Weston Aluminium Pty Ltd

# MONITORING AND VERIFICATION REPORT

# TRIAL DESTRUCTION OF PHARMACEUTICAL & ILLICIT DRUG WASTES

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| **REVISION** | **:** | **0** |
| **COPY** | **:** | **Original** |
| **DATE** | **:** | **10 November 2017** |

# DOCUMENT REVISION RECORD

| Rev. | Date | Description | Prepared | Checked | Approved |
|---|---|---|---|---|---|
| Draft | 07.11.2017 | Draft preparation | C. McClung | I. Burns | I. Burns |
| 0 | 10.11.2017 | Final Document issue | C. McClung | I. Burns | I. Burns |

# DISTRIBUTION LIST

| Copy Number | Recipient | Location |
|---|---|---|
| Original | Plant Environmental Management Representative | Kurri Kurri, NSW |
| 2 of 4 | NSW Department of Planning & Environment | Sydney, NSW |
| 3 of 4 | NSW Environment Protection Authority | Newcastle, NSW |
| 4 of 4 | Cessnock City Council | Cessnock, NSW |

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# 1. INTRODUCTION

In NSW, medical wastes (including pharmaceutical wastes) and illicit drug (exhibit) wastes must be disposed of via incineration, and limited options currently exist for their responsible and sustainable destruction. Pharmaceutical wastes may consist of expired, superceded, unwanted / unused, off-specification medications and their associated packaging (including cardboard cartons, drums, plastic and glass bottles, blister packs and plastic wrap). exhibit wastes may include plant materials (leaf, stem and root) and powdered or pill-formed illicit drugs confiscated by the NSW Police, as well as their associated cardboard and/or plastic evidence satchels. Given the limited disposal options available, compounding waste generation rates (>3% annually), and technical challenges associated with their responsible waste treatment (variable waste stream; stringent air emissions control requirements), medical wastes are often transported interstate for destruction. This situation is unsustainable.

In response to the continual decline in Weston Aluminium Pty Limited's (Weston Aluminium) traditional markets serviced (aluminium and steelmaking sectors), the resultant surplus thermal treatment capacity, and superior emissions control performance, Weston Aluminium has sought to explore other diversification opportunities and investigate the viability of pharmaceutical and exhibit waste processing (thermal destruction) utilizing existing plant infrastructure, equipment and processes. Regulatory approval for the Trial was granted by the NSW Department of Planning & Environment on 15 September 2015 (DA 86-04-01 Mod 9 and 10397 of 1995 Mod 7) and by the NSW Environment Protection Authority on 29 September 2015 (Notice 1534264), permitting the receipt, storage and processing of up to 1,000 tonnes of pharmaceutical and up to 200 tonnes of illicit drug wastes over a 24 month period. Trial operations commenced during October 2015.

The objectives of the Trial were to establish the following:

- Variability of waste consignment density, packaging type, moisture content and storage and handling requirements;
- Verification of technology and infrastructure compatibility and performance on a relatively large-scale (storage and containment, treatment, and environmental control systems);
- Optimal furnace operating conditions, including identifying suitable batch composition, batch/residence time, burner protocol and required operating temperature for the processing of pharmaceutical and illicit drug wastes;
- Verification of the performance of the existing pollution control systems;
- Verification of the performance of various feedstock formulations;
- Assessment and confirmation of process and procedural controls relating to occupational exposures and safety performance;
- Generation of treatment product quantities and, in conjunction with other inputs, formulation of the manufacture of a value-added product which serves as a direct substitute for conventional industrial raw material feedstock; and
- Energy demand requirements.

This Monitoring and Verification report has been prepared in accordance with requirements defined in Weston Aluminium's Development Consent (DA 86-04-01 Mod 9 and DA 10397 of 1995 Mod 7; refer **Attachment 1**) and our Environment Protection Licence (EPL No. 6423; **Attachment 2**), and describes processing methodology, monitoring findings and verification of plant, equipment, processes and emission control performance assessed during the Pharmaceutical and Illicit Drug Processing Trial.

# 2. SCOPE OF WORKS

## 2.1 Pharmaceutical and Illicit Drug Waste Processing Trial

The scope of the Pharmaceutical and Illicit Drug Waste Processing Trial, performed during the period October 2015 – October 2017, was consistent with Regulatory Approval requirements, and is defined as follows:

1. Facilitation of a Community and Stakeholder Information Session prior to trial commencement to outline details of the proposal to interested parties. Session invitations were issued in writing to government regulators, industry stakeholders and representatives of local environmental and interest groups. This Information Session occurred on 15 May 2015;
2. Update of Safety Management System and Emergency Response Plan prior to Trial commencement;
3. Confirmation and verification of existing site security protocols;
4. Provision of notification to regulatory bodies prior to, and upon conclusion, of Trial activities;
5. Domestic sourcing of up to 1,000 tonnes of pharmaceutical waste and up to 200 tonnes of illicit drug wastes. Input materials were sourced primarily from New South Wales;
6. Transportation of pharmaceutical wastes to Weston Aluminium's Kurri Kurri facility by licensed Transport Contractors. Weston Aluminium has extensive experience with bulk waste materials that require special procedures for correct storage, handling and processing. As per historical protocols, controlled transport, handling and attended observation of the destruction of illicit drug wastes was managed by NSW Police and their independent verifiers;
7. Storage of pharmaceutical wastes in existing enclosed, under-cover and bunded storage bays to prevent the potential contamination of air and stormwater. As illicit drug wastes are processed immediately upon receipt, temporary storage of these inputs was not required;
8. The processing of pharmaceutical and exhibit wastes over a 24-month Trial interval as follows:
    - Thermal processing of waste blends [small-quantity combinations (typically <100 kg) with conventional dross, SPL and/or scrap furnace additions] within existing natural gas-fired furnaces under a batch-style process. These furnaces are capable of attaining the required elevated temperatures to efficiently and safely oxidise combustible components;
    - Process emissions ventilated, controlled and monitored by existing best-practice emission controls systems, including extraction hoods, lime scrubber-fabric-filter baghouse complexes, and real-time continuous emissions monitoring systems;
    - Bulk process ash removal from the furnace for conventional downstream processing (including cooling, crushing, blending and sizing) for beneficiation into existing and established end-use products; and
    - The storage, handling and dispatch of finished product to Customers under existing quality control procedures;
9. Independent NATA-accredited emissions monitoring on a quarterly basis (when processing Trial inputs; additional to conventional compliance emissions monitoring program) to assess compliance with existing exhaust emission performance requirements for EPL Point 1 (Stack 1). Air emission parameters assessed included total and fine particulate, chlorine, hydrogen chloride, particulate and gaseous fluoride, cyanide, polycyclic aromatic hydrocarbons, volatile organic hydrocarbons,

heavy metals, oxides of nitrogen and sulfur, carbon monoxide, oxygen and gas flow characteristics (i.e. velocity, volumetric flowrate, temperature and gas density);

10. Real-time, continuous assessment of gaseous fluoride and solid particulate air emissions utilizing existing, on-site control and monitoring systems; and
11. Document operational processes in accordance with existing Quality Management System procedures.

### 2.2 Reporting

The scope of this Monitoring and Verification Report is defined in Condition 54 of our Development Consent and Condition E2.5 of our Environment Protection Licence, as reproduced below:

The Monitoring and Verification Report must:

- be submitted to the EPA, Cessnock City Council and the Director-General within 90 days of the completion of the Trial;
- detail the results of monitoring required by conditions of the Development Consent and the Environment Protection Licence;
- compare the results of the trial to the limits in the EPL and EPA's air quality impact assessment criteria;
- describe any anomalies in the monitoring data, and any exceedances of the limits or assessment criteria;
- characterise the trial outputs and describe how these products are to be managed and reused, recycled and/or disposed of;
- summarise the findings of the trial;
- recommend any actions that could be taken to minimise pollutant emissions associated with future processing activities; and
- discuss the likely options for any future processing.

## 3. TRIAL FINDINGS

### 3.1 Waste Receipt, Storage and Handling

Waste material receipt, storage and handling practices adopted throughout the Trial were performed in accordance with existing chain of custody protocols, defined as follows:

- The receipt of Trial waste inputs was limited to the period December 2015 - August 2017;
- Transport of pharmaceutical wastes to site was performed by licensed transport contractors. Deliveries were documented in accordance with the NSW EPA's waste tracking protocols;
- Transport of exhibit (illicit drug) wastes to site was performed by NSW Police;
- Storage of Pharmaceutical Wastes occurred within a single, dedicated storage bay within the Plant Building to mitigate contact with stormwater. This storage bay was also gated and

locked, and maintained under video surveillance. No spills or leaks from the site or storage facility occurred during the Trial. Exhibit wastes were processed immediately upon receipt, and accordingly, no storage of exhibit waste was required; and

- Wastes were transferred via forklift truck to rotary furnaces in discrete batches for treatment and processing.

## 3.2 Treatment Process Conditions

Waste processing conditions are summarised as follows:

- The thermal processing of Trial waste inputs was limited to the period December 2015 – October 2017;
- Pharmaceutical waste inputs were quite varied in composition, including bulk powders (blended product as well as component ingredients) in drums, formed tablets (bulk in drums and product in complete blister packs and cardboard carton packaging), glass and plastic bottles and vials/ampoules containing liquid formulations and their associated packaging (typically cardboard cartons and plastic film). The majority of waste received was also plastic shrink-wrapped for transportation purposes;
- Exhibit waste inputs were also quite variable, including cannabis exhibits (seeds, foliage, roots and stem material), loose powders (illicit drugs and suspected 'cutting agents'), formed tablets, vials of steroid, and their associated packaging (including plastic and paper/cardboard exhibit bags);
- All packaging material associated with pharmaceutical and illicit drug waste deliveries were thermally destroyed. This practice meets NSW requirements for the thermal destruction of pharmaceutical wastes, satisfies NSW Police chain of custody requirements, and meets internal work health and safety requirements designed to mitigate direct contact between furnace inputs and site personnel. Stack monitoring events confirm that Weston Aluminium's emission control systems are effective at controlling emissions associated with the thermal destruction of waste inputs and their packaging (refer below);
- Pharmaceutical wastes were thermally processed in existing 5 tonne natural gas-fired rotary furnaces, and co-processed with aluminium dross inputs. No co-processing with either SPL or aluminium scrap occurred. Where liquids were present within pharmaceutical wastes, these inputs were charged to an empty furnace to mitigate the hazard associated with molten aluminium presence;
- Temperatures achieved during processing exceeded 1000 $^{o}$C;
- Furnace batch times were consistent with conventional dross processing batches; and
- As per convention, bulk ashes generated from processing activities were cooled by rotary cooler, crushed and stored within bulka bags within the Plant Building for ultimate dispatch to Customers.

This process is consistent with conventional Aluminium Dross processing.

## 3.3 Air Emission Monitoring

Independent NATA certified emission testing was performed by AECOM on five occasions. Real-time, continuous monitoring of gaseous fluoride and particulate air emissions was also performed throughout the Trial to assess compliance with regulatory requirements. Monitoring findings are shown below.

### 3.3.1 Stack Emission Monitoring

A summary of NATA certified stack emission monitoring results is presented in **Table 1**. Regulatory compliance limits are also tabulated for comparative assessment.

Copies of Air Emissions Assessment Reports (excluding Appendices; can be provided upon request) are enclosed as **Attachment 3**.

**Table 1:** Summary of Independent Stack Emissions Monitoring Findings

| Emission Parameter | Units | Trial Air Emissions Monitoring Events | | | | | Regulatory Approval Limits |
|---|---|---|---|---|---|---|---|
| | | 16 Dec 2015 | 18 Mar 2016 | 30 Jun 2016 | 28 Sep 2016 | 08 Jun 2017 | |
| Total Particulate | $mg/m^3$ | 3.2 | 1.0 | 2.6 | 4.9 | 8.7 | 25 |
| PM10 | $mg/m^3$ | 0.24 | 0.049 | 0.83 | 2.0 | 3.7 | NL |
| Chlorine | $mg/m^3$ | <5.3 | <0.5 | <1.8 | <4.6 | 11 | NL |
| Sulfuric Acid Mist | $mg/m^3$ | <1.9 | <1.7 | <1.9 | <8.5 | <1.6 | 100 |
| Sulfur Dioxide | $mg/m^3$ | <9.3 | <8.5 | <9.6 | <1.7 | <8 | NL |
| Hydrochloric Acid | $mg/m^3$ | <5.3 | <1 | <9.1 | <9.3 | <7.7 | 400 |
| Heavy Metals | $mg/m^3$ | 0.013 | 0.011 | 0.0087 | 0.017 | 0.071 | 10 |
| Cyanide | $mg/m^3$ | 0.22 | 0.35 | 0.33 | 0.25 | 0.38 | 0.5 |
| Gaseous Fluoride | $mg/m^3$ | 0.14 | 0.018 | 0.03 | 0.095 | 0.028 | 2 |
| Particulate Fluoride | $mg/m^3$ | 0.37 | 0.055 | 0.13 | 0.11 | 0.38 | NL |
| Oxides of Nitrogen | $mg/m^3$ | 6 | 2 | 7 | 12 | 12 | 2500 |
| Carbon Monoxide | ppm | 38 | 76 | 2 | 28 | 20 | 100 |
| Polycyclic Aromatic Hydrocarbons | $mg/m^3$ | 0.29 | 0.082 | 0.053 | 0.015 | 0.11 | NL |
| Dioxins & Furans | $ng/m^3$ | 0.0012 [1] | 0.0013 [1] | 0.0026 [1] | 0.0021 [1] | 0.0020 [1] | 0.1 [2] |
| Volatile Organic Compounds | $mg/m^3$ | 0.11 | 5.2 | 0.4 | <0.36 | <0.35 | NL |
| Carbon Dioxide | % | <0.1 | <0.1 | <0.1 | 0.2 | 0.3 | NL |

**NOTES:**

Emission concentrations expressed at dry gas, 273 K and 101.3 kPa conditions

NL Not Listed

*1 Value is a rolling annual average for direct comparison with the regulatory limit.

*2 Limit value is a rolling annual average.

**Exceedances this period: Nil**

### 3.3.2 Real-time Gaseous Fluoride Emissions Monitoring

Continuous monitoring of gaseous fluoride emissions was performed throughout the Trial to assess compliance with the hourly average regulatory limit of 1.4 mg/m$^3$. Monitoring data are illustrated in **Figure 1**. Instantaneous gaseous fluoride emissions also remained below the limit criterion of 2 mg/m$^3$ at all times.

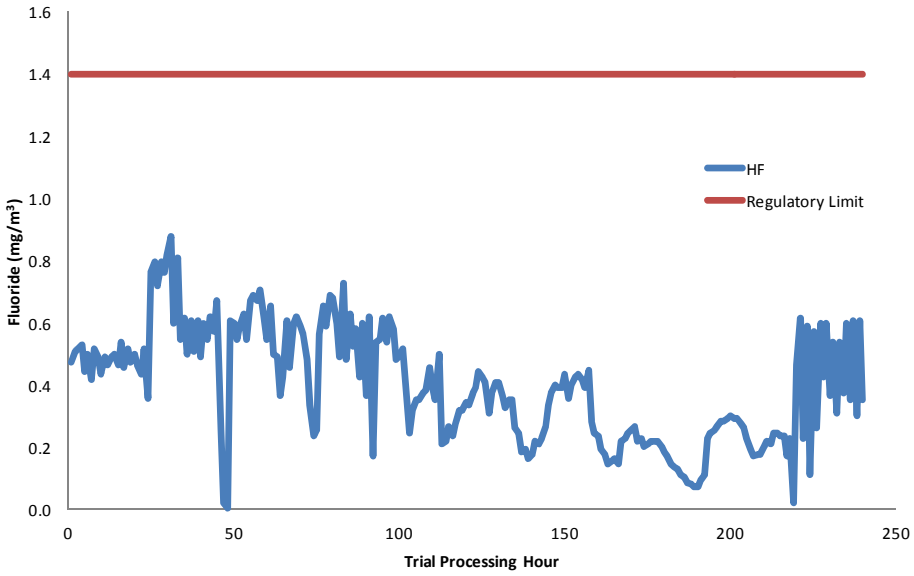


**Figure 1:** Real-time, Continuous Gaseous Fluoride Emissions Monitoring Data

### 3.3.3 Real-time Particulate Emissions Monitoring

Continuous monitoring of particulate emission was performed throughout the Trial to assess compliance with the regulatory limit of 25 mg/m$^3$. Monitoring data are illustrated in **Figure 2**.

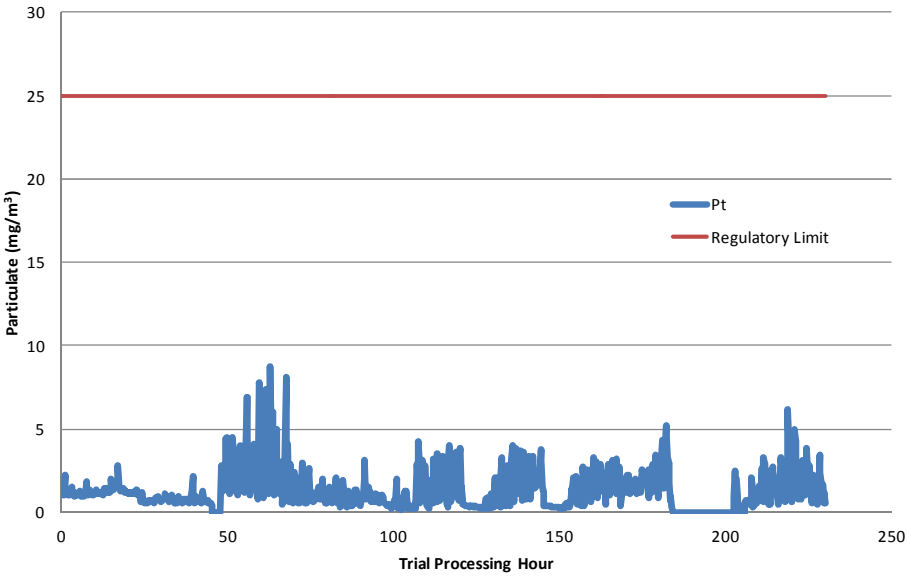


**Figure 2:** Real-time, Continuous Particulate Emissions Monitoring Data

# 4. DISCUSSION

- 141 tonnes of pharmaceutical and 1.9 tonnes of illicit drug wastes have been received and processed to-date. It is noted that input waste tonnages are much lower than anticipated during the Trial interval, and for which approval was originally sought (i.e. up to 1,000 and 200 tonnes respectively).

  Whilst the generation of exhibit (illicit drug) waste and consequential demand for destruction services has (and will continue to be) highly variable, pharmaceutical waste sourcing constraints during the Trial are attributable to unanticipated competition market forces (monopolized medical waste processing provider) and contractual arrangements limited by WA's *'Trial'* status. To elaborate further:

  - The monopoly service provider in NSW (Daniels Health; with strong awareness of Weston Aluminium's Trial activities) had forced generators / managers of medical waste (clinical, cytotoxic, anatomical, pharmaceutical, etc.) to sole-supply them with pharmaceutical waste arisings or risk penalty through an increased service charges for all other waste inputs. This situation had effectively starved Weston Aluminium of consistent pharmaceutical waste inputs, particularly throughout the second year Trial phase; and

  - Large pharmaceutical product manufacturers are encouraged by Weston Aluminium's Trial successes and deliberate market disruption, yet are reluctant to provide consistent, large and contracted waste quantities for processing whilst Weston Aluminium held regulatory approval for a *Trial-scale* only. Producers of wastes are awaiting commercial-scale regulatory approval confirmation before Contractual arrangements can be finalized.

