS | <2.8 | ug/Filter | |
| Vanadium (Filter) | 177 | ICPMS | <4 | ug/Filter | |

Signed: A Harmon
 Aoife Harmon - Technical Supervisor

Date: 21/11/11

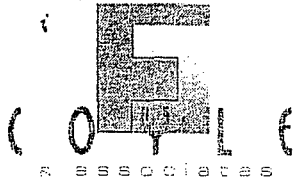
Acc: Accredited Parameters by ISO 17025:2005

All organic results are analysed as received and all results are corrected for dry weight at 104 C
 Results shall not be reproduced - except in full - without the approval of Fitz Scientific
 Results contained in this report relate only to the samples tested

**The analytical result for this parameter may not be reflective of the concentration present at the time of sampling. The maximum recommended preservation time for this parameter has been exceeded

Page 1 of 1

CIVIL AND ENVIRONMENTAL CONSULTANTS



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|----------------------------|--|-----|------|----------------|-----------------|----------------------|
| Client | Basta Parsons Limited | | | | | |
| Project Title | Atmospheric air quality at Basta Parsons Limited, Tubbercurry, Co. Sligo. | | | | | |
| Document Title | Analysis of Stack Emission from Furnace Building at Basta Parsons Facility | | | | | |
| Document No. | | | | | | |
| This Document Comprises | DCS | TOC | Text | List of Tables | List of Figures | No. of Appendices |
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| 01 | Draft | OF/CF | FC | F.J.C. | Roscommon | 18 th August 2009 |
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1.0 Introduction

The following report details the findings of atmospheric emissions monitoring carried out on behalf of *Basta Parsons Limited*, Tubbercurry, Co. Sligo. Atmospheric emissions monitoring from the furnace stack were undertaken on 17th July 2009.

Metal emissions and gaseous emissions were monitored from a referenced sampling stack on the roof of the foundry building the **Emission Point Reference No:** Furnace A2-1 as per the granted IPPC Licence Ref. No. P0269/01

2.0 Methodology

2.1 Metal emissions

The sample was taken using Isokinetic stack sampling equipment.

Isokinetic means that the sampling flow rate must be set that the gas velocity entering the sampling probe nozzle is equal (or as close as possible) to the gas velocity of the stack.

Metal concentrations were determined by analytical laboratory analysis while the total particulates are calculated gravimetrically. Analysis has been carried out by *Euro Environmental Services*, Unit 35, Boyne Business Park, Drogheda, Co. Louth.

Equipment used

'TCR Tecora' *Isostack Basic* Automatic Isokinetic Sampler.

This automatic Isokinetic sampler has been realised in accordance with the most recent ISO 9096 Standard.

2.2 Gaseous emissions

In-situ sampling and analysis was performed by trained technicians using a Horiba PG-250 portable stack gas analyzer. This instrument can simultaneously measure up to five separate gas components.

The PG-250 uses

- Non-dispersive IR detection for CO, SO₂, and CO₂ determination

- Chemiluminescence (cross-flow modulation) for NO_x
- A galvanic cell or an optional zirconium oxide sensor for O₂ measurements.

3.0 Summary Results

Table 1 Metal concentrations.

| Parameter | E.L.V. | Conc. (mg/m ³) |
|----------------------------------|--|----------------------------|
| TA Luft Inorganic Dust Class I | 0.2 mg/m ³ (at mass flows >1 g/hr) | < 0.2 |
| TA Luft Inorganic Dust Class II | 1.0 mg/m ³ (at mass flows >5 g/hr) | < 1.0 |
| TA Luft inorganic Dust Class III | 5.0 mg/m ³ (at mass flows >25 g/hr) | <5.0 |

Volume Emitted Per Hour: 5269.14 m³

A Copy of the Certificate of Analysis for the analysing laboratory can be found in Appendix i.

A copy of the Isokinetic Sampling data can be found in Appendix ii .

Table 2 Gaseous concentrations.

Average Flue Gas Emissions – Corrected to 3% Oxygen

| Source | Temperature °C | Oxygen % | NO _x as NO ₂ mg/Nm ³ | SO _x as SO ₂ mg/Nm ³ |
|--------------------|----------------|----------|---|---|
| Furnace stack A2-1 | 48 | 20.32 | 3.06 | 13.52 |

Standard Reference Conditions

The concentrations of flue gas emissions have been calculated to standard reference conditions as follows.