  Whilst Weston Aluminium's Trial has proven to be very successful, and environmental and operation performance has been verified (refer points below), material sourcing constraints (and the consequentially limited processing batches) potentially limit the opportunity for Weston Aluminium to optimize process and energy efficiencies;

- All material storage, processing and handling was performed within enclosed production buildings. Built infrastructure was found to be suitable for the storage and handling of pharmaceutical wastes, sufficiently containing quantities of wastes received and mitigating contact with stormwater. No spills of Trial inputs occurred. Natural gas-fired rotary furnaces were found to be suitable for the processing of pharmaceutical and exhibit wastes (both in combination with aluminium dross and as discrete inputs), resulting in effective thermal destruction and the generation of negligible ashes. Emissions control infrastructure (including hooding, scrubber and fabric filter baghouse) effectively captured and controlled process emissions (refer below). Existing Preventative Maintenance programs, including routine burner analysis and tuning activities, proved effective during the Trial phase. It is concluded therefore that process sequencing, maintenance practices and associated plant and equipment utilised for the Trial are deemed suitable for the effective thermal treatment of pharmaceutical and illicit drug waste inputs;

- Processing residue yields are negligible and are physico-chemically compatible with existing process residue streams (principally calcium carbonate and silicate ashes from tablet and glass bottle/vial wastes). Product materials were incorporated into conventional alternative material product streams and dispatched for Customer evaluation and use (no disposal of residue occurred);
- A total of five (5) independent, NATA-certified air emissions monitoring and reporting events occurred during the 24-month Trial interval. Pharmaceutical waste processing occurred for the full duration of each monitoring event, and exhibit waste processing also occurred during testing events where such input processing could be formally coordinated with the NSW Police (28 September 2016 and 8 June 2017 events). Air emissions monitoring was not feasible during the period October 2016 – May 2017 due to insufficient or nil pharmaceutical waste stocks available to support testing requirements. Full compliance with regulatory approval limits were achieved for each monitoring event (refer **Table 1**);
- Emission testing undertaken in conjunction with Trial activities reveal exceptionally low pollutant discharge concentrations, and confirm reliable performance of the existing lime-scrubber and fabric filter baghouse pollutant control systems. As above, all air emission concentrations were below regulatory compliance limits, and hence, notification to Regulators in the event of elevated emission concentrations was not required during the Trial. Emissions data are of generally of the same order, or lower, than that reported for conventional processing of aluminium dross. Accordingly, no further assessment of emission performance (including dispersion modelling) is considered warranted;
- Continuous monitoring of gaseous fluoride and solid particulate emissions was performed during processing intervals. Data confirm full compliance with regulatory approval requirements (refer Figures 1 and 2). Notification to Regulators in the event of elevated emission concentrations was therefore not required. These data further confirm the suitability of existing pollution control systems for future processing of Pharmaceutical and Exhibit wastes; and
- Due to the performance verification and successes of the Trial, Weston Aluminium is currently in the process of seeking regulatory approval from the NSW Department of Planning and Environment and the NSW Environmental Protection Authority for the ongoing processing of domestically-sourced pharmaceutical and exhibit wastes within existing rotary furnaces (DA 86-04-01 Mod 12 and 10397 of 1995 Mod 10). The scale of the proposed Development Consent Modification / Environment Protection Licence Variation is up to 5,000 tonnes of pharmaceutical and up to 5 tonnes of illicit drug wastes per annum. The overall facility operation will remain within the existing combined 40,000 tonnes per annum facility approval.

  The proposed commercial-scale processing sequence is consistent with that implemented during the Trial. Environmental Assessment verified that the Project would not result in a change to the existing facility hazard profile, nor would result in significant air emissions. The overall scale of the development (site footprint, hours of operation, plant and equipment, transport movements and emissions limits) remain unchanged from the original development. Further detail relating to the proposed modification, environmental assessment and Project commitments may be referred to in the associated Environmental Assessment (AECOM, June 2017) and Response to Submissions Report (AECOM, November 2017).

# ATTACHMENT 1

**DETERMINATION OF A DEVELOPMENT APPLICATION**
**FOR STATE SIGNIFICANT, DESIGNATED AND INTEGRATED DEVELOPMENT**
**UNDER SECTION 80 OF THE**
**ENVIRONMENTAL PLANNING AND ASSESSMENT ACT, 1979**

I, the Minister for Urban Affairs and Planning, under Section 80 of the *Environmental Planning and Assessment Act 1979* ("the Act") and clause 8 of *State Environmental Planning Policy No. 34 - Major Employment-Generating Industrial Development*, determine the development application ("the Application") referred to in Schedule 1 by granting consent subject to the conditions set out in Schedule 2. The reason for the imposition of conditions is to minimise any adverse environmental impacts associated with the development.

DA 86-04-01 Mod 3 – determined 4 September 2009
DA 86-04-01 Mod 4 – determined 5 August 2010
DA 86-04-01 Mod 5 – determined 7 February 2011
DA 86-04-01 Mod 6 – determined 25 October 2011
DA 86-04-01 Mod 7 – determined 7 September 2012
DA 86-04-01 Mod 8 – determined 17 February 2013

Andrew Refshauge MP
Deputy Premier
**Minister for Urban Affairs and Planning**
**Minister for Aboriginal Affairs**
**Minister for Housing**

Sydney, 2001 File No. S00/00975

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**SCHEDULE 1**

| | |
|---|---|
| **Application made by:** | Weston Aluminium Pty Ltd ("the Applicant'); |
| **To:** | The Minister for Urban Affairs and Planning ("the Minister"); |
| **In respect of:** | Lot 796 DP 39877, Parish of Heddon, Cessnock local government area; |
| **For the following:** | Additions and extensions to an existing aluminium dross recycling plant including:<br>a) construction of an open scrap storage and sorting pad and an enclosed scrap storage warehouse;<br>b) extension of the existing plant building to allow for ingot casting, molten aluminium handling and aluminium alloying;<br>c) construction of an ingot storage and loading facility;<br>d) construction of an enclosed ALDEX storage and dispatch facility, incorporating a workshop area; and<br>e) extensions to the existing administration building, carpark and dross off-loading and sorting areas ("the development").<br>f) construction of a briquetting facility within the ALDEX building |
| **Development Application:** | Integrated DA No. 86-04-01, lodged with the Department of Urban Affairs and Planning on 30 April 2001; |
| **State Significant Development** | Under Section 76A(7) of the Act, the proposed development is classified as State Significant development because it is a type of development (metals, minerals or extractive materials processing) listed in Schedule 1 of *State Environmental Planning Policy No. 34 - Major Employment Generating Industrial Development* and has a capital investment in excess of $20 million. |
| **BCA Classification:** | Class 5 - administration building<br>Class 8 - plant building<br>bag houses<br>ALDEX building<br>Class 10a - warehouse |
| **Note:** | 1) To ascertain the date upon which this consent becomes effective, refer to Section 83 of the Act. |

2) To ascertain the date upon which this consent is liable to lapse, refer to Section 95 of the Act.

3) If the Applicant is dissatisfied with this determination, Section 97 of the Act grants him or her a right of appeal to the Land and Environment Court, which is exercisable within 12 months of receiving notice of this determination.

## DEFINITIONS

| | |
|---|---|
| AEMR | Annual Environmental Management Report |
| Applicant | Weston Aluminium Pty Ltd |
| BCA | Building Code of Australia |
| Council | Cessnock City Council |
| Court | Land and Environment Court |
| Day | The period from 7 am to 6pm on Monday to Saturday, and 8am to 6pm on Sundays and Public Holidays |
| ~~DECCW~~ | ~~Department of Environment, Climate Change and Water~~ |
| Department | Department of Planning and Infrastructure |
| Development | Establishment of a dross recycling facility and associated infrastructure (as described in the EIS and SEE, see below) |
| Director-General | Director-General of the Department (or delegate) |
| EIS | Environmental Impact Statement prepared by URS for Weston Aluminium Pty Ltd entitled *Additions to the Kurri Kurri Aluminium Refining and Recycling Facility*, Volumes 1-3 (dated 23 April 2001), including the following supporting documentation:<br>• Preliminary Hazard Analysis, prepared by Granherne Pty Ltd (dated 25 October 1999);<br>• Molten Metal Transportation Risk Assessment, prepared by Granherne Pty Ltd (dated 25 October 1999);<br>• Additional Information Requested by EPA for Noise Impact Assessment, prepared by URS (dated 19 June 2001);<br>• Additional Information Requested by EPA for Noise Impact Assessment - Supplement 1, prepared by URS (dated 3 July 2001);<br>• Additional Information Requested by EPA for Noise Impact Assessment - Supplement 2, prepared by URS (dated 3 July 2001);<br>• Response to EPA Request for Information in respect of air quality impacts, prepared by URS (dated July 2001);<br>• Flora and Fauna Habitat Investigations for Proposed Extensions to Existing Aluminium Recycling Facility, Kurri Kurri, NSW, prepared by HLA-Envirosciences Pty Ltd (dated 25 June 2001); and<br>Environmental Impact Statement prepared by Envirosciences Pty Ltd for Weston Aluminium Pty Ltd entitled *Environmental Impact Statement for an Aluminium Dross Recycling and Alloying Plant at Kurri Kurri* (dated July 1994), including the following supporting documentation:<br>• Inspection Protocol for Imported Dross, approved by the Land and Environment Court on 7 April 2000;<br>• Attachment A, entitled Supplementary Information Relating to Plant Design Refinements and Improvements to a Proposed Aluminium Dross Recycling and Alloying Plant at Kurri Kurri (exhibited from 10 July 1995 to 9 August 1995;<br>• Waste Management Plan, prepared by Mr P.C. Raymond (dated 2 August and approved by EPA on 5 May 1995); and<br>• Preliminary Hazard Analysis prepared by BHP Engineering (dated July 1994); |
| EP&A Act | *Environmental Planning and Assessment Act 1979* |
| EP&A Regulation | *Environmental Planning & Assessment Regulation 2000* |
| EPA | Environment Protection Authority |
| EPL | Environmental Protection Licence |
| Evening | The period from 6pm to 10pm |
| Extended Spent Potlining Material Processing Trial | The proposed 12 month trial of processing spent potlining material, as described in the Modification Application DA-86-04-01 Mod 6 and 10397 Mod 4, and Environmental Assessment dated June 2011 |
| First cut spent potlining | spent potlining material originating from the carbon lining of aluminium reduction cells (pots) |
| LEC | Land and Environment Court |
| Minister | Minister for Planning and Infrastructure |
| Mixed spent potlining | Combination of first and second cut spent potlining material |

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|---|---|
| DA-86-04-01-Mod 1 | Alternations to the administration building extension, as approved by the Minister on 4 October 2001 |
| DA-86-04-01-Mod 2 | Addition of an annex on the process building, as approved by the Minister on 8 August 2002 |
| DA-86-04-01-Mod 3 | Addition of new process and storage areas, and increased operational efficiency of the existing development, as described in the Statement of Environmental Effects to Support Modification Applications for Aluminium Dross Recycling Facility, prepared by ENRS Australia Pty Ltd for Weston Aluminium Pty Ltd (dated 21 November 2007) |
| DA-86-04-01-Mod 5 | Construction and operation of a briquetting facility to process Aldex ash into briquettes in the existing Aldex building, as described in the assessment prepared by GHD and dated November 2010 |
| DA-86-04-01 Mod 8 | A 12 month trial processing mixed spent potlining in existing rotary furnaces as described in the assessment prepared by Weston Aluminium and dated 30 November 2012 |
| Night | The period from 10pm to 7am on Monday to Saturday, and 10pm to 8am on Sundays and Public Holidays |
| Reasonable and Feasible | Reasonable relates to the application of judgement in arriving at a decision, taking into account: mitigation benefits, cost of mitigation versus benefits provided, community views and the nature and extent of potential improvements. Feasible relates to engineering considerations and what is practical to build. |
| Second cut spent potlining | Spent potlining material originating from the refractory lining of aluminium reduction cells (pots) |
| SEE | Statement of Environmental Effects provided to support Modification Applications for Aluminium Dross Recycling Facility, prepared by ENRS Australia Pty Ltd for Weston Aluminium Pty Ltd (dated 21 November 2007) |
| Site | Land to which the development application applies |
| SPL | Spent Potlining |
| Spent Potlining Material Processing Trial | The proposed 2 week trial of processing spent potlining material, as described in the Modification Application DA-86-04-01 Mod 4 and 10397 Mod 2, and the enclosed Letter dated 26 May 2010 and Attachments 1, 2 and 3. |

## SCHEDULE 2
## ADMINISTRATIVE CONDITIONS

**Obligation to Minimise Harm to the Environment**

1. The Applicant shall implement all practicable measures to prevent and/or minimise any harm to the environment that may result from the construction and/or operation of the development.

**Terms of Approval**

2. The Applicant shall carry out the development generally in accordance with the:
   a) EIS as modified by the SEE;
   b) site plans (see Appendix A);
   c) conditions of this approval; and, during the spent potlining material processing trial,
   d) modification application DA-86-04-01 Mod 4 and 10397 Mod 2, and the enclosed Letter dated 26 May 2010 and Attachments 1, 2 and 3.
   e) Modification application DA-86-04-01 Mod 5 and 10397 Mod 3, and the enclosed SEE, dated November 2010, prepared by GHD; and
   f) during the extended spent potlining material processing trial, modification application DA-86-04-01 Mod 6 and 10397 Mod 4, and the enclosed Environmental Assessment, dated June 2011 and the Response to Submissions dated 17 August 2011, prepared by Weston Aluminium.
   g) Modification application DA-86-04-01 Mod 7 and 10397 DA 10397 of 1995 Mod 5, and the enclosed Environmental Assessment, dated 10 May 2012, prepared by AECOM and the Response to Submissions dated 21 June 2012, prepared by Weston Aluminium.
   h) Modification application DA-86-04-01 Mod 8 and DA 10397 of 1995 Mod 6, and the enclosed Environmental Assessment, dated 30 November 2012, prepared by Weston Aluminium.

   If there is any inconsistency between the above, the conditions of this approval shall prevail to the extent of any inconsistency.

3. The Applicant shall comply with any reasonable requirement/s of the Director-General arising from the Department's assessment of:
   a) any reports, plans, strategies, programs or correspondence that are submitted in accordance with this approval; and
   b) the implementation of any actions or measures contained in these reports, plans, strategies, programs or correspondence.

4. Prior to each of the events listed below, or within such period otherwise agreed by the Director-General, the Applicant shall certify in writing to the satisfaction of the Director-General, that it has complied with all conditions of this consent applicable prior to that event:
   a) commencement of any physical works associated with the development; and
   b) commencement of operations.

**Limits on Approval**

5. The Applicant shall not process on site more than a combined total of 40,000 tonnes of dross aluminium and Second Cut SPL and 35,000 tonnes of scrap aluminium metal per year.

6. The Applicant shall not process more that 15,000 tonnes per year of dross aluminium sourced from overseas smelters and secondary aluminium processors.

6A The Applicant shall ensure that the combined total of Second Cut SPL and aluminium dross stored on site does not exceed 5,000 tonnes at any time.

6B The Applicant shall ensure that DA-86-04-01 Mod 8:
   a) is undertaken over a period of 12 months only; and
   b) during the operation of DA-86-04-01 Mod 8:
      i. no more than 3,000 tonnes of mixed spent potlining material is received on site over the 12 month trial period; and
      ii. no more than 1,000 tonnes of mixed SPL is stored on site at any one time.

**Management Plans/Monitoring Programs**

7. With the approval of the Director-General, the Applicant may submit any management plan or monitoring program required by this approval on a progressive basis.

**Structural Adequacy**

8. Within six months of the commencement of DA-86-04-01-Mod 3, the Applicant shall obtain and provide copies of all necessary building certificate(s) from Cessnock City Council to the Director-General, for the following works:
   a) extension of the ALDEX building;
   b) eight dross storage bays within the ALDEX building;
   c) pre-processing plant within the ALDEX building;
   d) annex to the Plant Building;
   e) covered conveyor between the ALDEX building and the Plant Building;
   f) Workshop in the north-western corner of the site; and
   g) Stack 6.

9. The Applicant shall ensure that all new buildings and structures, and any alterations or additions to existing buildings and structures, are constructed in accordance with the relevant requirements of the Building Code of Australia.

   *Notes:*
   - *Under Part 4A of the EP&A Act, the Applicant is required to obtain construction and occupation certificates for the proposed building works.*
   - *Part 8 of the EP&A Regulation sets out the requirements for the certification of the development.*

**Operation of Plant and Equipment**

10. The Applicant shall ensure that all plant and equipment used on the site is maintained and operated in an efficient manner, and in accordance with relevant Australian Standards.

~~**Spent Potlining Material Processing Trial**~~

~~10.A Prior to the commencement of the Spent Potlining Material Processing Trial, the Applicant must:~~
   ~~a) obtain an updated EPL allowing the Spent Potlining Material Processing Trial to proceed; and~~
   ~~b) notify the Director-General, Council and EPA's Regional Manager Hunter in writing, 1 week prior to the commencement of the trial and within 2 days of the conclusion of the trial.~~

**Extended Spent Potlining Material Processing Trial**

~~10.A Prior to the commencement of the extended Spent Potlining Material Processing Trial, the Applicant~~ must:
   ~~a) obtain an updated EPL allowing the Spent Potlining Material Processing Trial to proceed; and~~
   ~~b) notify the Director-General, Council and EPA's Regional Manager Hunter in writing, 1 week prior to the commencement of the trial and within 2 days of the conclusion of the trial.~~

10A. Prior to the commencement of the DA-86-04-01 Mod 8, the Applicant must:
   a) obtain an updated EPL allowing DA-86-04-01 Mod 8 to proceed; and
   b) notify the Director-General, Council and the EPA's Regional Manager Hunter in writing, 1 week prior to the commencement of DA-86-04-01 Mod 8 and within 2 days of the conclusion of the trial.

## SCHEDULE 3
## SPECIFIC ENVIRONMENTAL CONDITIONS

### AIR

### Emission Limits

11. [1]The Applicant shall ensure that the emissions from discharge points serving the facility do not exceed the emission limits in Table 1.

*Table 1: Air Emission Limits*

| Parameter/ Pollutant | Unit of Measure | 100% Limit | Discharge Point[1] |
|---|---|---|---|
| Nitrogen Oxides | grams per cubic metre | 2.5 | 1 |
| | | 0.1 | 6, 13 |
| Hydrogen Chloride | milligrams per cubic metre | 400 | 1 |
| | | 10 | 13 |
| Solid Particles | milligrams per cubic metre | 25 | 1 |
| | | 35 | 2 |
| | | 20 | 3 |
| | | 15 | 7 |
| | | 24 | 4 |
| | | 10 | 6, 13 |
| | kilograms per hour | 5.43 | Total plant emissions |
| Sulfuric acid mist and sulfur trioxide (as $SO_3$) | milligrams per cubic metre | 100 | 1, 6, 13 |
| Carbon monoxide | parts per million | 100 | 1 |
| | milligrams per cubic metre | 125 | 6 |
| | | 125[2] | 13 |
| Gaseous fluoride | milligrams per cubic metre | 2 | 1 |
| | milligrams per cubic metre | 1.4[2] | 1 |
| | kilograms per hour | 0.25 | Total plant emissions |
| Type 1 and Type 2 substances in aggregate | milligrams per cubic metre | 10 | 1 |
| | | 5 | 13 |
| Volatile organic compounds | milligrams per cubic metre | 77[3] | 13 |
| | | 40 | 6 |
| Dioxins & Furans | nanograms per cubic metre | 0.1[4] | 13 |
| Cyanide | Milligrams per cubic metre | 0.5 | 1 |

*Notes:*
1. *Discharge points 1, 2, 3, 4, and 13 as defined in the EPL. Discharge points 6 and 7 as defined in the SEE.*
2. *Limit value is a rolling 1 hour average.*
3. *Limit value is a rolling 1-hour average. VOC as n-hexane (dry, 273 K, 101.3 kPa).*
4. *Limit value is a rolling annual average. Polychlorinated-dibenzo-p-dioxins (PCDD) and polychlorinated-dibenzofurans (PCDF) as 2,3,7,8-tetrachloro-dibenzo-p-dioxin (TCDD) equivalent calculated in accordance with the procedures included in Part 4, Clause 29 of the Protection of the Environment Operations (Clean Air) Regulation 2002, (dry, 273 K, 101.3 kPa).*

### Monitoring

12. [2]Unless EPA specifies otherwise, the Applicant shall monitor the concentration of each parameter specified in Table 2 at the discharge points serving the facility.