Appendix i

Table 3. Laboratory Analysis Results

Inorganic Dust Particles

| | | Filter code | | |
|------------------|------|--------------|-------------|-------|
| | | B15 (Sample) | B16 (Blank) | B15 |
| Class I | | | | |
| Cadmium | ug/l | <0.09 | <0.09 | <0.09 |
| Mercury | ug/l | <0.2 | <0.2 | <0.2 |
| Thallium | ug/l | <0.2 | <0.2 | <0.2 |
| Class II | | | | |
| Arsenic | ug/l | <0.96 | <0.96 | <0.96 |
| Cobalt | ug/l | <1 | <1 | <1 |
| Nickel | ug/l | <0.85 | <0.85 | <0.85 |
| Selenium | ug/l | <1 | <1 | <1 |
| Tellurium | ug/l | <10 | <10 | <10 |
| Class III | | | | |
| Antimony | ug/l | <0.75 | <0.75 | <0.75 |
| Lead | ug/l | <1 | <0.38 | <0.62 |
| Chromium | ug/l | <0.93 | <0.93 | <0.93 |
| Manganese | ug/l | <0.7 | <0.7 | <0.7 |
| Platinum | ug/l | <10 | <10 | <10 |
| Palladium | ug/l | <10 | <10 | <10 |
| Rhodium | ug/l | <10 | <10 | <10 |
| Vanadium | ug/l | <1 | <1 | <1 |
| Tin | ug/l | <2.8 | <2.8 | <2.8 |

Appendix ii

Sampling Data:

Isokinetic sampling

09-17-07 10.26 Fri

| Port | Point | Distance (cm) | ET (hh:mm:ss) | Flow q'Va | Volume Vgn |
|------|-------|---------------|---------------|-----------|------------|
| 1 | 1 | 8.8 | 00:15:00 | 29.6 | 0.3863 |
| 1 | 2 | 51.2 | 00:15:00 | 27.4 | 0.3465 |

| Volume Vdn | Deviation DI | Velocity v'a | Press. diff. (Pa) | Pitot Temperature ta (°C) |
|------------|--------------|--------------|-------------------|---------------------------|
| 0 | 0.1 | 6.28 | 31.487 | 36.56 |
| 0 | -0.15 | 5.84 | 26.32 | 47.87 |

FINAL REPORT

Method : ISO 9096 no central point

DUCT AND GAS SPECIFICATION

Circular section

Diameter m : 0.600

Port n° : 02

PROGRAMMED VALUES

Derived flow qVdn l/m : 0.00

MEASURE POINT

Suggested point for diameter : 01

Selected number of point 01

SAMPLED VOLUMES

Dry at gas meter Vg m³ : 0.8096

Dry std. condition Vgn m³ : 0.7326

Wet at measure plain V'ga m³ : 0.8572

Nozzle diameter mm : 10.00

Average flow q'Va l/min : 28.57

Average flow q'Vn l/min : 24.42

Average nozzle speed v'N m/s : 6.06

Average duct speed v'a m/s : 6.06

Total elapsed time ETt hh:mm:ss : 00:30:00

ISOKINETIC CONDITION

ISO rate v'N/v'a : 1.0

ISO deviation DI % : 0.06

DUCT FLOW RATE

Moist actual Q'Va m³/h : 6165.20

Moist standard Q'Vn m³/h : 5269.15

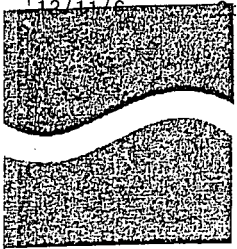
Dry standard QVn m³/h : 5269.15

F.J. Coyle & Associates
Environmental Consultants

Basta Parsons Limited

Appendix iii

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Environmental Science & Management
Water, Soil & Air Testing

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| Customer | Fergal Coyle FJ Coyle & Associates Magnet Mall 70/71 Glasslough st Monaghan Co Monaghan | Lab Report Ref. No. | 1760/020/01 |
| Customer PO | | Date of Receipt | 24/07/2009 |
| Customer Ref | B20 | Date Testing Commenced | 24/07/2009 |
| | | Received or Collected | Courier: An Post |
| | | Condition on Receipt | Acceptable |
| | | Date of Report | 30/07/2009 |
| | | Sample Type | Other |