*Table 2: Source Emissions Monitoring Requirements*

| Pollutant/ Parameter | Units of Measure | Frequency | Discharge Point[1] |
|---|---|---|---|
| Carbon monoxide | parts per million | Yearly | 1 |
| Gaseous fluoride | milligrams per cubic metre | Continuous | 1 |
| Hydrogen chloride | milligrams per cubic metre | Yearly | 1 |

[1] EPA General Term of Approval
[2] EPA General Term of Approval

| | | | |
|---|---|---|---|
| | | Quarterly | 6, 13 |
| Nitrogen Oxides | milligrams per cubic metre | Yearly | 1, 6, 13 |
| Solid Particles | milligrams per cubic metre | Yearly | 1, 2, 3, 4, 7 |
| | | Quarterly | 6, 13 |
| Sulfuric acid mist and sulphur trioxide (as $SO_3$) | milligrams per cubic metre | Yearly | 1, 6, 13 |
| Type 1 and Type 2 substances in aggregate | milligrams per cubic metre | Yearly | 1, 6, 13 |
| Dioxins & Furans | milligrams per cubic metre | Quarterly | 6, 13 |
| Fluorides | milligrams per cubic metre | Yearly | 6, 13 |
| Volatile organic compounds | milligrams per cubic metre | Quarterly | 6, 13 |
| Velocity | metres per second | Quarterly | 6, 13 |
| Volumetric flow rate | Normal cubic metres per second | Quarterly | 6, 13 |
| Dry gas density | kilograms per cubic metre | Quarterly | 6, 13 |
| Moisture content in stack gases | percent | Quarterly | 6, 13 |
| Temperature | Degrees Celsius | Quarterly | 6, 13 |
| Oxygen in stack gases | percent | Quarterly | 6, 13 |
| Cyanide | milligrams per cubic metre | Special Frequency 1 | 1 |

*Notes:*
*1. Discharge points 1, 2, 3, 4, and 13 as defined in the EPL. Discharge points 6 and 7 as defined in the SEE.*
*2. The EPA will specify the sampling methods for this monitoring in the EPL for the development.*
*3 Where Special frequency 1 means quarterly testing frequency for the first year of SPL processing operations. Following four consecutive tests demonstrating compliance with the concentration limit and stable emission parameters, the licensee can apply to EPA for a reduced monitoring frequency.*

13. [3]The Applicant shall update its existing Air Quality Monitoring Program for the development to the satisfaction of the Director-General. This program must:
    a) be prepared in consultation with the EPA;
    b) be submitted to the Director-General for approval within one month from the commencement of DA-86-04-01-Mod 7; and
    c) include:
    - a program to validate the air emissions of the development, which involved carrying out monitoring of the emissions from the development;
    - mitigation measures and timeframe for their implementation in case of non-compliances with the emission limits referred to in condition 11; and
    - a program to monitor the ongoing performance of the development.

13A The Applicant shall:
    (a) undertake additional Stack Testing at point 15 (as specified in EPL 6423) within 90 days from the commencement of DA-86-04-01- Mod 5;
    (b) submit a report which contains the results of the stack testing to the Director-General and EPA; and
    (c) describe, in the report, actions that will be implemented to ensure compliance with air emission limits for Stack 7 if air emission limits referred to in condition 11 are exceeded.

14. [4]The Applicant shall ensure that discharge points serving the facility are designed, constructed and operated generally in accordance with the parameters outlined in the EPL for the Development.

**Construction**

15. During construction, the Applicant shall ensure that:
    a) all trucks entering or leaving the site with loads have their loads covered;
    b) trucks associated with the development do not track dirt onto the public road network; and
    c) the public roads used by these trucks are kept clean.

**Operation**

16. The Applicant shall implement all reasonable and feasible measures to minimise the dust generated by the development.

17. Within three months of the commencement of DA-86-04-01-Mod 3, the Applicant shall isolate each of the eight dross storage bays by curtains to improve the collection efficiency of dust from the localised area.

[3] EPA General Term of Approval
[4] EPA General Term of Approval

18. Within 6 months of the commencement of DA-86-04-01-Mod 3, the Applicant shall certify to the Director-General that it has installed and commenced the operation of bag house No 7 in accordance with the SEE.

19. Within 9 months of the commencement of DA-86-04-01-Mod 3, the Applicant shall certify to the Director-General that it has installed and commenced the operation of bag house No 3 in accordance with the SEE, should the air quality monitoring referred to in condition 13 indicate that the air emission limit for BH No 7 referred to in condition 11 is exceeded.

20. Within 6 months of the commencement of DA-86-04-01-Mod 3, the Applicant shall certify to the Director-General that bag house No 2 has being detached from the ALDEX building and is servicing the dross storage area in the Plant Building only.

21. [5]The Applicant must maintain a continuous fluoride emission monitoring system, which in the event that the concentration of fluoride emitted to atmosphere exceeds the limit value of 1.4 milligrams per cubic metre must activate visible and audible alarms.

22. [6]If the one hour average concentration of gaseous fluoride emitted to atmosphere exceeds 1.4 milligrams per cubic metre at discharge point 1, then the plant or the section of the plant where the exceedance occurred, must cease operating until the Applicant is able to ensure compliance with the emission limits specified in the EPL for the Development.

23. [7]A continuous recording and alarmed bag leak detector must be installed in each stack servicing the facility, excluding the stack 6, with calibration to detect bag failure. The results shall be included in the annual report required under condition 58 of this consent. In the event of a bag failure the failed bag shall be repaired or replaced as soon as possible within the current operational cycle.

23A The Applicant must ensure all SPL is appropriately bunded and covered to prevent the emission of SPL dust, flammable gases and the contamination of stormwater

**Health Impact Assessment**

24. The Applicant shall participate and implement recommendations from any regional Health Impact Assessment to the satisfaction of the Director-General.

**SOIL AND WATER**

**Discharge Limits**

25. [8]Except as may be expressly provided in an EPL for the development, the Applicant shall comply with Section 120 of the *Protection of the Environment Operations Act 1997*.

**Erosion and Sediment Control**

26. Prior to commencement of construction, the Applicant shall implement erosion and sediment controls in accordance with the Department of Housing and Landcom's *Managing Urban Stormwater: Soils and Construction*.

27. The Applicant shall prepare and implement its Erosion and Sediment Control Plan, Site Rehabilitation Plan and Water Management Plan detailing monitoring requirements and measures to control runoff from the site, contain spillages, minimise stormwater contamination, and dispose of contaminated water and process effluent. These plans shall be submitted to Council and EPA for approval prior to the commencement of construction of the development.

**NOISE**

**Operating Hours**

28. [9]The Applicant shall comply with the restrictions in Table 3, unless otherwise agreed by the Director-General.

*Table 3: Construction Hours for the Development*

[5] EPA General Term of Approval
[6] EPA General Term of Approval
[7] EPA General Term of Approval
[8] EPA General Term of Approval
[9] EPA General Term of Approval

| *Activity* | *Day* | *Time* |
|---|---|---|
| Construction | Monday – Friday | 7:00am to 6:00pm |
| | Saturday | 8:00am to 1:00pm |
| | Sunday and Public Holidays | Nil |

*Note: Construction activities may be conducted outside the hours in Table 3 provided that the activities are not audible at any residence beyond the boundary of the site.*

**Noise Limits**

29. [10]The Applicant shall ensure that the noise from the operation of the development does not exceed the noise limits presented in Table 4.

*Table 4: Development Noise Limits (dB(A))*

| *Location* | *Daytime* | *Evening* | | *Night time* | | |
|---|---|---|---|---|---|---|
| | $L_{Aeq(15\ minute)}$ (dB(A)) | $L_{Aeq(15\ minute)}$ (dB(A)) | $L_{Aeq(evening)}$ (dB(A)) | $L_{Aeq(15\ minute)}$ (dB(A)) | $L_{Aeq(night)}$ (dB(A)) | $L_{Aeq(1\ minute)}$ (dB(A)) |
| Residences at the corner of Government Street and 10th Street | 48 | 48 | 40 | 47 | 35 | 57 |
| Residences on Northcote Street | 44 | 44 | - | 44 | 40 | 57 |
| Residences in the Light Industrial Zone on Mitchell Avenue and Railway Road | 43 | 43 | - | 43 | 41 | 55 |

*Note: Condition 30 of this consent does not impose maximum allowable noise limits for residences on Horton Road and McCarva Road as the Applicant has established a negotiated agreement with the landowner of those properties in regard to noise.*

**Operating Conditions**

30. [11]The Applicant shall ensure that trucks are not entering and leaving the site outside the hours of 7.00am to 10.00pm.

30A All doors adjacent the briquetting plant are to be closed at all times

**Noise Monitoring**

31. [12]The Applicant shall prepare and implement a Noise Monitoring Program, in consultation with the EPA. The Program shall be submitted for the approval of the Director-General within three months of the commencement of operation of the development, and must include a noise monitoring protocol to evaluate compliance with development noise limits specified in Condition 28 and management measures to address any exceedances.

31A If noise limits specified in Condition 28 are exceeded as a result of the briquetting plant modification, the Applicant shall fully enclose the concrete slab on the southern side of the Aldex building to the satisfaction of the Director-General.

**HAZARDS**

**Pre-construction Studies**

32. At least one month prior to construction of the development (except for construction of preliminary works that are outside the scope of the hazard studies), the Applicant shall submit for the approval of the Director General, the following studies:
    a) a Hazard and Operability Study for the process operations and fuel supply. This shall include the rotary cooler cooling water system, safeguards for hydrogen fluoride release, rotary furnaces and holding furnaces. The study shall be chaired by an independent qualified person approved by the Director-General;
    b) a Final Hazards Analysis (FHA) prepared in accordance with the Department's *Hazardous Industry Planning Advisory Paper No.6 'Guidelines for Hazard Analysis'*; and
    c) arrangements covering the transport of hazardous materials including details of routes to be used for the movement of trucks. Further, the applicant shall enter into contractual arrangements with contract drivers to

[10] EPA General Term of Approval
[11] EPA General Term of Approval
[12] EPA General Term of Approval

require the use of routes determined under this condition except where necessary for local deliveries. This should include a management plan and emergency procedures.

**Pre-commissioning Studies**

33. At least two months prior to commissioning of the development, the Applicant shall prepare and submit for the approval of the Director-General a Preliminary Hazards Implementation Update, certifying that the recommendations made in following studies have been fully implemented:
    a) Dross Processing Plant Additions at Weston Kurri Kurri, NSW - Preliminary Hazard Analysis, prepared by Granherne and dated 25 October 1999; and
    b) Proposed Additional Facilities at the Weston Dross Processing Plant Weston, NSW - Molten Metal Transportation Risk Assessment.

    Where it has been decided not to implement a particular recommendation, the reasons shall be clearly stated.

**Pre-operation Emergency Services Cooperation Agreement**

34. Prior to the commencement of operation of the development, the Applicant shall develop an Emergency Services Cooperation Agreement in consultation with the emergency response teams relevant to the site and proposed haulage routes for molten aluminium (NSW Fire Brigades, State Emergency Services and local bushfire fighting services, where relevant). The Agreement shall provide, but not necessarily be limited to:
    a) policies and procedures for the on-going supply of hazards information to the emergency response teams in relation to the site, molten aluminium transport and dross transport, including quantities and locations of hazardous materials and possible hazardous events associated with the site and dross/ molten aluminium haulage;
    b) policies and procedures for communication with the emergency response teams, and notification in the event of an emergency;
    c) any agreement for access to water stores at the development in the event of a bushfire; and
    d) any agreement for the provision of suitably qualified and appropriately trained employees from the site to assist where relevant in the event of a bushfire or emergency.

    The Emergency Services Cooperation Agreement shall be consistent with the Emergency Plan required under this consent. The Applicant shall supply a copy of the Emergency Services Cooperation Agreement to the Director-General prior to the commencement of operation.

**Dross Importation Protocol**

35. Dross sourced from overseas smelters and secondary aluminium processors must be inspected prior to processing in accordance with the Inspection Protocol for Imported Dross, approved by the Land and Environment Court on 7 April 2000.

**Dangerous Goods**

36. The Applicant shall store and handle all dangerous goods, as defined by the Australian Dangerous Goods Code, strictly in accordance with:
    a) all relevant Australian Standards;
    b) a minimum bund volume requirement of 110% of the volume of the largest single stored volume within the bund; and
    c) the EPA's Environment Protection Manual Technical Bulletin *Bunding and Spill Management*.

**Emergency Stop System**

37. At the commencement of DA-86-04-01-Mod 3, The Applicant shall have in operation emergency stop systems in ALDEX and Plant buildings, including a temperature sensor and an alarm, in the event of a fire.

**TRANSPORT**

**Road Network and Parking**

38. The Applicant shall ensure that that haulage of molten aluminium is via Main Road 588 (Renshaw Drive) when travelling towards the Sydney- Newcastle Freeway (F3), rather than via Main Road 195 (Kurri Kurri-Mulbring Road) and Main Road 220 (Lake Road).

39. The Applicant shall ensure that all parking generated by the development is accommodated on site. No vehicles associated with the development shall park on the public road system at any stage.

**Vehicle Queuing**

40. During the development, the Applicant shall ensure that the development does not result in any vehicles queuing on the public road network.

**Transport Code of Conduct**

41. Prior to the commencement of operation of the development, the Applicant shall submit for the approval of the Director-General a Transport Code of Conduct to outline management of traffic impacts associated with the site and minimum requirements fo the movement of heavy vehicles to and from the site. The Code shall meet the requirements of Council and the RTA, should there be any. The Code shall include, but not necessarily be limited to:
    a) restrictions to routes, consistent with condition 37 of this consent;
    b) restrictions to the hours of transport operations, consistent with condition 29 of this consent, to avoid travelling built-up areas late at night or at times of high traffic flows in those areas;
    c) speed limits to be observed along routes to and from the site, in particular through built-up areas;
    d) minimum requirements for vehicle maintenance to address noise and exhaust emissions;
    e) load coverage requirements; and
    f) behavioural requirements for vehicle drivers.

**VISUAL**

**Lighting**

42. The Applicant shall ensure that the lighting associated with the development:
    a) complies with the latest version of Australian Standard *AS 4282(INT) - Control of Obtrusive Effects of Outdoor Lighting*; and
    b) is mounted, screened and directed in such a manner that it does not create a nuisance to surrounding properties or the public road network.

**Landscape Management Plan**

43. The Applicant shall prepare a Landscape Management Plan in consultation with Council prior to the commencement of construction of the development and provide details of existing and proposed tree and shrub species, finish of exposed surfaces (including paved areas), and outline a program for implementation.

**WASTE**

**Operating Conditions**

44. [13]The Applicant shall ensure that all waste generated on the site during construction and operation of the development is classified in accordance with the EPA's Waste Classification Guidelines and disposed of to a facility that may lawfully accept the waste.

45. [14]Except as expressly permitted by an EPL, the Applicant shall not cause, permit or allow any waste generated outside the site to be received at the site for storage, treatment, processing, reprocessing or disposal, or any waste generated at the site to be disposed of at the site.

**Waste Recycling Investigation**

46. The Applicant shall investigate recycling options for ash and fume wastes and submit findings to Council and EPA within 12 months of the commissioning of the development, and every 12 months thereafter, until a feasible recycling alternative is found and implemented.

47. The Applicant shall maximise on site waste recycling, in particular packaging materials, paper and any other such wastes.

**FLORA AND FAUNA**

48. The Applicant shall not clear any native vegetation beyond the limits defined in Figure 4.1 of Additions to the *Kurri Kurri Aluminium Refining and Recycling Facility - Volume II Construction Environmental Plan*, prepared by URS and dated 23 April 2001.

49. Clearing for the development shall be restricted to areas of the site covered by the Angophora/Stringybark/Grey Gum community. The Forest Red Gum, (Eucalyptus tereticornis) community shall be preserved for its habitat value and ecological significance.

[13] EPA General Term of Approval
[14] EPA General Term of Approval

50. The Typha swamp in the north-western corner of the site and Swamp Creek (and its associated drainage lines) shall be protected from siltation by appropriate means detailed in the Erosion and Sediment Control Plan.

51. The Applicant shall implement a program to minimise the presence and spread of weeds, in particular camphor laurel, on the site.

**ABORIGINAL CULTURAL HERITAGE**

52. In the event that Aboriginal objects are uncovered during the course of the development, the Applicant shall cease all works in the immediate areas, notify the EPA and implement any reasonable and feasible measures recommended by the EPA.

**GREENHOUSE GAS**

**Energy Savings Action Plan**

53. The Applicant shall prepare and implement an Energy Savings Action Plan for the development to the satisfaction of the Director-General. This plan must be prepared in accordance with the requirements of the EPA and the *Guidelines for Energy Savings Action Plans, DEUS 2005*, and be submitted to the Director-General for approval within six months from the commencement of DA-86-04-01-Mod 3.

**Monitoring and Reporting**

54. The Applicant shall, to the satisfaction of the Director-General:
    a) monitor the greenhouse gas emissions generated by the development;
    b) investigate ways to reduce greenhouse gas emissions generated by the development; and
    c) report on greenhouse gas monitoring and abatement measures and energy efficiency measures identified in the Energy Savings Action Plan.

**EXTENDED SPENT POTLINING MATERIAL PROCESSING TRIAL**

**Monitoring and Verification Reporting**

~~54A For the duration of the Spent Potlining Material Processing Trial, the Applicant must:~~
~~b) monitor and record, air emissions, including cyanide, hydrogen cyanide, fluoride, particulates and all pollutants and parameters specified in the EPL;~~
~~c) monitor and record all processing conditions for the trial, including:~~
~~i. the quantity and characteristics of all inputs;~~
~~ii. the processing methods, including the rotary furnace temperature profile and the duration of thermal treatment;~~
~~d) undertake real-time monitoring of fluoride and particulate emissions and immediately cease processing, and notify EPA and the Director-General, should any exceedance of the limits in the EPL occur;~~
~~e) ensure all spent potlining material is appropriately bunded and covered to prevent the emission of spent potlining dust, flammable gases and the contamination of stormwater.~~

~~54A For the duration of the Extended Spent Potlining Material Processing Trial, the Applicant must:~~
~~a) monitor and record, air emissions, including cyanide, hydrogen cyanide, fluoride, particulates and all pollutants and parameters specified in the EPL;~~
~~b) cease processing, and notify the EPA and the Director-General, should laboratory results indicate emissions of cyanide are greater than 0.09 mg/m3;~~
~~c) monitor and record all processing conditions for the trial, including:~~
~~i. the quantity and characteristics of all inputs;~~
~~ii. the processing methods, including the rotary furnace temperature profile and the duration of thermal treatment;~~
~~d) undertake real-time monitoring of fluoride and particulate emissions and immediately cease processing, and notify the EPA and the Director-General, should any exceedance of the limits in the EPL occur;~~
~~e) ensure all spent potlining material is appropriately bunded and covered to prevent the emission of spent potlining dust, flammable gases and the contamination of stormwater.~~

54A. For the duration of the DA-86-04-01 Mod 8, the Applicant must:
    a) monitor and record, air emissions, including cyanide, hydrogen cyanide, fluoride, particulates and all pollutants and parameters specified in the EPL;
    b) cease processing, and notify the EPA and the Director-General, should laboratory results indicate emissions of cyanide are greater the limits in the EPL or the *Protection of the Environment Operations (Clean Air) Regulation 2010;*
    c) monitor and record all processing conditions for the trial, including:
        i. the quantity and characteristics of all inputs;
        ii. the processing methods, including the rotary furnace temperature profile and the duration of thermal treatment; and

d) undertake real-time monitoring of fluoride and particulate emissions and immediately cease processing, and notify the EPA and the Director-General, should any exceedance of the limits in the EPL occur.

~~54B The Applicant must prepare a detailed monitoring report, on the outcomes of the Spent Potlining Material Processing Trail, to the satisfaction of EPA and the Director-General. The report must:~~

~~a) be submitted to EPA, Council and the Director-General within 90 days of the completion of the Spent Potlining Material Processing Trial;~~
~~b) detail the results of the monitoring required in condition 0 above;~~
~~c) compare the results of the trial to the laboratory results described in the report dated 30 April 2010 prepared by K2 Environmental Limited, the limits in the EPL and EPA's air quality impact assessment criteria specified in the "*Approved Methods for the Modelling and Assessment of Air Pollutants in NSW*" (DEC 2005);~~
~~d) describe any anomalies in the monitoring data, and any exceedances of the limits or assessment criteria;~~
~~e) characterise the trial outputs and describe how these products are to be managed and disposed of, demonstrating compliance with condition 44;~~
~~f) summarise the findings of the trial;~~
~~g) recommend any actions that could be taken to minimise emissions during any future processing; and~~
~~h) discuss the likely options for any future processing.~~

~~54B The Applicant must prepare a detailed monitoring report, on the outcomes of the Extended Spent Potlining Material Processing Trail, to the satisfaction of EPA and the Director-General. The report must:~~

~~a) be submitted to EPA, Council and the Director-General within 90 days of the completion of the Extended Spent Potlining Material Processing Trial;~~
~~b) detail the results of the monitoring required in condition 0 above;~~
~~c) compare the results of the trial to the laboratory results described in the report dated 30 April 2010 prepared by K2 Environmental Limited, the limits in the EPL and EPA's air quality impact assessment criteria specified in the "*Approved Methods for the Modelling and Assessment of Air Pollutants in NSW*" (DEC 2005);~~
~~d) describe any anomalies in the monitoring data, and any exceedances of the limits or assessment criteria;~~
~~e) characterise the trial outputs and describe how these products are to be managed and disposed of, demonstrating compliance with condition 44;~~
~~f) summarise the findings of the trial;~~
~~g) recommend any actions that could be taken to minimise emissions during any future processing; and~~
~~h) discuss the likely options for any future processing.~~

54B The Applicant must prepare a detailed monitoring report, on the outcomes of DA-86-04-01 Mod 8, to the satisfaction of the EPA and the Director-General. The report must:

a) be submitted to EPA, Council and the Director-General within 90 days of the completion of DA-86-04-01 Mod 8;
b) detail the results of the monitoring required in condition 54A above;
c) compare the results of the trial to, the limits in the EPL and the EPAs air quality impact assessment criteria specified in the "*Approved Methods for the Modelling and Assessment of Air Pollutants in NSW*" (DEC 2005);
d) describe any anomalies in the monitoring data, and any exceedances of the limits or assessment criteria;
e) characterise the trial outputs and describe how these products are to be managed and disposed of, demonstrating compliance with condition 44;
f) summarise the findings of the trial;
g) recommend any actions that could be taken to minimise emissions during any future processing; and
h) discuss the likely options for any future processing.

## SCHEDULE 4
## ENVIRONMENTAL MANAGEMENT AND MONITORING

### CONSTRUCTION ENVIRONMENTAL MANAGEMENT PLAN

55. The Applicant shall implement the following Plans for the development:
    a) Additions to the Kurri Kurri Aluminium Refining and Recycling Facility - Volume II Construction Environmental Management Plan, prepared by URS and dated 23 April 2001;
    b) Additions to the Kurri Kurri Aluminium Refining and Recycling Facility - Volume II Construction Environmental Management Plan Appendices, prepared by URS and dated 23 April 2001; and
    c) Construction Safety Study, prepared in accordance with the Department's *Hazardous Industry Planning Advisory Paper No. 7 - Construction Safety Study Guidelines*.

### OPERATIONAL ENVIRONMENTAL MANAGEMENT PLAN

56. The Applicant shall update the following Plans/Studies to reflect the requirements of this consent and submit the amended Plans for the approval of the Director-General within three months from the commencement of DA-86-04-01-Mod 3:
    a) Additions to the Kurri Kurri Aluminium Refining and Recycling Facility - Volume III Operational Environmental Management Plan, prepared by URS and dated 23 April 2001;
    b) Additions to the Kurri Kurri Aluminium Refining and Recycling Facility - Volume III Operational Environmental Management Plan Appendices, prepared by URS and dated 23 April 2001;
    c) Fire Safety Study prepared in accordance with the Department's *Hazardous Industry Planning Advisory Paper No. 2 'Fire Safety Study Guidelines'* and the New South Wales Government's *Best Practice Guidelines for Contaminated Water Retention and Treatment Systems*. The study shall also be submitted to the NSW Fire Brigade for approval;
    d) Emergency Plan detailing emergency procedures for the development, including detailed procedures for the safety of people outside of the development who may be at risk from the development. The Emergency Plan must be prepared accordance with the Department's *Hazardous Industry Planning Advisory Paper No. 1 'Industry Emergency Planning Guidelines'*; and
    e) Safety Management System covering all on-site operations and associated transport activities involving hazardous materials. The Safety Management System must specify all safety related procedures, responsibilities and policies, along with mechanisms for ensuring adherence to the procedures.

56A The Applicant shall update the studies required in Conditions 56 c), d) and e), above to reflect the requirements of this consent. The Applicant shall submit the amended Plans for the approval of the Director-General within three months from the commencement of DA-86-04-01-Mod 7.

### ENVIRONMENTAL REPORTING

#### Incident Reporting

57. Within 24 hours of detecting an exceedance of the limits/performance criteria in this approval or the occurrence of an incident that causes (or may cause) harm to the environment, the Applicant shall notify the Department and other relevant agencies of the exceedance/incident.

58. Within 7 days of notifying the Department and other relevant agencies of an exceedance/incident, the Applicant shall provide the Department and these agencies with a written report that:
    a) describe the date, time, and nature of the exceedance/incident;
    b) identify the cause (or likely cause ) of the exceedance/incident;
    c) describe what action has been taken to date; and
    d) describe the proposed measures to address the exceedance/incident.

#### Annual Reporting

59. Within 12 months of this approval, and annually thereafter, the Applicant shall submit an AEMR to the Director-General and relevant agencies. This report must:
    a) identify the standards and performance measures that apply to the development;
    b) describe the works carried out in the last 12 months;
    c) describe the works that will be carried out in the next 12 months;
    d) include a summary of the complaints received during the past year, and compare this to the complaints received in previous years;
    e) include a summary of the monitoring results for the development during the past year;
    f) include an analysis of these monitoring results against the relevant:
        - impact assessment criteria/limits;
        - monitoring results from previous years; and
        - predictions in the EA;
    g) identify any trends in the monitoring results over the life of the development;

h) identify any non-compliance during the previous year; and
i) describe what actions were, or are being, taken to ensure compliance.

**AUDITING**

**Independent Environmental Audit**

60. Within 12 months of the commencement of operations, and every 3 years thereafter, unless the Director-General directs otherwise, the Applicant shall commission and pay the full cost of an Independent Environmental Audit of the development. This audit must:
    a) be conducted by a suitably qualified, experienced, and independent team of experts whose appointment has been endorsed by the Director-General;
    b) be undertaken in consultation with EPA, and Council;
    c) include a Hazard Audit in accordance with the Department's *Hazardous Industry Planning Advisory Paper No. 5 – Hazard Audit Guidelines*. The audit shall include a review of the Safety Management System and of all incidents recorded and be accompanied by a program for the implementation of all recommendations made in the audit report. If the Applicant intends to defer the implementation of a recommendation, justification must be included.
    d) assess whether the development is being carried out in accordance with industry best practice;
    e) assess the environmental performance of the development, and its effects on the surrounding environment and sensitive receivers;
    f) assess whether the development is complying with the relevant standards, performance measures, and statutory requirements;
    g) review the adequacy of any strategy/plan/program required under this approval; and, if necessary,
    h) recommend measures or actions to improve the environmental performance of the development, and/or any strategy/plan/program required under this approval.

61. Within 6 weeks of completing this audit, or as otherwise agreed by the Director-General, the Applicant shall submit a copy of the audit report to the Director-General with a response to any recommendations contained in the audit report.

62. Within 3 months of submitting an audit report to the Director-General, the Applicant shall review and if necessary revise the strategy/plans/programs required under this approval to the satisfaction of the Director-General.

**COMPLAINTS MANAGEMENT**

63. Prior to the commencement of construction works, the Applicant shall ensure that the following are available for community complaints:
    a) a telephone number on which complaints about operations on the site may be registered;
    b) a postal address to which written complaints may be sent; and
    c) an email address to which electronic complaints may be transmitted.

    The telephone number, the postal address and the email address shall be displayed on a sign near the entrance to the site, in a position that is clearly visible to the public. These details shall also be provided on the Applicant's internet site.

64. The Applicant shall record details of all complaints received through the means listed under condition 62 of this consent in an up-to-date Complaints Register. The Register shall record, but not necessarily be limited to:
    a) the date and time, where relevant, of the complaint;
    b) the means by which the complaint was made (telephone, mail or email);
    c) any personal details of the complainant that were provided, or if no details were provided, a note to that effect;
    d) the nature of the complaint;
    e) any action(s) taken by the Applicant in relation to the complaint, including any follow-up contact with the complainant; and
    f) if no action was taken by the Applicant in relation to the complaint, the reason(s) why no action was taken.

    The Complaints Register shall be made available for inspection by the Director-General and/or EPA upon request.

**ACCESS TO INFORMATION**

65. Within 3 months of the approval of any strategy/plan/program required under this approval (or any subsequent revision of these strategies/plans/programs), or the completion of the audits or AEMRs required under this approval, the Applicant shall provide a copy of the relevant document/s to:
    a) the relevant agencies, and
    b) any interested party upon request.

**APPENDIX A**
**SITE PLAN**

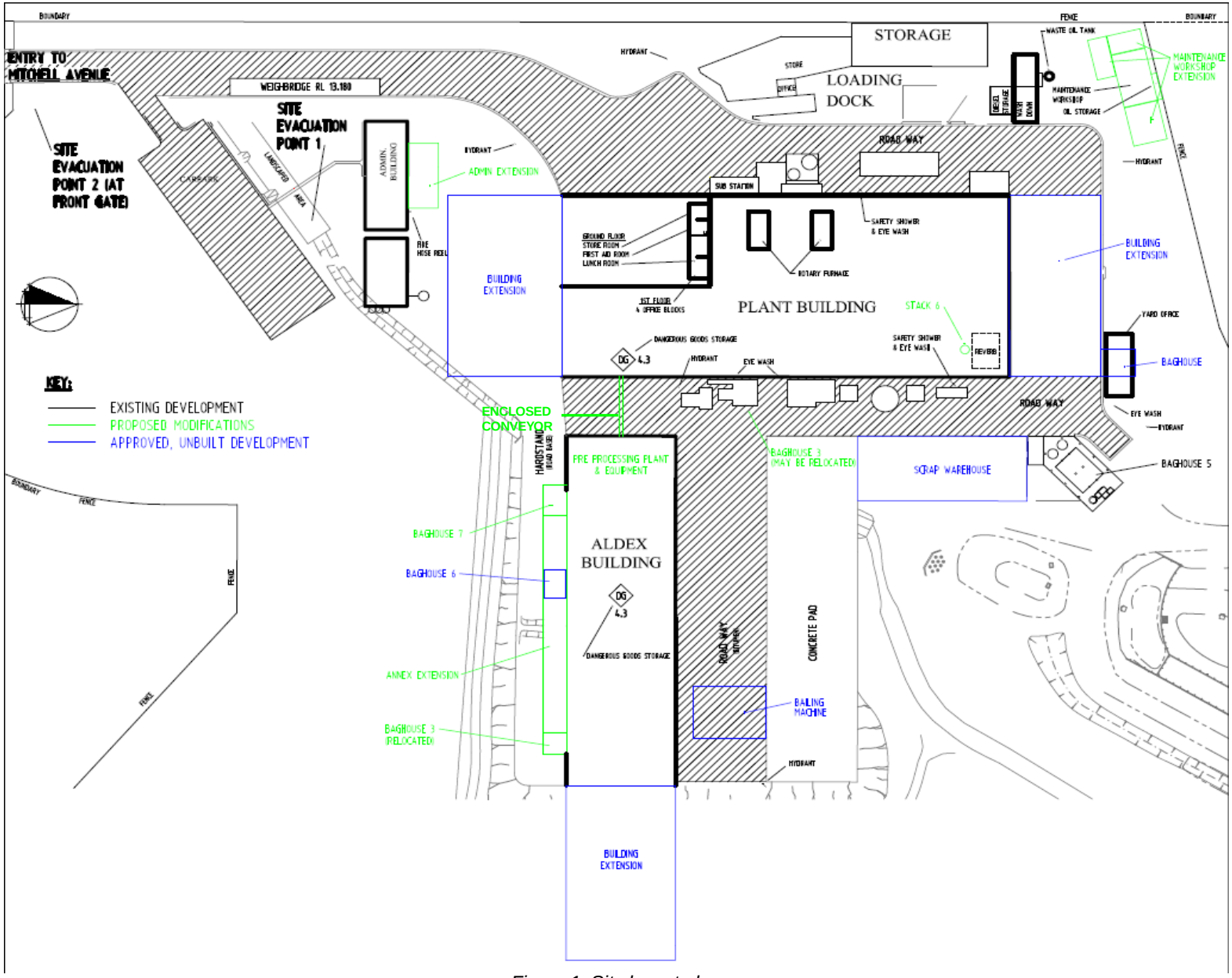


*Figure 1: Site layout plan*

Contact: Emma Barnet
Phone: 02 9228 6412
Fax: 02 9228 6466
Email: emma.barnet@planning.nsw.gov.au

Mr Garbis Simonian
Weston Aluminium
PO Box 295
Kurri Kurri NSW 2327

Attn: Chris McClung

Dear Mr Simonian

**Determination of Modification Request for Weston Aluminium Dross Recycling Facility (DA 86_04_01 MOD 9 and DA 10397 of 1995 MOD 7)**

I am writing to inform you that the above requests were approved on 15 September 2015.

Copies of the approvals are enclosed for your records. The Secretary's assessment report and Instruments of Modification are available on the Department's website at:

http://majorprojects.planning.nsw.gov.au/page/determinations/

Your contact officer for this project, Emma Barnet, can be contacted on 02 9228 6412 or via email at emma.barnet@planning.nsw.gov.au. Please mark all correspondence regarding the project to the attention of the contact officer.

Yours sincerely

p.p. 15/9/15

Joanna Bakopanos
**Team Leader**
**Industry Assessments**

# Notice of Modification

**Section 75W of the *Environmental Planning and Assessment Act 1979***

As delegate of the Minister for Planning, under the delegation dated 16 February 2015, I hereby modify the development consent referred to in Schedule 1, subject to conditions as set out in Schedule 2.

Daniel Keary
**A/Executive Director**
**Infrastructure and Industry Assessments**

Sydney 15th SEPTEMBER 2015

## SCHEDULE 1

| | |
|---|---|
| **Application Number:** | DA 86-04-01 |
| **Applicant:** | Weston Aluminium Pty Limited |
| **Approval Authority:** | Minister for Planning |
| **Land:** | Lot 796 DP 39877 129 Mitchell Avenue, Kurri Kurri |
| **Project:** | Extensions to an existing aluminium dross recycling plant |
| **Modification Number:** | DA 86-04-01 Mod 9 |
| **Modification:** | A 24 month trial processing illicit drug and pharmaceutical wastes |

## SCHEDULE 2

This development consent is modified as follows:

In the definitions table:

1. Deleting the definition for Department, Director-General and Minister and inserting the following definitions in alphabetical order:

| | |
|---|---|
| Department | The Department of Planning and Environment or its successors in title |
| Minister | The Minister for Planning |
| Secretary | The Secretary of the Department of Planning and Environment, or nominee |

2. Inserting the following definitions in alphabetical order:

| | |
|---|---|
| DA-86-04-01 Mod 9 | A 24 month trial processing illicit drug and pharmaceutical waste in existing furnaces as described in the assessment prepared by Weston Aluminium and dated 12 March 2015 and the Response to Submissions prepared by Weston Aluminium and dated 15 July 2015 |

In Schedules 2, 3 and 4:

3. Deletion of all instances of the word Director-General and replacing with the word Secretary.

4. Deletion of all instances of the words NSW Fire Brigade and replacing with the words NSW Fire and Rescue.

5. Inserting the following Condition 2i) after Condition 2h) of Schedule 2:

   2i) Modification request DA 86-04-01 Mod 9 and DA 10397 of 1995 Mod 7 and the enclosed Environmental Assessment, dated 12 March 2015, prepared by Weston Aluminium and the Response to Submissions, dated 15 July 2015, prepared by Weston Aluminium.

6. Inserting the following Condition 6C after Condition 6B:

   6C The Applicant shall ensure that DA 86-04-01 Mod 9:
   a) is undertaken over a trial period of not more than 24 consecutive months only; and
   b) during the operation of DA 86-04-01 Mod 9:
      i. no more than 200 tonnes of illicit drug waste is received or processed on site over the 24 month trial period; and
      ii. no more than 1,000 tonnes of pharmaceutical waste is received, stored or processed on site over the 24 month trial period.

7. Inserting the following Condition 25A after Condition 25 of Schedule 3:

   25A All pharmaceutical waste must be stored in an enclosed (appropriately bunded and covered) area to prevent the contamination of stormwater.

**Illicit Drug Waste and Pharmaceutical Waste Processing Trial (DA 86-04-01 Mod 9)**

8. Inserting the following Condition 10B after Condition 10A in Schedule 2:

   10A. Prior to the commencement of DA 86-04-01 Mod 9, the Applicant must:
   a) obtain an updated EPL allowing DA 86-04-01 Mod 9 to proceed; and
   b) notify the Secretary, Council and the EPA's Regional Manager Hunter in writing, two weeks prior to the commencement of DA 86-04-01 Mod 9 and within two weeks of the conclusion of the trial.

9. Inserting the following Condition 54C with the following Condition 54B in Schedule 3:

54C For the duration of the DA 86-04-01 Mod 9, the Applicant must:

a) monitor and record, air emissions and all pollutants and parameters specified in the EPL. All air quality monitoring must occur on a quarterly basis and whenever Pharmaceutical and Illicit Drug Waste material is being processed;
b) ensure air quality emissions testing in completed in accordance with the EPA's *Approved Methods for Sampling and Analysis of Air Pollutants in NSW*
c) cease processing, and notify the EPA and the Secretary, should laboratory results indicate emissions are greater the limits in the EPL or the *Protection of the Environment Operations (Clean Air) Regulation 2010*;
d) monitor and record all processing conditions for the trial, including:
   i. the names, contact details and qualifications and experience of the person(s) conducting and supervising the trial;
   ii. the source facility, a description of the waste type, amount and date received of each load of waste accepted for disposal as part of the trial;
   iii. all process conditions for the trial including the quantity of pharmaceutical and/or illicit drug waste in each batch processed, any other materials/additives processed in each batch, the temperature profile of the furnace during each batch processed and the residence time of the material within the furnace; and
e) undertake real-time monitoring of fluoride and particulate emissions and immediately cease processing, and notify the EPA and the Secretary, should any exceedance of the limits in the EPL occur.

10. Inserting the following Condition 54D in after Condition 54C in Schedule 3:

54D The Applicant must prepare a detailed monitoring report, on the outcomes of DA 86-04-01 Mod 9, to the satisfaction of the EPA and the Secretary. The report must:

a) be submitted to EPA, Council and the Secretary within 90 days of the completion of DA 86-04-01 Mod 9;
b) detail the results of the monitoring required in condition 54C above;
c) compare the results of the trial to, the limits in the EPL and the EPA's air quality impact assessment criteria specified in the "Approved Methods for the Modelling and Assessment of Air Pollutants in NSW" (DEC 2005);
d) describe any anomalies in the monitoring data, and any exceedances of the limits or assessment criteria;
e) characterise the trial outputs and describe how these products are to be managed and disposed of, demonstrating compliance with condition 44;
f) summarise the findings of the trial;
g) recommend any actions that could be taken to minimise emissions during any future processing; and
h) discuss the likely options for any future processing.