CERTIFICATE OF ANALYSIS

| Test Parameter | SOP | Analytical Technique | Result | Units | Acc. |
|--------------------|-----|----------------------|--------|-----------|------|
| Antimony (Filter) | 177 | ICPMS | <0.13 | ug/Filter | |
| Arsenic (Filter) | 177 | ICPMS | <0.96 | ug/Filter | |
| Cadmium (Filter) | 177 | ICPMS | <0.09 | ug/Filter | |
| Chromium (Filter) | 177 | ICPMS | <0.93 | ug/Filter | |
| Cobalt (Filter) | 177 | ICPMS | <0.2 | ug/Filter | |
| Copper (Filter) | 177 | ICPMS | 0.6 | ug/Filter | |
| Lead (Filter) | 177 | ICPMS | 0.5 | ug/Filter | |
| Manganese (Filter) | 177 | ICPMS | <0.7 | ug/Filter | |
| Mercury (Filter) | 178 | ICPMS | <0.2 | ug/Filter | |
| Nickel (Filter) | 177 | ICPMS | <0.47 | ug/Filter | |
| Palladium (Filter) | 184 | ICPMS | <5 | ug/Filter | |
| Platinum (Filter) | 184 | ICPMS | <5 | ug/Filter | |
| Rhodium (Filter) | 0 | ICPMS | <5 | ug/Filter | |
| Selenium (Filter) | 177 | ICPMS | <0.74 | ug/Filter | |
| Tellurium (Filter) | 184 | ICPMS | <5 | ug/Filter | |
| Thallium (Filter) | 177 | ICPMS | <0.2 | ug/Filter | |
| Tin (Filter) | 177 | ICPMS | <2.8 | ug/Filter | |
| Vanadium (Filter) | 177 | ICPMS | <4 | ug/Filter | |

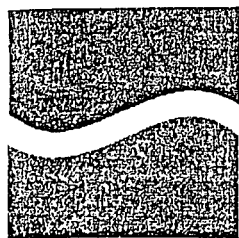
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Signed: Katherine McQuillan
Katherine McQuillan - Deputy Technical Manager

Date: 30/7/09

Acc. : Accredited Parameters by ISO 17025:2005

All organic results are analysed as received and all results are corrected for dry weight at 104 C
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Results contained in this report relate only to the samples tested



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Environmental Science & Management
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A copy of this certificate is available on www.euroenv.ie

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| | | | |
|---------------------|--|-------------------------------|------------------|
| <i>Customer</i> | Fergal Coyle FJ Coyle & Associates Magnet Mall 70/71 Glasslough st Monaghan Co Monaghan | <i>Lab Report Ref. No.</i> | 1760/020/02 |
| <i>Customer PO</i> | | <i>Date of Receipt</i> | 24/07/2009 |
| <i>Customer Ref</i> | B21 | <i>Date Testing Commenced</i> | 24/07/2009 |
| | | <i>Received or Collected</i> | Courier: An Post |
| | | <i>Condition on Receipt</i> | Acceptable |
| | | <i>Date of Report</i> | 30/07/2009 |
| | | <i>Sample Type</i> | Other |

CERTIFICATE OF ANALYSIS

| Test Parameter | SOP | Analytical Technique | Result | Units | Acc. |
|--------------------|-----|----------------------|--------|-----------|------|
| Antimony (Filter) | 177 | ICPMS | <0.13 | ug/Filter | |
| Arsenic (Filter) | 177 | ICPMS | <0.96 | ug/Filter | |
| Cadmium (Filter) | 177 | ICPMS | <0.09 | ug/Filter | |
| Chromium (Filter) | 177 | ICPMS | <0.93 | ug/Filter | |
| Cobalt (Filter) | 177 | ICPMS | <0.2 | ug/Filter | |
| Copper (Filter) | 177 | ICPMS | 0.4 | ug/Filter | |
| Lead (Filter) | 177 | ICPMS | <0.38 | ug/Filter | |
| Manganese (Filter) | 177 | ICPMS | <0.7 | ug/Filter | |
| Mercury (Filter) | 178 | ICPMS | <0.2 | ug/Filter | |
| Nickel (Filter) | 177 | ICPMS | <0.47 | ug/Filter | |
| Palladium (Filter) | 184 | ICPMS | <5 | ug/Filter | |
| Platinum (Filter) | 184 | ICPMS | <5 | ug/Filter | |
| Rhodium (Filter) | 0 | ICPMS | <5 | ug/Filter | |
| Selenium (Filter) | 177 | ICPMS | <0.74 | ug/Filter | |
| Tellurium (Filter) | 184 | ICPMS | <5 | ug/Filter | |
| Thallium (Filter) | 177 | ICPMS | <0.2 | ug/Filter | |
| Tin (Filter) | 177 | ICPMS | <2.8 | ug/Filter | |
| Vanadium (Filter) | 177 | ICPMS | <4 | ug/Filter | |

Signed: Katherine McQuillan

Date: 30/7/09

Katherine McQuillan - Deputy Technical Manager

Acc.: Accredited Parameters by ISO 17025:2005

All organic results are analysed as received and all results are corrected for dry weight at 104 C
Results shall not be reproduced, except in full, without the approval of EURO environmental services
Results contained in this report relate only to the samples tested