11. Replacing condition 56A with the following Condition 56A in Schedule 3:

56A Within three months of each of the modifications listed below, the Applicant shall submit, for approval of the Secretary, the relevant updated studies (as required by Condition 56 and described in table 5) to reflect the requirements of that modification.

| **Modification** | **Plans** |
|---|---|
| DA 86-04-01 Mod 7 | 56 c, d and e |
| DA 86-04-01 Mod 9 | 56 d and e |

12. Inserting the following Condition 56B after 56A in Schedule 3:

The Applicant shall prepare a Security Protocol for the management of pharmaceutical drug waste. The Protocol shall:

a) be implemented for the duration of DA 86-04-01 Mod 9;
b) be incorporated into the updated Safety Management System required by Condition 56B;
c) describe the measures to be undertaken to ensure the secure transport, storage and processing of pharmaceutical waste; and

d) include the security measures described in the Response to Submissions Report dated 15 July 2015.

13. Inserting the following condition 56C after Condition 56B in Schedule 3:

POST-STARTUP COMPLIANCE REPORT

56C Three months after the commencement of operation of DA 86-04-01 Mod 9, the Applicant shall submit to the Secretary, a report verifying that:

a) the updated Emergency Plan required under condition 56B is effectively in place and that at least one emergency exercise has been conducted; and

b) the updated Safety Management System required under condition 56B has been fully implemented and that records required by the system are being kept.

# Notice of Modification

## Section 75W of the *Environmental Planning and Assessment Act 1979*

As delegate of the Minister for Planning, under the delegation dated 16 February 2015, I hereby modify the development consent referred to in Schedule 1, subject to conditions as set out in Schedule 2.

Daniel Keary
**A/Executive Director**
**Infrastructure and Industry Assessments**

Sydney 15TH SEPTEMBER 2015

## SCHEDULE 1

| | |
|---|---|
| **Application Number:** | DA 10397 of 1995 |
| **Proponent:** | Weston Aluminium Pty Limited |
| **Approval Authority:** | Minister for Planning |
| **Land:** | Lot 796 DP 39877 129 Mitchell Avenue, Kurri Kurri |
| **Project:** | Extensions to an existing aluminium dross recycling plant |
| **Modification Number:** | DA 10397 of 1995 Mod 7 |
| **Modification:** | A 24 month trial processing illicit drug and pharmaceutical wastes |

## SCHEDULE 2

This development consent is modified as follows:

In the definitions table:

1. Deleting the definition for Department, Director-General and Minister and inserting the following definitions in alphabetical order:

| | |
|---|---|
| Department | The Department of Planning and Environment or its successors in title |
| Minister | The Minister for Planning |
| Secretary | The Secretary of the Department of Planning and Environment, or nominee |

2. Inserting the following definitions in alphabetical order:

| | |
|---|---|
| DA 10397 of 1995 Mod 7 | A 24 month trial processing illicit drug and pharmaceutical waste in existing furnaces as described in the assessment prepared by Weston Aluminium and dated 12 March 2015 and the Response to Submissions prepared by Weston Aluminium and dated 15 July 2015 |

In Schedules 2, 3 and 4:

3. Deletion of all instances of the word Director-General and replacing with the word Secretary.

4. Deletion of all instances of the words NSW Fire Brigade and replacing with the words NSW Fire and Rescue.

5. Inserting the following Condition 2i) after Condition 2h) of Schedule 2:

   2i) Modification request DA 86-04-01 Mod 9 and DA 10397 of 1995 Mod 7 and the enclosed Environmental Assessment, dated 12 March 2015, prepared by Weston Aluminium and the Response to Submissions, dated 15 July 2015, prepared by Weston Aluminium.

6. Inserting the following Condition 6C after Condition 6B:

   6C The Applicant shall ensure that DA 10397 of 1995 Mod 7:
   a) is undertaken over a trial period of not more than 24 consecutive months only; and
   b) during the operation of DA 10397 of 1995 Mod 7 :
      i. no more than 200 tonnes of illicit drug waste is received or processed on site over the 24 month trial period; and
      ii. no more than 1,000 tonnes of pharmaceutical waste is received, stored or processed on site over the 24 month trial period.

7. Inserting the following Condition 25A after Condition 25 of Schedule 3:

   25A All pharmaceutical waste must be stored in an enclosed (appropriately bunded and covered) area to prevent the contamination of stormwater.

**Illicit Drug Waste and Pharmaceutical Waste Processing Trial (DA 10397 of 1995 Mod 7)**

8. Inserting the following Condition 10B after Condition 10A in Schedule 2:

   10A. Prior to the commencement of DA 10397 of 1995 Mod 7, the Applicant must:
   a) obtain an updated EPL allowing DA 10397 of 1995 Mod 7 to proceed; and
   b) notify the Secretary, Council and the EPA's Regional Manager Hunter in writing, two weeks prior to the commencement of DA 10397 of 1995 Mod 7 and within two weeks of the conclusion of the trial.

9. Inserting the following condition 54C after Condition 54B in Schedule 3:

54C For the duration of DA 10397 of 1995 Mod 7, the Applicant must:

a) monitor and record, air emissions and all pollutants and parameters specified in the EPL. All air quality monitoring must occur on a quarterly basis and whenever pharmaceutical and illicit drug waste material is being processed;
b) ensure air quality emissions testing in completed in accordance with the EPA's *Approved Methods for Sampling and Analysis of Air Pollutants in NSW*
c) cease processing, and notify the EPA and the Secretary, should laboratory results indicate emissions are greater the limits in the EPL or the *Protection of the Environment Operations (Clean Air) Regulation 2010*;
d) monitor and record all processing conditions for the trial, including:
    i. the names, contact details and qualifications and experience of the person(s) conducting and supervising the trial;
    ii. the source facility, a description of the waste type, amount and date received of each load of waste accepted for disposal as part of the trial;
    iii. all process conditions for the trial including the quantity of pharmaceutical and/or illicit drug waste in each batch processed, any other materials/additives processed in each batch, the temperature profile of the furnace during each batch processed and the residence time of the material within the furnace; and
e) undertake real-time monitoring of fluoride and particulate emissions and immediately cease processing, and notify the EPA and the Secretary, should any exceedance of the limits in the EPL occur.

10. Inserting the following condition 54D in after Condition 54C in Schedule 3:

54D The Applicant must prepare a detailed monitoring report, on the outcomes of DA 10397 of 1995 Mod 7, to the satisfaction of the EPA and the Secretary. The report must:

a) be submitted to EPA, Council and the Secretary within 90 days of the completion of DA 10397 of 1995 Mod 7 ;
b) detail the results of the monitoring required in condition 54C above;
c) compare the results of the trial to, the limits in the EPL and the EPA's air quality impact assessment criteria specified in the "Approved Methods for the Modelling and Assessment of Air Pollutants in NSW" (DEC 2005);
d) describe any anomalies in the monitoring data, and any exceedances of the limits or assessment criteria;
e) characterise the trial outputs and describe how these products are to be managed and disposed of, demonstrating compliance with condition 44;
f) summarise the findings of the trial;
g) recommend any actions that could be taken to minimise emissions during any future processing; and
h) discuss the likely options for any future processing.

11. Replacing condition 56A with the following Condition 56A in Schedule 3:

56A Within three months of each of the modifications listed below, the Applicant shall submit, for approval of the Secretary, the relevant updated studies (as required by Condition 56 and described in table 5) to reflect the requirements of that modification.

| **Modification** | **Plans** |
|---|---|
| DA 10397 of 1995 Mod 5 | 56 c, d and e |
| DA 10397 of 1995 Mod 7 | 56 d and e |

12. Inserting the following Condition 56B after 56A in Schedule 3:

56B The Applicant shall prepare a Security Protocol for the management of pharmaceutical drug waste. The Protocol shall:

a) be implemented for the duration of DA 10397 of 1995 Mod 7;
b) be incorporated into the updated Safety Management System required by Condition 56B;

c) describe the measures to be undertaken to ensure the secure transport, storage and processing of pharmaceutical waste; and
d) include the security measures described in the Response to Submissions Report dated 15 July 2015.

13. Inserting the following Condition 56C after Condition 56B in Schedule 3:

POST-STARTUP COMPLIANCE REPORT

56C Three months after the commencement of operation of DA 10397 of 1995 Mod 7, the Applicant shall submit to the Secretary, a report verifying that:
a) the updated Emergency Plan required under condition 56B is effectively in place and that at least one emergency exercise has been conducted; and
b) the updated Safety Management System required under condition 56B has been fully implemented and that records required by the system are being kept.

# ATTACHMENT 2

# Environment Protection Licence

Licence - 6423

| Licence Details | |
|---|---|
| Number: | 6423 |
| Anniversary Date: | 19-December |

**Licensee**

WESTON ALUMINIUM PTY LIMITED

PO BOX 5523

WEST CHATSWOOD NSW 1515

**Premises**

WESTON ALUMINIUM PTY LTD

129 MITCHELL AVENUE

KURRI KURRI NSW 2327

**Scheduled Activity**

Metallurgical activities

Resource recovery

Waste storage

| Fee Based Activity | Scale |
|---|---|
| Aluminium production (scrap metal) | > 10000 T annual production capacity |
| Recovery of hazardous and other waste | Any hazardous and other waste recovered |
| Scrap metal processing | 0-100000 T annual production capacity |
| Waste storage - hazardous, restricted solid, liquid, clinical and related waste and asbestos waste | Any listed waste type stored |

**Region**

North - Hunter

Ground Floor, NSW Govt Offices, 117 Bull Street

NEWCASTLE WEST NSW 2302

Phone: (02) 4908 6800

Fax: (02) 4908 6810

PO Box 488G NEWCASTLE

NSW 2300

# Environment Protection Licence

Licence - 6423

# Environment Protection Licence

Licence - 6423

# Environment Protection Licence

Licence - 6423

## Information about this licence

### Dictionary

A definition of terms used in the licence can be found in the dictionary at the end of this licence.

### Responsibilities of licensee

Separate to the requirements of this licence, general obligations of licensees are set out in the Protection of the Environment Operations Act 1997 ("the Act") and the Regulations made under the Act. These include obligations to:

- ensure persons associated with you comply with this licence, as set out in section 64 of the Act;
- control the pollution of waters and the pollution of air (see for example sections 120 - 132 of the Act);
- report incidents causing or threatening material environmental harm to the environment, as set out in Part 5.7 of the Act.

### Variation of licence conditions

The licence holder can apply to vary the conditions of this licence. An application form for this purpose is available from the EPA.

The EPA may also vary the conditions of the licence at any time by written notice without an application being made.

Where a licence has been granted in relation to development which was assessed under the Environmental Planning and Assessment Act 1979 in accordance with the procedures applying to integrated development, the EPA may not impose conditions which are inconsistent with the development consent conditions until the licence is first reviewed under Part 3.6 of the Act.

### Duration of licence

This licence will remain in force until the licence is surrendered by the licence holder or until it is suspended or revoked by the EPA or the Minister. A licence may only be surrendered with the written approval of the EPA.

### Licence review

The Act requires that the EPA review your licence at least every 5 years after the issue of the licence, as set out in Part 3.6 and Schedule 5 of the Act. You will receive advance notice of the licence review.

### Fees and annual return to be sent to the EPA

For each licence fee period you must pay:

- an administrative fee; and
- a load-based fee (if applicable).

# Environment Protection Licence

Licence - 6423

The EPA publication “A Guide to Licensing” contains information about how to calculate your licence fees. The licence requires that an Annual Return, comprising a Statement of Compliance and a summary of any monitoring required by the licence (including the recording of complaints), be submitted to the EPA. The Annual Return must be submitted within 60 days after the end of each reporting period. See condition R1 regarding the Annual Return reporting requirements.

Usually the licence fee period is the same as the reporting period.

**Transfer of licence**

The licence holder can apply to transfer the licence to another person. An application form for this purpose is available from the EPA.

**Public register and access to monitoring data**

Part 9.5 of the Act requires the EPA to keep a public register of details and decisions of the EPA in relation to, for example:

- licence applications;
- licence conditions and variations;
- statements of compliance;
- load based licensing information; and
- load reduction agreements.

Under s320 of the Act application can be made to the EPA for access to monitoring data which has been submitted to the EPA by licensees.

## This licence is issued to:

| |
|---|
| **WESTON ALUMINIUM PTY LIMITED** |
| **PO BOX 5523** |
| **WEST CHATSWOOD NSW 1515** |

subject to the conditions which follow.

# Environment Protection Licence

Licence - 6423

## 1 Administrative Conditions

### A1 What the licence authorises and regulates

A1.1 This licence authorises the carrying out of the scheduled activities listed below at the premises specified in A2. The activities are listed according to their scheduled activity classification, fee-based activity classification and the scale of the operation.

Unless otherwise further restricted by a condition of this licence, the scale at which the activity is carried out must not exceed the maximum scale specified in this condition.

| Scheduled Activity | Fee Based Activity | Scale |
|---|---|---|
| Metallurgical activities | Aluminium production (scrap metal) | > 10000 T annual production capacity |
| Resource recovery | Recovery of hazardous and other waste | Any hazardous and other waste recovered |
| Metallurgical activities | Scrap metal processing | 0 - 100000 T annual production capacity |
| Waste storage | Waste storage - hazardous, restricted solid, liquid, clinical and related waste and asbestos waste | Any listed waste type stored |

### A2 Premises or plant to which this licence applies

A2.1 The licence applies to the following premises:

| Premises Details |
|---|
| **WESTON ALUMINIUM PTY LTD** |
| **129 MITCHELL AVENUE** |
| **KURRI KURRI** |
| **NSW 2327** |
| **LOT 796 DP 39877** |

### A3 Information supplied to the EPA

A3.1 Works and activities must be carried out in accordance with the proposal contained in the licence application, except as expressly provided by a condition of this licence.

In this condition the reference to "the licence application" includes a reference to:
a) the applications for any licences (including former pollution control approvals) which this licence replaces under the Protection of the Environment Operations (Savings and Transitional) Regulation 1998; and
b) the licence information form provided by the licensee to the EPA to assist the EPA in connection with the issuing of this licence.

# Environment Protection Licence

Licence - 6423

## 2 Discharges to Air and Water and Applications to Land

### P1 Location of monitoring/discharge points and areas

P1.1 The following points referred to in the table below are identified in this licence for the purposes of monitoring and/or the setting of limits for the emission of pollutants to the air from the point.

***Air***

| EPA identification no. | Type of Monitoring Point | Type of Discharge Point | Location Description |
|---|---|---|---|
| 1 | Air emissions monitoring Discharge to air | Air emissions monitoring Discharge to air | "Stack 1" on drawing titled "Proposed Site Plan" submitted to the EPA on 2 March 2010 . |
| 2 | Air emissions monitoring Discharge to air | Air emissions monitoring Discharge to air | "Stack 2" on drawing titled "Proposed Site Plan" submitted to the EPA on 2 March 2010. |
| 3 | Air emissions monitoring Discharge to air | Air emissions monitoring Discharge to air | "Stack 3" on drawing titled "Proposed Site Plan" submitted to the EPA on 2 March 2010. |
| 4 | Air emissions monitoring Discharge to air | Air emissions monitoring Discharge to air | "Stack 4" on drawing titled "Proposed Site Plan" submitted to the EPA on 2 March 2010. |
| 13 | Air emissions monitoring Discharge to air | Air emissions monitoring Discharge to air | "Stack 5" on drawing titled "Proposed Site Plan" submitted to the EPA on 2 March 2010 |
| 14 | Air emissions monitoring Discharge to air | Air emissions monitoring Discharge to air | Emissions from gas combustion side of reverberatory funace shown as "Stack 6" on drawing titled " Proposed Site Plan" submitted to the EPA on 2 March 2010. |
| 15 | Air emissions monitoring Discharge to air | Air emissions monitoring Discharge to air | Emissions from stack serving the ALDEX pre-processing plant "Stack 7" on drawing titled " Proposed Site Plan" submitted to the EPA on 2 March 2010. |

P1.2 The following utilisation areas referred to in the table below are identified in this licence for the purposes of the monitoring and/or the setting of limits for any application of solids or liquids to the utilisation area.

P1.3 The following points referred to in the table are identified in this licence for the purposes of the monitoring and/or the setting of limits for discharges of pollutants to water from the point.

***Water and land***

| EPA Identification no. | Type of Monitoring Point | Type of Discharge Point | Location Description |
|---|---|---|---|

| | | |
|---|---|---|
| 12 | Stormwater quality monitoring | Main pond on drawing "Figure 1 First Flush Stormwater Irrigation Plan" in "Pollution Study and Reduction Program Condition U2.1 Irrigation Sustainability Assessment Weston Aluminium, Kurri Kurri" prepared by HLA -Envirosciences Pty Ltd dated 1/12/06. |

# 3 Limit Conditions

## L1 Pollution of waters

L1.1 Except as may be expressly provided in any other condition of this licence, the licensee must comply with section 120 of the Protection of the Environment Operations Act 1997.

## L2 Load limits

L2.1 The actual load of an assessable pollutant discharged from the premises during the reporting period must not exceed the load limit specified for the assessable pollutant in the table below.

L2.2 The actual load of an assessable pollutant must be calculated in accordance with the relevant load calculation protocol.

| Assessable Pollutant | Load limit (kg) |
|---|---|
| Coarse Particulates (Air) | 6538.00 |
| Fine Particulates (Air) | 11622.00 |
| Fluoride (Air) | 1894.00 |
| Nitrogen Oxides (Air) | 22803.00 |
| Sulfur Oxides (Air) | 14935.00 |
| Volatile organic compounds (Air) | 3984.00 |

Note: An assessable pollutant is a pollutant which affects the licence fee payable for the licence.

## L3 Concentration limits

L3.1 For each monitoring/discharge point or utilisation area specified in the table\s below (by a point number), the concentration of a pollutant discharged at that point, or applied to that area, must not exceed the concentration limits specified for that pollutant in the table.

L3.2 Air Concentration Limits

# Environment Protection Licence

Licence - 6423

**POINT 1**

| Pollutant | Units of measure | 100 percentile concentration limit | Reference conditions | Oxygen correction | Averaging period |
|---|---|---|---|---|---|
| Gaseous fluoride | milligrams per cubic metre | 2 | | | |
| Type 1 and Type 2 substances in aggregate | milligrams per cubic metre | 10 | | | |
| Carbon monoxide | parts per million | 100 | | | |
| Sulfuric acid mist and sulfur trioxide (as SO3) | milligrams per cubic metre | 100 | | | |
| Solid Particles | milligrams per cubic metre | 25 | | | |
| Hydrogen chloride | milligrams per cubic metre | 400 | | | |
| Nitrogen Oxides | grams per cubic metre | 2.5 | | | |
| Cyanide | milligrams per cubic metre | 0.5 | Dry, 273 k, 101.3 kPa | | |

**POINT 2**

| Pollutant | Units of measure | 100 percentile concentration limit | Reference conditions | Oxygen correction | Averaging period |
|---|---|---|---|---|---|
| Solid Particles | milligrams per cubic metre | 35 | | | |

**POINT 3**

| Pollutant | Units of measure | 100 percentile concentration limit | Reference conditions | Oxygen correction | Averaging period |
|---|---|---|---|---|---|
| Solid Particles | milligrams per cubic metre | 50 | | | |

**POINT 4**

| Pollutant | Units of measure | 100 percentile concentration limit | Reference conditions | Oxygen correction | Averaging period |
|---|---|---|---|---|---|
| Solid Particles | milligrams per cubic metre | 24 | | | |

**POINT 13**

| Pollutant | Units of measure | 100 percentile concentration limit | Reference conditions | Oxygen correction | Averaging period |
|---|---|---|---|---|---|

| | | | |
|---|---|---|---|
| Volatile organic compounds | milligrams per cubic metre | 77 Note 1 | Dry, 273K, 101.3kPa |
| Hydrogen chloride | milligrams per cubic metre | 10 | Dry, 273K, 101.3kPa |
| Solid Particles | milligrams per cubic metre | 10 | Dry, 273K, 101.3kPa |
| Sulfuric acid mist and sulfur trioxide (as SO3) | milligrams per cubic metre | 100 | |
| Type 1 and Type 2 substances in aggregate | milligrams per cubic metre | 5 | |
| Nitrogen Oxides | milligrams per cubic metre | 100 | Dry, 273K, 101.3kPa |
| Dioxins & Furans | nanograms per cubic metre | 0.1 Note 2 | Dry, 273K, 101.3kPa |
| Carbon monoxide | milligrams per cubic metre | 125 Note 3 | Dry, 273K, 101.3kPa |
| Hydrogen chloride | milligrams per cubic metre | 10 | |

**POINT 14**

| Pollutant | Units of measure | 100 percentile concentration limit | Reference conditions | Oxygen correction | Averaging period |
|---|---|---|---|---|---|
| Solid Particles | milligrams per cubic metre | 10 | Dry, 273K, 101.3kPa | 3% | |

**POINT 15**

| Pollutant | Units of measure | 100 percentile concentration limit | Reference conditions | Oxygen correction | Averaging period |
|---|---|---|---|---|---|
| Solid Particles | milligrams per cubic metre | 15 | | | |

Note: Note 1 - Limit value is a rolling 1-hour average. VOC as n-hexane (dry, 273 K, 101.3 kPa).

Note 2 - Limit value is a rolling annual average. Polychlorinated-dibenzo-p-dioxins (PCDD) and polychlorinated-dibenzofurans (PCDF) as 2,3,7,8-tetrachloro-dibenzo-p-dioxin (TCDD) equivalent calculated in accordance with the procedures included in Part 5, Clause 40 of the Protection of the Environment Operations (Clean Air) Regulation 2010, (dry, 273K, 101.3kPA).

Note 3 - Limit value is a rolling 1-hour average.

L3.3 The concentration of gaseous fluoride emitted to the atmosphere from Point 1 must not exceed 1.4 milligrams per cubic metre of fluoride, measured as a one hour average.

L3.4 Total plant gaseous fluoride emissions must not exceed 0.25kg/hr.

L3.5 Total plant particulate emissions must not exceed 5.43 kg/hour.

## L4 Waste

L4.1 The licensee must not cause, permit or allow any waste to be received at the premises, except the wastes expressly referred to in the column titled “Waste” and meeting the definition, if any, in the column titled “Description” in the table below.
Any waste received at the premises must only be used for the activities referred to in relation to that waste in the column titled “Activity” in the table below.
Any waste received at the premises is subject to those limits or conditions, if any, referred to in relation to that waste contained in the column titled “Other Limits” in the table below.
This condition does not limit any other conditions in this licence.

| Code | Waste | Description | Activity | Other Limits |
|---|---|---|---|---|
| NA | Scrap metal | Scrap aluminium metal | Metallurgical Activities | No more that 35,000 tonnes of scrap metal is to be processed per year. |
| D100 | Metal carbonyls | Spent potlining wastes from Australian primary aluminium smelters | Waste processing (non-thermal treatment)<br>Waste storage | Combined total quantity of spent potlining and aluminium dross must not exceed 5000 tonnes stored on the premises at any time; and no more than a combined total of 40,000 tonnes of spent potlining and aluminium dross, in any combination is to be processed per year |
| A130 | Cyanides (inorganic) | Spent potlining material wastes from Australian primary aluminium smelters | Waste processing (non-thermal treatment)<br>Waste storage | Combined total quantity of spent potlining and aluminium dross must not exceed 5000 tonnes stored on the premises at any time; and no more than a combined total of |

| | | | | |
|---|---|---|---|---|
| | | | | 40,000 tonnes of spent potlining and aluminium dross, in any combination is to be processed per year |
| D300 | Non toxic salts | Aluminium Dross | Waste storage<br>Waste processing (non-thermal treatment) | Combined total quantity of spent potlining and aluminium dross must not exceed 5,000 tonnes stored on the premises at any time; and no more than a combined total of 40,000 tonnes of spent potlining and aluminium dross, in any combination is to be processed per year. |

Note: The licensee must comply with the conditions as specified in this licence or where no specific conditions are outlined in this licence, the licensee must comply with the Protection of the Environment Operations (Waste) Regulation 1996.

## L5 Noise limits

L5.1 To restrict noise impacts, truck movements to and from the premise must be limited to between the hours of 7am and 10pm.

L5.2 Noise from the premises must not exceed the noise limits presented in the table below.

Note: Where amenity noise levels are lower than instrusive noise levels, both levels are in the licence condition in order to ensure that intrusive noise impacts are controlled at all times.

| Location | Daytime | Evening | Night time |
|---|---|---|---|
| Residences at the corner of Government and 10th Streets | LAeq(15 minute) 48 dB(A) | LAeq(15 minute) 48dB(A), LAeq(evening) 40dB(A) | LAeq(15 minute) 47dB(A), LAeq(night) 35dB(A), LAeq(1 minute) 57dB(A) |
| Residences on Northcote Street | LAeq(15 minute) 44dB(A) | LAeq(15 minute) 44dB(A) | LAeq(15 minute) 44 dB(A), LAeq(night) 40dB(A), LAeq( 1 minute) 57dB(A) |

| | | | |
|---|---|---|---|
| Residences in the Light Industrial Zone on Mitchell Avenue and Railway Avenue | LAeq(15 minute) 43dB(A) | LAeq(15 minute) 43dB(A) | LAeq(15 minute) 43dB(A), LAeq(night) 41dB(A), LAeq(1 minute) 55dB(A) |

### L6 Potentially offensive odour

L6.1 No condition of this licence identifies a potentially offensive odour for the purposes of section 129 of the Protection of the Environment Operations Act 1997.

Note: Section 129 of the Protection of the Environment Operations Act 1997, provides that the licensee must not cause or permit the emission of any offensive odour from the premises but provides a defence if the emission is identified in the relevant environment protection licence as a potentially offensive odour and the odour was emitted in accordance with the conditions of a licence directed at minimising odour.

### L7 Other limit conditions

L7.1 The licensee must comply with the conditions as specified in this licence or where no specific conditions are outlined in this licence, the licensee must comply with the "Chemical Control Order in Relation to Aluminium Smelter Wastes containing Fluoride and/or Cyanide, 1986".

## 4 Operating Conditions

### O1 Activities must be carried out in a competent manner

O1.1 Licensed activities must be carried out in a competent manner.
This includes:
a) the processing, handling, movement and storage of materials and substances used to carry out the activity; and
b) the treatment, storage, processing, reprocessing, transport and disposal of waste generated by the activity.

### O2 Maintenance of plant and equipment

O2.1 All plant and equipment installed at the premises or used in connection with the licensed activity:
a) must be maintained in a proper and efficient condition; and
b) must be operated in a proper and efficient manner.

### O3 Dust

O3.1 The premises must be maintained in a condition which minimises or prevents the emission of dust from the premises.

### O4 Processes and management

O4.1 The licensee must ensure that any liquid and/or non-liquid waste generated and/or stored at the premises is assessed and classified in accordance with the Office of Environment and Heritage Waste Classification Guidelines as in force from time to time.

### O5 Waste management

O5.1 The licensee must ensure that waste identified for recycling is stored separately from other waste.

O5.2 All above ground tanks containing material that is likely to cause environmental harm must be bunded or have an alternative spill containment system in place.

O5.3 The licensee must ensure that suitable measures (e.g. high/low alarms, control valves with interlock control, one way valves) are installed on all tanks, ponds or clarifiers and associated pipes and hoses to prevent the spillage of waste.

### O6 Other operating conditions

O6.1 The continuous fluoride emission monitoring system must activate visible and audible alarms in the event that the concentration of fluoride emitted to atmosphere exceeds the limit value of 1.4 milligrams per cubic metre.

O6.2 If the 1 hour average concentration of gaseous fluoride emitted to atmosphere exceeds 1.4 milligrams per cubic metre at Point 1, the plant or section of the plant where the exceedance occurs must cease operating until the licensee is able to ensure compliance with the emission limits specified in this licence.

O6.3 The automated lime dosing system feeding the baghouse which services Point 13 must activate and audible alarm in the event that insufficient lime is added to the baghouse.

O6.4 Logged data from the automated lime dosing system feeding the baghouse which services Point 13 and records demonstrating that the reverberatory furnace metal level is adequately maintained must be kept on site for a period of at least 4 years after the data or record was obtained.

## 5 Monitoring and Recording Conditions

### M1 Monitoring records

M1.1 The results of any monitoring required to be conducted by this licence or a load calculation protocol must be recorded and retained as set out in this condition.

M1.2 All records required to be kept by this licence must be:
a) in a legible form, or in a form that can readily be reduced to a legible form;
b) kept for at least 4 years after the monitoring or event to which they relate took place; and

c) produced in a legible form to any authorised officer of the EPA who asks to see them.

M1.3 The following records must be kept in respect of any samples required to be collected for the purposes of this licence:
a) the date(s) on which the sample was taken;
b) the time(s) at which the sample was collected;
c) the point at which the sample was taken; and
d) the name of the person who collected the sample.

## M2 Requirement to monitor concentration of pollutants discharged

M2.1 For each monitoring/discharge point or utilisation area specified below (by a point number), the licensee must monitor (by sampling and obtaining results by analysis) the concentration of each pollutant specified in Column 1. The licensee must use the sampling method, units of measure, and sample at the frequency, specified opposite in the other columns:

M2.2 Air Monitoring Requirements

**POINT 1**

| Pollutant | Units of measure | Frequency | Sampling Method |
|---|---|---|---|
| Carbon monoxide | parts per million | Yearly | OM-1 |
| Cyanide | milligrams per cubic metre | Yearly | Special Method 1 |
| Gaseous fluoride | milligrams per cubic metre | Continuous | In line instrumentation |
| Hydrogen chloride | milligrams per cubic metre | Yearly | TM-7 & TM-8 |
| Nitrogen Oxides | milligrams per cubic metre | Yearly | TM-11 |
| Solid Particles | milligrams per cubic metre | Yearly | TM-15 |
| Sulfuric acid mist and sulfur trioxide (as SO3) | milligrams per cubic metre | Yearly | TM-3 |
| Type 1 and Type 2 substances in aggregate | milligrams per cubic metre | Yearly | TM-12, TM-13 & TM-14 |

**POINT 2**

| Pollutant | Units of measure | Frequency | Sampling Method |
|---|---|---|---|
| Solid Particles | milligrams per cubic metre | Yearly | TM-15 |

**POINT 3**

| Pollutant | Units of measure | Frequency | Sampling Method |
|---|---|---|---|
| Solid Particles | milligrams per cubic metre | Yearly | TM-15 |

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**POINT 4**

| Pollutant | Units of measure | Frequency | Sampling Method |
|---|---|---|---|
| Solid Particles | milligrams per cubic metre | Yearly | TM-15 |

**POINT 13**

| Pollutant | Units of measure | Frequency | Sampling Method |
|---|---|---|---|
| Dioxins & Furans | nanograms per cubic metre | Every 6 months | TM-18 |
| Dry gas density | kilograms per cubic metre | Every 6 months | TM-23 |
| Fluorides | milligrams per cubic metre | Yearly | TM-10 |
| Hydrogen chloride | milligrams per cubic metre | Yearly | TM-7 & TM-8 |
| Moisture content | percent | Yearly | TM-22 |
| Nitrogen Oxides | milligrams per cubic metre | Yearly | TM-11 |
| Oxygen (O2) | percent | Every 6 months | TM-25 |
| Solid Particles | milligrams per cubic metre | Yearly | TM-15 |
| Sulfuric acid mist and sulfur trioxide (as SO3) | milligrams per cubic metre | Yearly | TM-3 |
| Temperature | degrees Celsius | Yearly | TM-2 |
| Type 1 and Type 2 substances in aggregate | milligrams per cubic metre | Yearly | TM-12, TM-13 & TM-14 |
| Velocity | metres per second | Every 6 months | TM-2 |
| Volatile organic compounds | milligrams per cubic metre | Yearly | OM-2 |
| Volumetric flowrate | normalised cubic metres per second | Every 6 months | TM-2 |

**POINT 14**

| Pollutant | Units of measure | Frequency | Sampling Method |
|---|---|---|---|
| Carbon monoxide | milligrams per cubic metre | Yearly | OM-1 |
| Dry gas density | kilograms per cubic metre | Yearly | TM-23 |
| Moisture content | percent | Yearly | TM-22 |
| Nitrogen Oxides | milligrams per cubic metre | Yearly | TM-11 |
| Oxygen (O2) | percent | Yearly | TM-25 |
| Solid Particles | milligrams per cubic metre | Yearly | TM-15 |
| Temperature | degrees Celsius | Yearly | TM-2 |
| Velocity | metres per second | Yearly | TM-2 |

| | | | |
|---|---|---|---|
| Volumetric flowrate | normalised cubic metres per second | Yearly | TM-2 |

**POINT 15**

| Pollutant | Units of measure | Frequency | Sampling Method |
|---|---|---|---|
| Solid Particles | milligrams per cubic metre | Yearly | TM-15 |

Note: Special Method 1 means USEPA OTM-29.

M2.3 Water and/ or Land Monitoring Requirements

**POINT 12**

| Pollutant | Units of measure | Frequency | Sampling Method |
|---|---|---|---|
| Aluminium | milligrams per litre | Yearly | Grab sample |
| Conductivity | microsiemens per centimetre | Yearly | Grab sample |
| Cyanide | milligrams per litre | Yearly | Grab sample |
| Fluoride | milligrams per litre | Yearly | Grab sample |
| pH | pH | Yearly | Grab sample |
| Total suspended solids | milligrams per litre | Yearly | Grab sample |

M2.4 For the purposes of the Fluoride monitoring required for Point 1 in-line instrumentation means a continuous gaseous fluoride monitor.

## M3 Testing methods - concentration limits

M3.1 Monitoring for the concentration of a pollutant emitted to the air required to be conducted by this licence must be done in accordance with:
a) any methodology which is required by or under the Act to be used for the testing of the concentration of the pollutant; or
b) if no such requirement is imposed by or under the Act, any methodology which a condition of this licence requires to be used for that testing; or
c) if no such requirement is imposed by or under the Act or by a condition of this licence, any methodology approved in writing by the EPA for the purposes of that testing prior to the testing taking place.

M3.2 Subject to any express provision to the contrary in this licence, monitoring for the concentration of a pollutant discharged to waters or applied to a utilisation area must be done in accordance with the Approved Methods Publication unless another method has been approved by the EPA in writing before

any tests are conducted.

Note: The *Protection of the Environment Operations (Clean Air) Regulation 2010* requires testing for certain purposes to be conducted in accordance with test methods contained in the publication "Approved Methods for the Sampling and Analysis of Air Pollutants in NSW".

## M4 Testing methods - load limits

Note: Division 3 of the *Protection of the Environment Operations (General) Regulation 2009* requires that monitoring of actual loads of assessable pollutants listed in L2.2 must be carried out in accordance with the relevant load calculation protocol set out for the fee-based activity classification listed in the Administrative Conditions of this licence.

## M5 Recording of pollution complaints

M5.1 The licensee must keep a legible record of all complaints made to the licensee or any employee or agent of the licensee in relation to pollution arising from any activity to which this licence applies.

M5.2 The record must include details of the following:
a) the date and time of the complaint;
b) the method by which the complaint was made;
c) any personal details of the complainant which were provided by the complainant or, if no such details were provided, a note to that effect;
d) the nature of the complaint;
e) the action taken by the licensee in relation to the complaint, including any follow-up contact with the complainant; and
f) if no action was taken by the licensee, the reasons why no action was taken.

M5.3 The record of a complaint must be kept for at least 4 years after the complaint was made.

M5.4 The record must be produced to any authorised officer of the EPA who asks to see them.

## M6 Telephone complaints line

M6.1 The licensee must operate during its operating hours a telephone complaints line for the purpose of receiving any complaints from members of the public in relation to activities conducted at the premises or by the vehicle or mobile plant, unless otherwise specified in the licence.

M6.2 The licensee must notify the public of the complaints line telephone number and the fact that it is a complaints line so that the impacted community knows how to make a complaint.

M6.3 The preceding two conditions do not apply until 3 months after: the date of the issue of this licence.

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## 6 Reporting Conditions

### R1 Annual return documents

R1.1 The licensee must complete and supply to the EPA an Annual Return in the approved form comprising:
1. a Statement of Compliance,
2. a Monitoring and Complaints Summary,
3. a Statement of Compliance - Licence Conditions,
4. a Statement of Compliance - Load based Fee,
5. a Statement of Compliance - Requirement to Prepare Pollution Incident Response Management Plan,
6. a Statement of Compliance - Requirement to Publish Pollution Monitoring Data; and
7. a Statement of Compliance - Environmental Management Systems and Practices.

At the end of each reporting period, the EPA will provide to the licensee a copy of the form that must be completed and returned to the EPA.

R1.2 An Annual Return must be prepared in respect of each reporting period, except as provided below.

R1.3 Where this licence is transferred from the licensee to a new licensee:
a) the transferring licensee must prepare an Annual Return for the period commencing on the first day of the reporting period and ending on the date the application for the transfer of the licence to the new licensee is granted; and
b) the new licensee must prepare an Annual Return for the period commencing on the date the application for the transfer of the licence is granted and ending on the last day of the reporting period.

R1.4 Where this licence is surrendered by the licensee or revoked by the EPA or Minister, the licensee must prepare an Annual Return in respect of the period commencing on the first day of the reporting period and ending on:
a) in relation to the surrender of a licence - the date when notice in writing of approval of the surrender is given; or
b) in relation to the revocation of the licence - the date from which notice revoking the licence operates.

R1.5 The Annual Return for the reporting period must be supplied to the EPA via eConnect *EPA* or by registered post not later than 60 days after the end of each reporting period or in the case of a transferring licence not later than 60 days after the date the transfer was granted (the 'due date').

R1.6 Where the licensee is unable to complete a part of the Annual Return by the due date because the licensee was unable to calculate the actual load of a pollutant due to circumstances beyond the licensee's control, the licensee must notify the EPA in writing as soon as practicable, and in any event not later than the due date. The notification must specify:
a) the assessable pollutants for which the actual load could not be calculated; and
b) the relevant circumstances that were beyond the control of the licensee.

R1.7 The licensee must retain a copy of the Annual Return supplied to the EPA for a period of at least 4 years after the Annual Return was due to be supplied to the EPA.

R1.8 Within the Annual Return, the Statements of Compliance must be certified and the Monitoring and Complaints Summary must be signed by:
a) the licence holder; or
b) by a person approved in writing by the EPA to sign on behalf of the licence holder.

Note: The term "reporting period" is defined in the dictionary at the end of this licence. Do not complete the Annual Return until after the end of the reporting period.

Note: An application to transfer a licence must be made in the approved form for this purpose.

## R2 Notification of environmental harm

R2.1 Notifications must be made by telephoning the Environment Line service on 131 555.

R2.2 The licensee must provide written details of the notification to the EPA within 7 days of the date on which the incident occurred.

Note: The licensee or its employees must notify all relevant authorities of incidents causing or threatening material harm to the environment immediately after the person becomes aware of the incident in accordance with the requirements of Part 5.7 of the Act.

## R3 Written report

R3.1 Where an authorised officer of the EPA suspects on reasonable grounds that:
a) where this licence applies to premises, an event has occurred at the premises; or
b) where this licence applies to vehicles or mobile plant, an event has occurred in connection with the carrying out of the activities authorised by this licence,
and the event has caused, is causing or is likely to cause material harm to the environment (whether the harm occurs on or off premises to which the licence applies), the authorised officer may request a written report of the event.