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Environmental Consultants

Basta Hardware Limited

F.J. Coyle & Associates

Civil & Environmental Consultants

| | | | | | | |
|----------------------------|--|-----|------|----------------|-----------------|----------------------|
| Client | Basta Hardware Limited | | | | | |
| Project Title | Atmospheric air quality at Basta Hardware Limited, Tubbercurry, Co. Sligo. | | | | | |
| Document Title | Scope of Works for Assessment of Air Quality due to the Furnace Stack | | | | | |
| Document No. | | | | | | |
| This Document Comprises | DCS | TOC | Text | List of Tables | List of Figures | No. of Appendices |
| | X | X | ✓ | ✓ | ✓ | 3 |

| Rev. | Status | Author(s) | Reviewed By | Approved By | Office of Origin | Issue Date |
|------|--------|-----------|-------------|-------------|------------------|---------------------------------|
| | Final | TMcB | FC | F.J.C. | Monaghan | 3 rd October 2007 |
| | | | | | | |
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Environmental Consultants

Basta Hardware Limited

1.0 Introduction

The following report details the findings of atmospheric emissions monitoring carried out on behalf of *Basta Hardware Ltd.* Tubbercurry, Co. Sligo. Atmospheric emissions monitoring from the furnace stack was undertaken on 22nd June 2007.

Metal emissions and gaseous emissions were monitored.

Emission Point Reference No's.: Furnace A2-1

Location : Process building

2.0 Methodology

2.1 Metal emissions

The sample was taken using Isokinetic stack sampling equipment.

Isokinetic means that the sampling flow rate must be set that the gas velocity entering the sampling probe nozzle is equal (or as close as possible) to the gas velocity of the stack.

Metal concentrations were determined by analytical laboratory analysis while the total particulates are calculated gravimetrically. Analysis has been carried out by *Euro Environmental Services*, Unit 35, Boyne Business Park, Drogheda, Co. Louth.

Equipment used

'TCR Tecora' *Isostack Basic* Automatic Isokinetic Sampler.

This automatic Isokinetic sampler has been realised in accordance with the most recent ISO 9096 Standard.

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Basta Hardware Limited

2.2 Gaseous emissions

In-situ sampling and analysis was performed by trained technicians using a Horiba PG-250 portable stack gas analyzer. This instrument can simultaneously measure up to five separate gas components.

The PG-250 uses

- Non-dispersive IR detection for CO, SO₂, and CO₂ determination
- Chemiluminescence (cross-flow modulation) for NOx
- A galvanic cell or an optional zirconium oxide sensor for O₂ measurements.

3.0 Summary Results

Table 1 Metal concentrations.

| Parameter | E.L.V. | Conc. (mg/m ³) |
|----------------------------------|--|----------------------------|
| TA Luft Inorganic Dust Class I | 0.2 mg/m ³ (at mass flows >1 g/hr) | < 0.2 |
| TA Luft Inorganic Dust Class II | 1.0 mg/m ³ (at mass flows >5 g/hr) | < 1.0 |
| TA Luft inorganic Dust Class III | 5.0 mg/m ³ (at mass flows >25 g/hr) | <5.0 |

Volume Emitted Per Hour: 5269.14 m³

A copy of the Laboratory Analysis Results for the analysing laboratory can be found in Appendix i.

A copy of the Isokinetic Sampling data can be found in Appendix ii .

A copy of the Certificate of Analysis from the analysing laboratory can be found in Appendix iii.

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Table 2 Gaseous concentrations.

Average Flue Gas Emissions – Corrected to 3% Oxygen

| Source | Temperature °C | Oxygen % | NOx as NO ₂ mg/Nm ³ | SOx as SO ₂ mg/Nm ³ |
|--------------------------|-------------------|----------|---|---|
| Furnace stack A2-1 | 48 | 20.32 | 3.06 | 13.52 |

Standard Reference Conditions

The concentrations of flue gas emissions have been calculated to standard reference conditions as follows.

- Temperature: 273 °K.
- Pressure: 101.3 kPa.
- Dry gas

4.0 Discussion

Monitoring of the stack emissions was carried out in accordance with **Condition 10, Monitoring**, of the company I.P.C. licence.

The methods of sampling and analysis were carried out as prescribed in **Schedule 1 (ii), Monitoring of Emissions to Atmosphere**.

The results show that for each of Class i , Class ii, and Class iii inorganic dusts the concentrations are below the Emission limit values.

The volume emitted per hour is also within the Maximum hourly limit.

There are no emission limit values for gaseous emissions (for NOx and SO₂) detailed in the IPPC licence.

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Appendix i

Laboratory Analysis Results

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Table 3. Laboratory Analysis Results

Inorganic Dust Particles

| | | Filter code | | |
|------------------|------|--------------|-------------|-------|
| | | B15 (Sample) | B16 (Blank) | B15 |
| Class I | | | | |
| Cadmium | ug/l | <0.09 | <0.09 | <0.09 |
| Mercury | ug/l | <0.2 | <0.2 | <0.2 |
| Thallium | ug/l | <0.2 | <0.2 | <0.2 |
| | | | | |
| Class II | | | | |
| | | | | |
| Arsenic | ug/l | <0.96 | <0.96 | <0.96 |
| Cobalt | ug/l | <1 | <1 | <1 |
| Nickel | ug/l | <0.85 | <0.85 | <0.85 |
| Selenium | ug/l | <1 | <1 | <1 |
| Tellurium | ug/l | <10 | <10 | <10 |
| | | | | |
| Class III | | | | |
| | | | | |
| Antimony | ug/l | <0.75 | <0.75 | <0.75 |
| Lead | ug/l | <1 | <0.38 | <0.62 |
| Chromium | ug/l | <0.93 | <0.93 | <0.93 |
| Manganese | ug/l | <0.7 | <0.7 | <0.7 |
| Platinum | ug/l | <10 | <10 | <10 |
| Palladium | ug/l | <10 | <10 | <10 |
| Rhodium | ug/l | <10 | <10 | <10 |
| Vanadium | ug/l | <1 | <1 | <1 |
| Tin | ug/l | <2.8 | <2.8 | <2.8 |

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Appendix ii

Sampling Data

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Appendix iii

Certificate of Analysis

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CONFIDENTIAL REPORT

Compiled by:

F.J. Coyle & Associates
70 – 71 Glaslough Street,
Monaghan,
Co. Monaghan

Compiled on behalf of:

Basta Parsons Limited
Tubbercurry,
Co. Sligo

Dated:

24th July 2002
First Half Monitoring for 2002.

*Consent of Client for inspection purposes only.
Consent of Client for other use.*

Location: **Basta Hardware Ltd.**
Tubbercurry, Co. Sligo.

Emission Point Reference No's.: Furnace A2-1

Location : Process building

Date: Thursday 30th May 2002, 10:00am

Method

The sample was taken using Isokinetic stack sampling equipment.
Isokinetic means that the sampling flow rate must be set that the gas velocity entering the sampling probe nozzle is equal (or as close as possible) to the gas velocity of the stack.

Equipment

'TCR Tecora' Isostack Basic Automatic Iskinetic Sampler.
This automatic isokinetic sampler has been realised in accordance with the most recent ISO 9096 Standard.

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Summary Results

Table 1.

| Parameter | E.L.V. | Conc. (mg/m ³) |
|----------------------------------|--|----------------------------|
| TA Luft Inorganic Dust Class I | 0.2 mg/m ³ (at mass flows >1 g/hr) | < 0.014 |
| TA Luft Inorganic Dust Class II | 1.0 mg/m ³ (at mass flows >5 g/hr) | < 0.35 |
| TA Luft inorganic Dust Class III | 5.0 mg/m ³ (at mass flows >25 g/hr) | < 2.6 |
| Total Particulates | - | 5.89 |

Volume Emitted Per Hour: 5214.31 m³

A comprehensive table of results can be found in **Table 2. Appendix i.**

A Copy of the Certificate of Analysis for the analysing laboratory can also be found in Appendix i.

A copy of the Isokinetic Sampling data can be found in Appendix ii .

Discussion

Monitoring of the stack emissions was carried out in accordance with **Condition 10, Monitoring**, of the company I.P.C. licence.

The methods of sampling and analysis were carried out as prescribed in **Schedule 1 (ii), Monitoring of Emissions to Atmosphere.**

The results show that for each of Class i , Class ii, and Class iii inorganic dusts the concentrations are below the Emission limit values.

The volume emitted per hour is also within the Maximum hourly limit.

Appendix i

Table 2. Laboratory Analysis Results

Inorganic Dust Particles

| | | Filter code | | |
|------------------|------|-------------|-------------|----------|
| | | B2 (Blank) | B3 (Sample) | B3 |
| Class I | | | | |
| Cadmium | mg/l | < 0.003 | < 0.003 | < 0.003 |
| Mercury | mg/l | < 0.0005 | < 0.0005 | < 0.0005 |
| Thallium | mg/l | < 0.01 | < 0.01 | < 0.01 |
| Class II | | | | |
| Arsenic | mg/l | < 0.005 | < 0.005 | < 0.005 |
| Cobalt | mg/l | < 0.01 | < 0.01 | < 0.01 |
| Nickel | mg/l | 2.9 | 3.2 | 0.3 |
| Selenium | mg/l | < 0.01 | < 0.01 | < 0.01 |
| Tellurium | mg/l | < 0.01 | < 0.01 | < 0.01 |
| Class III | | | | |
| Antimony | mg/l | < 0.001 | < 0.001 | < 0.001 |
| Lead | mg/l | < 0.049 | < 0.049 | < 0.049 |
| Chromium | mg/l | 16.79 | 17.82 | 1.03 |
| Cyanides | mg/l | < 0.003 | 1.124 | 1.12 |
| Fluorides | mg/l | 1.89 | 1.92 | 0.03 |
| Copper | mg/l | 0.79 | 0.91 | 0.12 |
| Manganese | mg/l | 0.586 | 0.68 | 0.094 |
| Platinum | mg/l | < 0.01 | < 0.01 | < 0.01 |
| Palladium | mg/l | < 0.01 | < 0.01 | < 0.01 |
| Rhodium | mg/l | < 0.01 | < 0.01 | < 0.01 |
| Vanadium | mg/l | < 0.01 | < 0.01 | < 0.01 |
| Tin | mg/l | < 0.001 | < 0.001 | < 0.001 |