R3.2 The licensee must make all reasonable inquiries in relation to the event and supply the report to the EPA within such time as may be specified in the request.

R3.3 The request may require a report which includes any or all of the following information:
a) the cause, time and duration of the event;
b) the type, volume and concentration of every pollutant discharged as a result of the event;
c) the name, address and business hours telephone number of employees or agents of the licensee, or a specified class of them, who witnessed the event;
d) the name, address and business hours telephone number of every other person (of whom the licensee is aware) who witnessed the event, unless the licensee has been unable to obtain that information after making reasonable effort;
e) action taken by the licensee in relation to the event, including any follow-up contact with any complainants;
f) details of any measure taken or proposed to be taken to prevent or mitigate against a recurrence of such an event; and
g) any other relevant matters.

R3.4 The EPA may make a written request for further details in relation to any of the above matters if it is not satisfied with the report provided by the licensee. The licensee must provide such further details to the EPA within the time specified in the request.

R3.5 A noise compliance assessment report mustl be prepared every three years and submitted to the EPA with the Annual Return. The report must be prepared by an accredited acoustical consultant and must provide an assessment of compliance with Condition L5.2.

# 7 General Conditions

## G1 Copy of licence kept at the premises or plant

G1.1 A copy of this licence must be kept at the premises to which the licence applies.

G1.2 The licence must be produced to any authorised officer of the EPA who asks to see it.

G1.3 The licence must be available for inspection by any employee or agent of the licensee working at the premises.

# 8 Special Conditions

## E1 Compliance audit

E1.1 The licensee must conduct an independent compliance audit no less than once every three (3) years to assess and report on compliance with the conditions of this licence, including the adequacy of the documentation required by this licence. A report containing the audit findings must be submitted with the Annual Return.

## E2 Trial destruction of illicit drugs and pharmaceutical waste

E2.1 The licensee is to;
a) Undertake a trial of the destruction of illicit drugs and pharmaceutical waste at the premises for a period of not more than 24 consecutive months (the trial period).
b) Ensure during the trial period that:
i) No more than 200 tonnes of illicit drug waste is received or processed on site; and
ii) No more than 1,000 tonnes of pharmaceutical waste is received, stored or processed at the premises.

E2.2 The licensee must ensure that all pharmaceutical waste is stored in an enclosed (appropriately bunded and covered) area to prevent the contamination of stormwater.

E2.3 The licensee must notify the EPA's Regional Manager Hunter, in writing, at least two weeks prior to the commencement of, and within two weeks of the conclusion of, the trial destruction of illicit drugs and pharmaceutical wastes at the premises.

E2.4 During the trial period and while the destruction of illicit drugs and/or pharmaceuticals is occurring, the licensee must:
a) Carry out the monitoring and recording of air emissions for the following pollutants and stack emission conditions in addition to the monitoring requirements of any other licence condition:
Velocity, Temperature, Dry gas density, Moisture content, Solid particles, Hydrogen chloride, Metals, Dioxins and Furans, Polycyclic Aromatic Hydrocarbons, Carbon dioxide, Carbon monoxide, Oxides of Nitrogen, Oxides of Sulphur, Volatile Organic Compounds and Fluoride.
b) Monitor fluoride and solid particle emissions via real time continuous monitoring and should any exceedance of the licence limits occur, cease waste processing immediately, and notify the EPA of the exceedance (via the Environment Line on 131555 and by email to hunter.region@epa.nsw.gov.au.
c) Undertake air quality monitoring on a quarterly basis and whenever pharmaceutical and/or illicit drug wastes are being processed.
d) Cease processing any pharmaceutical and/or illicit drug wastes and notify the EPA (via the Environment Line on 131555 and by email to hunter.region@epa.nsw.gov.au) if emission test results indicate that pollutant concentrations are greater than any limits set in this licence or the Protection of the Environment Operations (Clean Air) Regulation 2010.
f) Monitoring and record all processing conditions during the operation of the trial including:
i) The names, contact details and qualifications and experience of the person(s) conducting and supervising the trial;
ii) The source of the pharmaceutical and drug wastes, a description of the wastes and the amount and date received of each load of waste accepted for disposal as part of the trial;
iii) All process conditions for the trial including the quantity of pharmaceutical and/or illicit drug waste in each batch processed, any other materials/additives processed in each batch, the temperature profile of the furnace during each batch processed and the residence time of the material within the furnace.
g) During the processing of pharmaceutical and/or illicit drug wastes the licence limits and conditions at Monitoring Point 1 for Dioxins and Furans is the same as Monitoring Point 13, that is, 0.1 Nanograms per cubic metre (Note 2) Reference Conditions Dry, 273K, 1013kPa.

E2.5 The licensee must prepare a report which provides the results of all monitoring conducted during the trial and the outcomes of the trial to the satisfaction of the EPA's Regional Manager Hunter. The report must:
a) Be submitted to the EPA's Regional Manager Hunter within 90 days of the completion of the trial;
b) Detail the results of all monitoring conducted during the trial;
c) Compare the monitoring results obtained during the trial to the limits in the licence and in the EPA's air quality impact assessment criteria specified in the "Approved Methods for the Modelling and Assessment of Air Pollutants in NSW (DEC2005)"
d) Describe any anomalies in the monitoring data, and any exceedances of the licence limits or assessment criteria;
e) Characterise the trial outputs and describe how these products are to be managed and reused, recycled and/or disposed of;
f) Describe the findings of the trial;
g) Recommend any actions that could be taken to minimise pollutant emissions from the processing of pharmaceutical and illicit drug wastes; and
h) Discuss the possible options for future processing of pharmaceutical and illicit drug wastes at the premises.

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## Dictionary

### General Dictionary

| | |
|---|---|
| **3DGM [in relation to a concentration limit]** | Means the three day geometric mean, which is calculated by multiplying the results of the analysis of three samples collected on consecutive days and then taking the cubed root of that amount. Where one or more of the samples is zero or below the detection limit for the analysis, then 1 or the detection limit respectively should be used in place of those samples |
| **Act** | Means the Protection of the Environment Operations Act 1997 |
| **activity** | Means a scheduled or non-scheduled activity within the meaning of the Protection of the Environment Operations Act 1997 |
| **actual load** | Has the same meaning as in the Protection of the Environment Operations (General) Regulation 2009 |
| **AM** | Together with a number, means an ambient air monitoring method of that number prescribed by the *Approved Methods for the Sampling and Analysis of Air Pollutants in New South Wales*. |
| **AMG** | Australian Map Grid |
| **anniversary date** | The anniversary date is the anniversary each year of the date of issue of the licence. In the case of a licence continued in force by the Protection of the Environment Operations Act 1997, the date of issue of the licence is the first anniversary of the date of issue or last renewal of the licence following the commencement of the Act. |
| **annual return** | Is defined in R1.1 |
| **Approved Methods Publication** | Has the same meaning as in the Protection of the Environment Operations (General) Regulation 2009 |
| **assessable pollutants** | Has the same meaning as in the Protection of the Environment Operations (General) Regulation 2009 |
| **BOD** | Means biochemical oxygen demand |
| **CEM** | Together with a number, means a continuous emission monitoring method of that number prescribed by the *Approved Methods for the Sampling and Analysis of Air Pollutants in New South Wales*. |
| **COD** | Means chemical oxygen demand |
| **composite sample** | Unless otherwise specifically approved in writing by the EPA, a sample consisting of 24 individual samples collected at hourly intervals and each having an equivalent volume. |
| **cond.** | Means conductivity |
| **environment** | Has the same meaning as in the Protection of the Environment Operations Act 1997 |
| **environment protection legislation** | Has the same meaning as in the Protection of the Environment Administration Act 1991 |
| **EPA** | Means Environment Protection Authority of New South Wales. |
| **fee-based activity classification** | Means the numbered short descriptions in Schedule 1 of the Protection of the Environment Operations (General) Regulation 2009. |
| **general solid waste (non-putrescible)** | Has the same meaning as in Part 3 of Schedule 1 of the Protection of the Environment Operations Act 1997 |

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| | |
|---|---|
| **flow weighted composite sample** | Means a sample whose composites are sized in proportion to the flow at each composites time of collection. |
| **general solid waste (putrescible)** | Has the same meaning as in Part 3 of Schedule 1 of the Protection of the Environmen t Operations Act 1997 |
| **grab sample** | Means a single sample taken at a point at a single time |
| **hazardous waste** | Has the same meaning as in Part 3 of Schedule 1 of the Protection of the Environment Operations Act 1997 |
| **licensee** | Means the licence holder described at the front of this licence |
| **load calculation protocol** | Has the same meaning as in the Protection of the Environment Operations (General) Regulation 2009 |
| **local authority** | Has the same meaning as in the Protection of the Environment Operations Act 1997 |
| **material harm** | Has the same meaning as in section 147 Protection of the Environment Operations Act 1997 |
| **MBAS** | Means methylene blue active substances |
| **Minister** | Means the Minister administering the Protection of the Environment Operations Act 1997 |
| **mobile plant** | Has the same meaning as in Part 3 of Schedule 1 of the Protection of the Environment Operations Act 1997 |
| **motor vehicle** | Has the same meaning as in the Protection of the Environment Operations Act 1997 |
| **O&G** | Means oil and grease |
| **percentile [in relation to a concentration limit of a sample]** | Means that percentage [eg.50%] of the number of samples taken that must meet the concentration limit specified in the licence for that pollutant over a specified period of time. In this licence, the specified period of time is the Reporting Period unless otherwise stated in this licence. |
| **plant** | Includes all plant within the meaning of the Protection of the Environment Operations Act 1997 as well as motor vehicles. |
| **pollution of waters [or water pollution]** | Has the same meaning as in the Protection of the Environment Operations Act 1997 |
| **premises** | Means the premises described in condition A2.1 |
| **public authority** | Has the same meaning as in the Protection of the Environment Operations Act 1997 |
| **regional office** | Means the relevant EPA office referred to in the Contacting the EPA document accompanying this licence |
| **reporting period** | For the purposes of this licence, the reporting period means the period of 12 months after the issue of the licence, and each subsequent period of 12 mo nths. In the case of a licence continued in force by the Protection of the Environment Operations Act 1997, the date of issue of the licence is the first anniversary of the date of issue or last renewal of the licence following the commencement of the Act. |
| **restricted solid waste** | Has the same meaning as in Part 3 of Schedule 1 of the Protection of the Environment Operations Act 1997 |
| **scheduled activity** | Means an activity listed in Schedule 1 of the Protection of the Environment Operations Act 1997 |
| **special waste** | Has the same meaning as in Part 3 of Schedule 1 of the Protection of the Environment Operations Act 1997 |
| **TM** | Together with a number, means a test method of that number prescribed by the *Approved Methods for the Sampling and Analysis of Air Pollutants in New South Wales*. |

# Environment Protection Licence

Licence - 6423

| | |
|---|---|
| **TSP** | Means total suspended particles |
| **TSS** | Means total suspended solids |
| **Type 1 substance** | Means the elements antimony, arsenic, cadmium, lead or mercury or any compound containing one or more of those elements |
| **Type 2 substance** | Means the elements beryllium, chromium, cobalt, manganese, nickel, selenium, tin or vanadium or any compound containing one or more of those elements |
| **utilisation area** | Means any area shown as a utilisation area on a map submitted with the application for this licence |
| **waste** | Has the same meaning as in the Protection of the Environment Operations Act 1997 |
| **waste type** | Means liquid, restricted solid waste, general solid waste (putrescible), general solid waste (non - putrescible), special waste or hazardous waste |

Mr Bernie Weir

Environment Protection Authority

(By Delegation)

Date of this edition: 26-April-2000

# Environment Protection Licence

Licence - 6423

## End Notes

| | |
|---|---|
| 1 | Licence varied by notice 1013185, issued on 28-Nov-2001, which came into effect on 23-Dec-2001. |
| 2 | Licence varied by notice 1014219, issued on 15-Apr-2002, which came into effect on 10-May-2002. |
| 3 | Licence varied by notice 1017402, issued on 30-Aug-2002, which came into effect on 24-Sep-2002. |
| 4 | Licence varied by notice 1026798, issued on 14-Aug-2003, which came into effect on 08-Sep-2003. |
| 5 | Licence varied by notice 1036624, issued on 02-Sep-2004, which came into effect on 27-Sep-2004. |
| 6 | Licence varied by notice 1051350, issued on 21-Feb-2006, which came into effect on 18-Mar-2006. |
| 7 | Licence varied by notice 1059849, issued on 14-Sep-2006, which came into effect on 14-Sep-2006. |
| 8 | Licence varied by notice 1068022, issued on 03-May-2007, which came into effect on 03-May-2007. |
| 9 | Licence varied by notice 1075595, issued on 04-Sep-2007, which came into effect on 04-Sep-2007. |
| 10 | Licence varied by notice 1079692, issued on 01-Nov-2007, which came into effect on 01-Nov-2007. |
| 11 | Licence varied by notice 1082016, issued on 18-Jan-2008, which came into effect on 18-Jan-2008. |
| 12 | Licence varied by notice 1084007, issued on 27-Mar-2008, which came into effect on 27-Mar-2008. |
| 13 | Licence varied by notice 1087174, issued on 14-May-2008, which came into effect on 14-May-2008. |
| 14 | Condition A1.3 Not applicable varied by notice issued on <issue date> which came into effect on <effective date> |
| 15 | Licence varied by notice 1093631, issued on 03-Dec-2008, which came into effect on 03-Dec-2008. |
| 16 | Licence varied by notice 1096523, issued on 01-May-2009, which came into effect on 01-May-2009. |
| 17 | Licence varied by notice 1106654, issued on 25-Sep-2009, which came into effect on 25-Sep-2009. |

# Environment Protection Licence

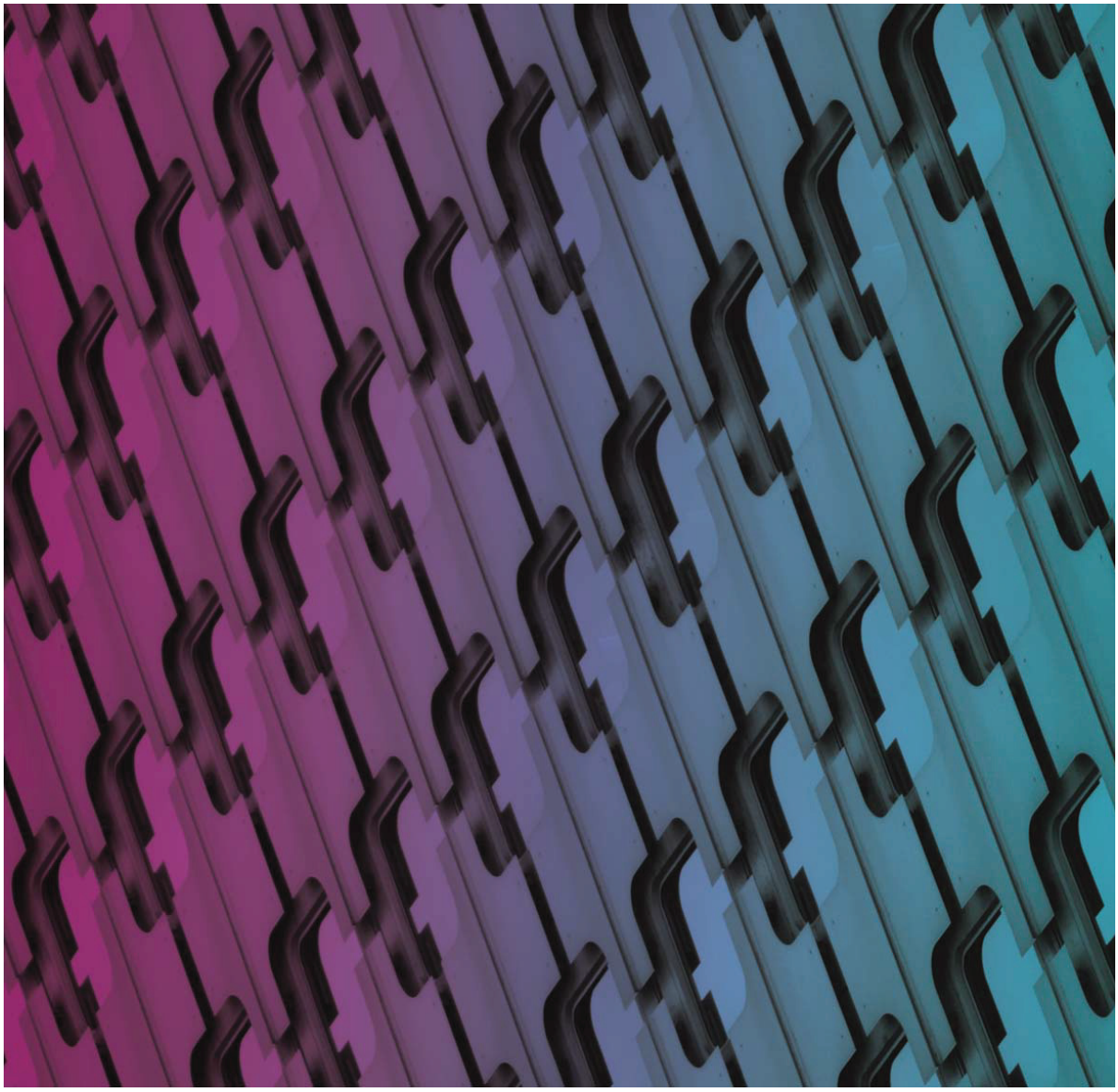
Licence - 6423

| | |
|---|---|
| 18 | Licence varied by notice 1108647, issued on 13-Nov-2009, which came into effect on 13-Nov-2009. |
| 19 | Licence varied by notice 1111022, issued on 01-Feb-2010, which came into effect on 01-Feb-2010. |
| 20 | Licence varied by notice 1111304, issued on 23-Jul-2010, which came into effect on 23-Jul-2010. |
| 21 | Licence varied by notice 1118230, issued on 10-Aug-2010, which came into effect on 10-Aug-2010. |
| 22 | Licence varied by notice 1501309 issued on 29-Aug-2011 |
| 23 | Licence varied by notice 1502941 issued on 13-Dec-2011 |
| 24 | Licence varied by notice 1507415 issued on 27-Jul-2012 |
| 25 | Licence varied by notice 1508430 issued on 25-Sep-2012 |
| 26 | Licence varied by notice 1510441 issued on 02-Jan-2013 |
| 27 | Licence varied by notice 1512256 issued on 15-Mar-2013 |
| 28 | Licence varied by notice 1519974 issued on 10-Jul-2014 |
| 29 | Licence varied by notice 1531395 issued on 15-Jul-2015 |
| 30 | Licence varied by notice 1534264 issued on 01-Oct-2015 |
| 31 | Licence varied by notice 1535147 issued on 29-Oct-2015 |
| 32 | Licence varied by notice 1552663 issued on 28-Jun-2017 |

# ATTACHMENT 3

# Stack 1 Emissions Testing Report December 2015

Weston Aluminium



# Stack 1 Emissions Testing Report December 2015

Weston Aluminium

Client: Weston Aluminium

ABN: 91 075 245 108

Prepared by

**AECOM Australia Pty Ltd**
17 Warabrook Boulevard, Warabrook NSW 2304, PO Box 73, Hunter Region MC NSW 2310, Australia
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ABN 20 093 846 925

25-Jan-2016

Job No.: 60341673

AECOM in Australia and New Zealand is certified to the latest version of ISO9001, ISO14001, AS/NZS4801 and OHSAS18001.