Cert of analysis to go here!!

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Appendix ii

Sampling Data:

Isokinetic sampling

1

02-05-30 13.54 Thu

| Port | Point | Distance (cm) | ET Min | Flow q'Va | Volume Vgn | Deviation DI | Press. diff. Pitot (Pa) | Temperature ta (°C) | Pressure Pa (kPa) |
|------|-------|---------------|--------|-----------|------------|--------------|-------------------------|---------------------|-------------------|
| 1 | 1 | 8.8 | 10:00 | 27.495 | 0.2401 | -2.92 | 0.023 | 35.21 | 99.871 |
| 1 | 2 | 51.2 | 10:00 | 28.042 | 0.2455 | -0.82 | 0.01 | 35.56 | 100.227 |
| 2 | 1 | 8.8 | 10:00 | 28.044 | 0.2381 | -0.81 | 0.01 | 45.57 | 100.361 |
| 2 | 2 | 51.2 | 10:00 | 28.235 | 0.2319 | -0.14 | 0.01 | 56.38 | 100.388 |

FINAL REPORT

Method : ISO 9096 no central point

DUCT AND GAS SPECIFICATION

Circular section

Diameter m : 0.600

Port n° : 02

Ambient pressure kPa : 99.59

MEASURE POINT

Suggested point for diameter : 02

Selected number of point : 02

SAMPLED VOLUMES

Dry at gas meter Vg m³ : 1.0424

Dry derived Vdn m³ : 0.0000

Dry std. condition Vgn m³ : 0.9556

Wet at measure plain V'ga m³ : 1.1187

Nozzle diameter mm : 10.000

Average flow q'Va l/min : 27.968
 Average flow q'Vn l/min : 23.891
 Average nozzle speed v'N m/s : 5.93
 Average duct speed v'a m/s : 6.00
 Total derived time ETd hh:mm:ss : 00:00:00
 Total elapsed time ETt hh:mm:ss : 00:40:00

ISOKINETIC CONDITION

ISO rate v'N/v'a : 0.99
 ISO deviation DI % : -1.08

DUCT FLOW RATE

Moist actual Q'Va m³/h : 6104.16
 Moist standard Q'Vn m³/h : 5214.31
 Dry standard QVn m³/h : 5214.31

AVERAGE VALUES

Actual temperature ta °C : 43.18
 Gas meter temperature tg °C : 19.76
 Actual pressure kPa : 100.212
 Press. diff. Pitot Pa : 0.013

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Location

Basta Hardware Ltd. Tubbercurry, Co. Sligo.

Emission Point Reference No's.: Furnace A2-1

Location : Process building

Method

The sample was taken using Isokinetic stack sampling equipment.

Isokinetic means that the sampling flow rate must be set that the gas velocity entering the sampling probe nozzle is equal (or as close as possible) to the gas velocity of the stack.

Metal concentrations were determined by analytical laboratory analysis while the total particulates is calculated gravimetrically. Analysis has been carried out by Euro Environmental Services, Southbank Hse., Drogheda, Co. Louth.

Equipment

'TCR Tecora' *Isostack Basic* Automatic Isokinetic Sampler.

This automatic Isokinetic sampler has been realised in accordance with the most recent ISO 9096 Standard.

Summary Results

Table 1.

| Parameter | E.L.V. | Conc. (mg/m ³) |
|----------------------------------|--|----------------------------|
| TA Luft Inorganic Dust Class I | 0.2 mg/m ³ (at mass flows >1 g/hr) | 0.11 |
| TA Luft Inorganic Dust Class II | 1.0 mg/m ³ (at mass flows >5 g/hr) | 0.96 |
| TA Luft inorganic Dust Class III | 5.0 mg/m ³ (at mass flows >25 g/hr) | 3.29 |
| Total Particulates | - | 6.51 |

Volume Emitted Per Hour: 5270.94 m³

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A comprehensive table of results can be found in **Table 2**. Appendix i.

A Copy of the Certificate of Analysis for the analysing laboratory can also be found in Appendix i.

A copy of the Isokinetic Sampling data can be found in Appendix ii .

Discussion

Monitoring of the stack emissions was carried out in accordance with **Condition 10, Monitoring**, of the company I.P.C. licence.

The methods of sampling and analysis were carried out as prescribed in **Schedule 1 (ii)**, Monitoring of Emissions to Atmosphere.

The results show that for each of Class i , Class ii, and Class iii inorganic dusts the concentrations are below the Emission limit values.

The volume emitted per hour is also within the Maximum hourly limit.

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Appendix i

Table 2. Laboratory Analysis Results

| | | Inorganic Dust Particles | | |
|------------------|------|--------------------------|-------------|--------|
| | | Filter code | | |
| | | B9 (Sample) | B10 (Blank) | B9 |
| Class I | | | | |
| Cadmium | ug/l | 24.7 | <10 | 24.7 |
| Mercury | ug/l | 7.9 | 8.8 | 0 |
| Thallium | ug/l | 41.5 | <10 | 41.5 |
| | | | | |
| Class II | | | | |
| | | | | |
| Arsenic | ug/l | 518.9 | 155.2 | 363.7 |
| Cobalt | ug/l | 24.4 | <10 | 24.4 |
| Nickel | ug/l | 288.7 | 145.4 | 143.3 |
| Selenium | ug/l | <10 | <10 | 0 |
| Tellurium | mg/l | 0.043 | 0.015 | 0.028 |
| | | | | |
| Class III | | | | |
| | | | | |
| Antimony | ug/l | 82.4 | 87.5 | 0 |
| Lead | ug/l | 1254 | 126.7 | 1127.3 |
| Chromium | ug/l | 493.2 | 310.3 | 182.9 |
| Copper | ug/l | 644.3 | 401.5 | 242.8 |
| Manganese | mg/l | 0.716 | 0.919 | 0 |
| Platinum | mg/l | 0.013 | 0.007 | 0.006 |
| Palladium | mg/l | 0.366 | 0.292 | 0.074 |
| Rhodium | mg/l | 0.001 | <0.001 | 0.001 |
| Vanadium | ug/l | <10 | <10 | 0 |
| Tin | ug/l | 2201 | 1927 | 274 |

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| | | | |
|---------------|--|------------------------|------------|
| Customer Name | Oliver Fitzsimons | Lab Report Ref. No | 176000401 |
| Company | F.J Coyle & Associates | Date of Receipt | 29/11/03 |
| Address | Magnet Mall 7071 Glaslough st Monaghan | Date Testing Commenced | 29/11/03 |
| Customer PO | | Received or Collected | Collected |
| | | Condition on Receipt | Acceptable |
| | | Date of Report | 12/12/03 |

CERTIFICATE OF ANALYSIS

Client Ref: Filter ID B9 17/11/03

Lab Ref: 176000401

SAMPLE

| Test Parameter | Method of Analysis | Analytical Technique | Result | Units |
|----------------|--------------------|----------------------|--------|-------|
| Antimony | SOP 177 | ICPMS | 82.4 | ug/L |
| Arsenic | SOP 177 | ICPMS | 518.9 | ug/L |
| Cadmium | SOP 177 | ICPMS | 24.7 | ug/L |
| Chromium | SOP 177 | ICPMS | 493.2 | ug/L |
| Cobalt | SOP 177 | ICPMS | 24.4 | ug/L |
| Copper | SOP 177 | ICPMS | 644.3 | ug/L |
| Lead | SOP 177 | ICPMS | 1254.0 | ug/L |
| Manganese | SOP 177 | ICPMS | 0.716 | mg/L |
| Mercury | SOP 177 | ICPMS | 7.9 | ug/L |
| Nickel | SOP 177 | ICPMS | 288.7 | ug/L |
| Palladium | SOP 184 | ICPMS | 0.386 | mg/L |
| Platinum | SOP 184 | ICPMS | 0.013 | mg/L |
| Rhodium | SOP 0 | ICPMS | 0.001 | mg/L |
| Selenium | SOP 177 | ICPMS | <10.0 | ug/L |
| Tellurium | SOP 184 | ICPMS | 0.043 | mg/L |
| Titanium | SOP 177 | ICPMS | -1.5 | ug/L |
| Tin | SOP 177 | ICPMS | 2291.0 | ug/L |
| Vanadium | SOP 177 | ICPMS | <10.0 | ug/L |

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Signed: Mark Jacob

Date: 12/12/03

Mark Jacob - Technical Quality Manager

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The number of test results has been indicated.

Page 1 of 1



F.J Coyle & Associates



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| | | | |
|---------------|---|------------------------|-------------|
| Customer Name | Oliver Fitzsimons | Lab Report Ref. No. | 1760/004/02 |
| Company | FJ Coyle & Associates | Date of Receipt | 25/11/03 |
| Address | Mugnet Mall 70/72 Glasneigh st Monaghan | Date Testing Commenced | 25/11/03 |
| Customer PO | | Received or Collected | Collected |
| | | Condition on Receipt | Acceptable |
| | | Date of Report | 12/12/03 |

CERTIFICATE OF ANALYSIS

Client Ref: Filter ID B10 (Blank) 17/11/03

Lab Ref: 1760/004/02

| Test Parameter | Method of Analysis | Analytical Technique | Result | Units |
|----------------|--------------------|----------------------|--------|-------|
| Antimony | SOP 177 | ICPMS | 67.5 | ug/L |
| Arsenic | SOP 177 | ICPMS | 155.2 | ug/L |
| Cadmium | SOP 177 | ICPMS | <10.0 | ug/L |
| Chromium | SOP 177 | ICPMS | 310.3 | ug/L |
| Cobalt | SOP 177 | ICPMS | <10.0 | ug/L |
| Copper | SOP 177 | ICPMS | 401.5 | ug/L |
| Lead | SOP 177 | ICPMS | 120.7 | ug/L |
| Manganese | SOP 177 | ICPMS | 0.910 | mg/L |
| Mercury | SOP 178 | ICPMS | 6.8 | ug/L |
| Nickel | SOP 177 | ICPMS | 145.4 | ug/L |
| Palladium | SOP 184 | ICPMS | 0.292 | mg/L |
| Platinum | SOP 184 | ICPMS | 0.007 | mg/L |
| Rhodium | SOP 0 | ICPMS | <0.001 | mg/L |
| Selenium | SOP 177 | ICPMS | <10.0 | ug/L |
| Tellurium | SOP 164 | ICPMS | 0.010 | mg/L |
| Thallium | SOP 177 | ICPMS | <10.0 | ug/L |
| Tin | SOP 177 | ICPMS | 1927.0 | ug/L |
| Vanadium | SOP 177 | ICPMS | <10.0 | ug/L |

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Signed: _____

Date: _____

Mark Jacob - Technical Quality Manager

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Page 1 of 1



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Appendix ii**Sampling Data:****Isokinetic sampling**

03-03-10 10.33 Mon

| Port | Point | Distance (cm) | ET (hh:mm:ss) | Flow q'Va | Volume Vgn | Deviation DI | Velocity v'a | Temperature ta (°C) | Pressure Pa (kPa) |
|------|-------|------------------|------------------|--------------|------------|-----------------|-----------------|------------------------|----------------------|
| 1 | 1 | 8.8 | 00:15:00 | 10.316 | 0.1489 | -3.47 | 6.3 | 47.4 | 99.037 |
| 1 | 2 | 51.2 | 00:15:00 | 10.652 | 0.1495 | -0.33 | 6.3 | 57.4 | 99.386 |
| 2 | 1 | 8.8 | 00:15:00 | 10.333 | 0.1406 | -0.96 | 6.15 | 45.39 | 99.557 |
| 2 | 2 | 51.2 | 00:15:00 | 10.997 | 0.1412 | -0.46 | 5.92 | 34.01 | 99.633 |

FINAL REPORT

Method : ISO 9096 no central point

DUCT AND GAS SPECIFICATION

Circular section

Diameter m : 0.600

Port n : 02

Ambient pressure kPa : 98.6

MEASURE POINT

Suggested point for diameter : 02

Selected number of point : 02

SAMPLED VOLUMESDry at gas meter Vg m³ : 0.6376Dry derived Vdn m³ : 0.0000Dry std. condition Vgn m³ : 0.5802Wet at measure plain V'ga m³ : 0.6196

Nozzle diameter mm : 6.0

Average flow q'Va l/min : 10.326

Average flow q'Vn l/min : 8.671

Average nozzle speed v'N m/s : 6.09

Average duct speed v'a m/s : 6.17

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Total derived time ETD hh:mm:ss : 00:00:00

Total elapsed time ETt hh:mm:ss : 01:00:00

ISOKINETIC CONDITION

ISO rate v'N/v'a : 0.99

ISO deviation DI % : -1.35

DUCT FLOW RATE

Moist actual Q'Va m³/h : 6277.11

Moist standard Q'Vn m³/h : 5270.94

Dry standard QVn m³/h : 5270.94

AVERAGE VALUES

Actual temperature ta °C : 46.05

Gas meter temperature tg °C : 18.11

Actual pressure kPa : 99.403

Press. diff. Pitot Pa : 29.276

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