# Quality Information

Document Stack 1 Emissions Testing Report December 2015

Ref 60341673

Date 25-Jan-2016

Prepared by James Lang

Reviewed by Chad Whitburn Approved Signatory 

Revision History

| Revision | Revision Date | Details | Authorised | |
|---|---|---|---|---|
| | | | Name/Position | Signature |
| 0 | 25 Jan 16 | Final Report | Chad Whitburn<br>Associate Director - Air Quality |  |

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# Table of Contents



**List of Tables**

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# 1.0 Introduction

AECOM was appointed by Weston Aluminium Pty Ltd to conduct a series of measurements to determine air emissions from Stack 1 located at their Weston plant in Kurri Kurri, NSW while processing Pharmaceutical waste. Emission testing was a compliance requirement of Environmental Protection Licence (EPL) number 6423.

Testing was conducted on 16 December 2015 to determine emission concentrations for the following parameters:

**Stack 1 (EPL Point 1)**

- Total Particulate;
- Fine Particulate ($PM_{10}$);
- Sulfuric Acid Mist ($H_2SO_4$ as $SO_3$);
- Sulfur Dioxide ($SO_2$ as $SO_3$);
- Chlorine;
- Hydrogen Chloride;
- Gaseous Fluoride;
- Particulate Fluoride;
- Hazardous Substances (Metals);
- Volatile Organic Compounds (VOC);
- Oxides of Nitrogen;
- Carbon Monoxide;
- Carbon Dioxide;
- Oxygen;
- Cyanide;
- Polycyclic Aromatic Hydrocarbon (PAH); and
- Dioxins and Furans.

Laboratory analysis was conducted by the following laboratories, which hold NATA accreditation for the specified tests:

- Steel River Testing Pty. Ltd., NATA accreditation number 18079, performed the following analysis detailed in report number 10284-0-M, 10284-0-P:
    - Moisture;
    - Fine Particulate ($PM_{10}$); and
    - Total Particulate.
- Australian Laboratory Services, NATA accreditation number 18079, performed the following analysis detailed in report number EN1514408:
    - Fluoride;
    - Cyanide;
    - Sulfuric Acid Mist;
    - Sulfur Dioxide;
    - Hydrogen Chloride;
    - Chlorine; and
    - Volatile Organic Compounds.

- National Measurements Institute, NATA accreditation number 198, performed the following analysis detailed in report number ORG15_156 and DAU16-004:
    - Polycyclic Aromatic Hydrocarbons; and
    - Dioxins and Furans.
- SGS Leeder Consulting, NATA accreditation number 14429, performed the following analysis detailed in report number M152864:
    - Hazardous Substances (Metals).

# 2.0 Sampling Plane Requirements

The criteria for sampling planes are specified in AS 4323.1-1995 (R2014).

**Table 1 Criteria for Selection of Sampling Planes (AS 4323. 1)**

| Type of flow disturbance | Minimum distance upstream from disturbance, diameters (D) | Minimum distance downstream from disturbance, diameters (D) |
|---|---|---|
| Bend, connection, junction, direction change | >2D | >6D |
| Louvre, butterfly damper (partially closed or closed) | >3D | >6D |
| Axial fan | >3D | >8D (see Note) |
| Centrifugal fan | >3D | >6D |

*NOTE: The plane should be selected as far as practicable from a fan. Flow straighteners may be required to ensure the position chosen meets the check criteria listed in Items (a) to (f) below.*

*a. The gas flow is basically in the same direction at all points along each sampling traverse.*

*b. The gas velocity at all sampling points is greater than 3 m/s.*

*c. The gas flow profile at the sampling plane shall be steady, evenly distributed and not have a cyclonic component which exceeds an angle of 15$^{o}$ to the duct axis, when measured near the periphery of a circular sampling plane.*

*d. The temperature difference between adjacent points of the survey along each sampling traverse is less than 10% of the absolute temperature, and the temperature at any point differs by less than 10% from the mean.*

*e. The ratio of the highest to lowest pitot pressure difference shall not exceed 9:1 and the ratio of highest to lowest gas velocities shall not exceed 3:1. For isokinetic testing with the use of impingers, the gas velocity ratio across the sampling plane should not exceed 1.6:1.*

*f. The gas temperature at the sampling plane should preferably be above the dewpoint.*

Stack 1 (EPA Identification No. 1) did not satisfy the requirements of AS 4323.1 Section 4.1 with regard to the upstream and downstream distances from disturbances. To compensate for this, additional sampling points were added in accordance with AS 4323.1 Section 4.2.

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# 3.0 Methodology

## 3.1 NATA Accredited Methods

The following methods are accredited with the National Association of Testing Authorities (NATA), Accreditation No. 2778 (14391), and are approved for the sampling and analysis of gases and aerosols. Specific details of the methods are available on request.

All sampling and analysis is conducted according to the methods in **Table 2**.

**Table 2 AECOM NATA Endorsed Methods**

| NSW EPA Approved Methods | USEPA Methods | Parameter measured |
|---|---|---|
| NSW EPA TM-1 (AS 4323.1-1995) | USEPA (2000) Method 1 under approved circumstances | Selection of sampling positions |
| NSW EPA TM-2 | USEPA (2000) Method 2 or 2C or USEPA (1999) Method 2F or 2G or 2H (as appropriate) | Velocity or volumetric flow rate or temperature or pressure of stack gases |
| NSW EPA TM-3 | USEPA (2000) Method 8 (for sampling and analysis) or APHA (1998) Method 4110B (for analysis only if interference from fluorides, free ammonia and/or dimethyl aniline has been demonstrated to the satisfaction of the Chief Scientist) (as appropriate) | Sulfuric acid mist ($H_2SO_4$) or sulphur trioxide ($SO_3$) |
| NSW EPA TM-4 | USEPA (2000) Method 6 or 6A or 6B or USEPA (1996) Method 6C or ISO (1989) Method 7934 or ISO (1992) Method 7935 or ISO (1993) Method 10396 or ISO (1998) Method 11632 (as appropriate) | Sulfur dioxide ($SO_2$) |
| NSW EPA TM-7 | USEPA (2000) 26A | Chlorine ($Cl_2$) |
| NSW EPA TM-8 | USEPA (2000) 26A | Hydrogen chloride (HCl) |
| NSW EPA TM-9 | USEPA (2000) Method 13A or 13B (as appropriate) | Fluorine ($F_2$) or any compound containing fluorine, except where emitted by a primary aluminium smelter while manufacturing aluminium from alumina |
| NSW EPA TM-12 | USEPA (2000) Method 29 or USEPA (2000) Method 102 (for mercury only in hydrogen rich streams) (as appropriate) | Type 1 substances (elements antimony (Sb), arsenic (As), cadmium (Cd), lead (Pb) or mercury (Hg) or any compound containing one or more of those elements) |
| NSW EPA TM-13 | USEPA (2000) Method 29 (Analysis for tin and vanadium to be done by Inductively Coupled Argon Plasma Emission Spectroscopy (ICAP) as defined in USEPA Method 29) or USEPA (1986) Method 7910 (for vanadium only) or USEPA (1986) Method 7911 (for vanadium only) (as appropriate) | Type 2 substances (elements beryllium (Be), chromium (Cr), cobalt (Co), manganese (Mn), nickel (Ni), selenium (Se), tin (Sn) or vanadium (V) or any compound containing one or more of those elements) |
| NSW EPA TM-14 | Cadmium (Cd) or mercury (Hg) or any compound containing one or more of those elements | USEPA (2000) Method 29 or USEPA (2000) Method 102 (for mercury only in hydrogen rich streams) (as appropriate) |
| NSW EPA TM-15 (AS 4323.2-1995) | USEPA (2000) Method 5 under approved circumstances | Solid particles (Total) |

| NSW EPA Approved Methods | USEPA Methods | Parameter measured |
|---|---|---|
| NSW EPA TM-22 | USEPA (2000) Method 4 | Moisture content in stack gases |
| NSW EPA TM-23 | USEPA (2000) Method 3 | Dry gas density or molecular weight of stack gases |
| NSW EPA TM-34 | USEPA (2000) Method 18 or USEPA (2000) Method 25 or 25A or 25B or 25C or 25D or 25E (as appropriate) | Volatile organic compounds |
| NSW EPA OM-5 | USEPA (1997) Method 201 or 201A (as appropriate) | 'Fine' particulates ($PM_{10}$) |
| NSW EPA OM-6 | California EPA Air Resources Board (1997) Method 429 | Polycyclic aromatic hydrocarbons (PAHs) |
| NSW EPA TM-32 | USEPA Method 10 | Determination of Carbon Monoxide emissions from stationary sources |
| NSW EPA TM-25 | USEPA (1990) Method 3A | Determination of Oxygen concentrations from stationary sources |
| NSW EPA TM-24 | USEPA (1990) Method 3A | Carbon dioxide ($CO_2$) in stack gases |
| NSW EPA TM-11 | USEPA(2000) Method 7C | Determination of Nitrogen dioxide or nitric oxide emissions from stationary sources |
| NSW EPA TM-18 | USEPA (1995) Method 23 | Dioxins and Furans |

## 3.2 Deviations from NATA Accredited Methods

The following method is not accredited with the National Association of Testing Authorities (NATA), Accreditation No. 2778 (14391). Specific details of the method is available on request.

All sampling and analysis is conducted according to the method in **Table 3**.

**Table 3 NATA Method Deviations**

| USEPA Methods | Parameter measured |
|---|---|
| USEPA (2011) Other Test Method 29 | Sampling and analysis for Hydrogen Cyanide emissions from stationary sources |

# 4.0 Sampling Location

## 4.1 Sampling Location Summary

**Table 4** provides a summary of the location sampled by AECOM on 16 December 2015 at the Weston Aluminium plant in Kurri Kurri, NSW.

**Table 4 Sampling Location Summary**

| Discharge Description | Stack 1 (EPA Identification No. 1) |
|---|---|
| Duct Shape | Circular |
| Construction Material | Metal |
| Duct Diameter (mm) | 1650 |
| Minimum No. Sampling Points | 16 |
| Sampling Ports | 2 |
| Min. Points/Traverse | 8 |
| Disturbance | Yes |
| Distance from Upstream Disturbance | 2D |
| Type of Disturbance | Fan entry |
| Distance from Downstream Disturbance | 4D |
| Type of Disturbance | Stack Exit |
| Ideal Sampling Location | No |
| Correction Factors Applied | Yes |
| Total No. Points Sampled | 20 |
| Points/Traverse | 10 |
| Sampling Performed to Standard* | Yes[2] |

*AS 4323.1 Stationary source emissions Method 1 – Selection of sampling positions

[1] AS 4323.1 Section 4.1

[2] AS 4323.1 Section 4.2

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# 5.0 Equipment Calibration

AECOM has a calibration schedule to ensure the emission testing equipment is maintained in good order and with known calibration. Equipment used in this project was calibrated according to the procedures and frequency identified in the AECOM calibration schedule. Details of the schedule and the calibration calculations are available on request.

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# 6.0 Results

A summary of test results for December 2015 testing is presented in **Table 5**. Calculated Fine Particulate ($PM_{10}$) cut size is displayed in **Table 6**. Gas Data Concentrations and Mass Emission Rate summaries are reported in **Tables 7 & 8** respectively. Detailed results along with gas stream properties during the testing periods can be found in **Tables 9** to **12**. Speciated Volatile Organic Carbons and Dioxins and Furan results can be found in **Tables 13 &14,** Hazardous Substances (Metals) results in **Table 15**, and Polycyclic Aromatic Hydrocarbons results in **Table 16**.

All emission concentrations are converted to standard conditions of 0°C, dry gas and 1 atm pressure for comparison with regulatory limits outlined in the Weston Aluminium Environmental Protection Licence 6423.

Field notes recorded during the project are attached as **Appendix A**. with Laboratory Analysis Reports attached as **Appendix B**, and Raw & Calculated Gas Data as **Appendix C**.

**Table 5 Stack Emissions Results Summary 16 December 2015**

| Parameter | Stack 1<br>EPL Point 1 |
|---|---|
| Carbon Monoxide (CO) (ppm) | 38 *(100)* |
| Chlorine ($mg/m^3$) | <5.3 |
| Cyanide | 0.22 *(0.5)* |
| Fine Particulate ($PM_{10}$) ($mg/m^3$) | 0.24 |
| Gaseous Fluoride ($mg/m^3$) | 0.14 *(2)* |
| Hydrogen Chloride ($mg/m^3$) | <5.3 *(400)* |
| Oxides of Nitrogen (as Equivalent $NO_2$) ($mg/m^3$) | 6 *(2500)* |
| Oxygen (%) | 20.8 |
| Carbon Dioxide (%) | <0.1 |
| Particulate Fluoride ($mg/m^3$) | 0.37 |
| Sulfur Dioxide ($SO_2$ as $SO_3$) ($mg/m^3$) | <9.3 |
| Sulfuric Acid Mist ($H_2SO_4$ as $SO_3$) ($mg/m^3$) | <1.9 *(100)* |
| Total Particulate ($mg/m^3$) | 3.2 *(25)* |
| Total Polycyclic Aromatic Hydrocarbons ($mg/m^3$) | 0.29 |
| Dioxins and Furans | 0.0012 |
| Type 1 and 2 Substances in Aggregate (Metals) ($mg/m^3$) | 0.013 *(10)* |
| Volatile Organic Compounds (VOC) ($mg/m^3$) | 0.11 |

Note – EPL Limits are in parenthesis

USEPA method 201A, section 6.3.5 (Determination of $PM_{10}$ Emissions) and USEPA Conditional Test Method 040, Section 17, Table 2 (Determination of $PM_{2.5}$ Emissions) specifies that results are acceptable provided the calculated aerodynamic cut size ($D_{50}$) for the test lies between 9.0μm and 11.0μm. Post sampling cut size calculations performed for the sampling conducted are displayed in **Table 6**.

Cut size, or $D_{50}$, refers to the aerodynamic diameter of the particles contained in the gas stream which can be captured with a 50% efficiency and is a calculated value. For a Fine Particulate ($PM_{10}$) test particle sizes of 10μm and less are expected.

The cut size ($D_{50}$) is calculated prior to testing and is based on the pre-test measurements such as stack gas velocity, stack gas temperature, moisture content of the gas stream and stack gas density. This pre-test calculation of cut size ($D_{50}$) is used in conjunction with the pre-test measurements, some of which are stated above, to establish the sampling conditions or parameters.

**Table 6 Calculated $PM_{10}$ Cut Sizes**

| Sampling Location | $PM_{10}$ Cut Size ($D_{50}$) |
|---|---|
| Stack 1 | 9.9 |

The calculated cut sizes meet the criteria for cut size conditions stated above.

**Table 7 Calculated Gas Concentrations Data Summary, 16 December 2015**

| Parameter | Stack 1 |
|---|---|
| Time Period | 7:32-8:32 |
| Nitrogen Oxide (NO) ($mg/m^3$) | 3 |
| Nitrogen Dioxide ($NO_2$) ($mg/m^3$) | 1 |
| Nitrogen Oxides ($NO_x$) ($mg/m^3$) | 4 |
| Oxides of Nitrogen as Equivalent $NO_2$ ($mg/m^3$) | 6 *(2500)* |
| Carbon Monoxide (ppm) | 38 *(100)* |
| Carbon Monoxide ($mg/m^3$) | 48 |
| Carbon Dioxide (%) | <0.1 |
| Oxygen (%) | 20.8 |

Note – EPL Limits are provided in parenthesis.

**Table 8 Gas Mass Emission Rates Summary, 16 December 2015**

| Parameter | Stack 1 |
|---|---|
| Time Period | 7:32-8:32 |
| Stack Gas Flow Rate (0°C, dry gas, 1 atm pressure) | 24 |
| Nitrogen Oxide (NO) (mg/s) | 72 |
| Nitrogen Dioxide ($NO_2$) (mg/s) | 24 |
| Nitrogen Oxides ($NO_x$) (mg/s) | 96 |
| Oxides of Nitrogen as Equivalent $NO_2$ (mg/s) | 144 |
| Carbon Monoxide (mg/s) | 1,152 |

**Table 9 Stack 1 Fine Particulate (PM10), Total Particulate, and Cyanide Results, 16 December 2015**

| | | | | |
|---|---|---|---|---|
| **Sampling Conditions:** | | | | |
| Stack internal diameter at test location | 1650 | mm | | |
| Stack gas temperature (average) | 74.9 | $^{o}$C | 348.1 | K |
| Stack pressure (average) | 1013 | hPa | | |
| Stack gas velocity (average, stack conditions) | 15 | m/s | | |
| Stack gas flowrate (stack conditions) | 31 | $m^3/s$ | | |
| Stack gas flowrate ($0^0$C, dry gas, 1 atm pressure) | 24 | $m^3/s$ | | |
| **Fine Particulate (PM10) Testing** | | | | |
| Test Period | 8:15 | - | 10:00 | |
| Fine Particulate (PM10) Mass | 0.3 | mg | | |
| Gas Volume Sampled | 1.25 | $m^3$ | | |
| Fine Particulate (PM10) Emission*1 | 0.24 | $mg/m^3$ | | |
| Fine Particulate (PM10) Mass Emission Rate*2 | 5.7 | mg/s | | |
| Regulatory Limit | NA | $mg/m^3$ | | |
| **Total Particulate Testing** | | | | |
| Test Period | 8:15 | - | 10:00 | |
| Total Particulate Mass | 3.0 | mg | | |
| Gas Volume Sampled | 0.948 | $m^3$ | | |
| Total Particulate Emission*1 | 3.2 | $mg/m^3$ | | |
| Total Particulate Mass Emission Rate*2 | 77 | mg/s | | |
| Regulatory Limit | 25 | $mg/m^3$ | | |
| **Cyanide Testing** | | | | |
| Test Period | 8:15 | - | 10:00 | |
| Cyanide Mass | 0.21 | mg | | |
| Gas Volume Sampled | 0.948 | $m^3$ | | |
| Cyanide Emission*1 | 0.22 | $mg/m^3$ | | |
| Cyanide Mass Emission Rate*2 | 5.3 | mg/s | | |
| Regulatory Limit | 0.5 | $mg/m^3$ | | |
| **Moisture Content (%)** | **2.4** | | | |
| **Gas Density (dry at 1 atmosphere)** | **1.29** | **$kg/m^3$** | | |
| **Dry Molecular Weight** | **28.9** | **g/g-mole** | | |

Notes *1 Emission concentration at Standard conditions of $0^0$C, 1 atm, dry gas

*2 Mass emission rate determined from pre and post test sampling flow measurements and the respective test moisture content. See $Q_{std}$ in field sheets and final calculations "Stack Analysis - Final Calculations" for each test.

**Table 10 Stack 1 Hazardous Substances (Metals), Particulate Fluoride and Gaseous Fluoride Results, 16 December 2015**

| | | | | |
|---|---|---|---|---|
| **Sampling Conditions:** | | | | |
| Stack internal diameter at test location | 1650 | mm | | |
| Stack gas temperature (average) | 74.8 | $^{o}$C | 348.0 | K |
| Stack pressure (average) | 1013 | hPa | | |
| Stack gas velocity (average, stack conditions) | 15 | m/s | | |
| Stack gas flowrate (stack conditions) | 31 | $m^3/s$ | | |
| Stack gas flowrate ($0^0$C, dry gas, 1 atm pressure) | 24 | $m^3/s$ | | |
| **Particulate Fluoride Testing** | | | | |
| Test Period | 12:11 | - | 14:12 | |
| Particulate Fluoride Mass | 0.44 | mg | | |
| Gas Volume Sampled | 1.2 | $m^3$ | | |
| Particulate Fluoride Emission*1 | 0.37 | $mg/m^3$ | | |
| Particulate Fluoride Mass Emission Rate*2 | 8.9 | mg/s | | |
| Regulatory Limit | NA | $mg/m^3$ | | |
| **Gaseous Fluoride Testing** | | | | |
| Test Period | 12:11 | - | 14:12 | |
| Gaseous Fluoride Mass | 0.17 | mg | | |
| Gas Volume Sampled | 1.2 | $m^3$ | | |
| Gaseous Fluoride Emission*1 | 0.14 | $mg/m^3$ | | |
| Gaseous Fluoride Mass Emission Rate*2 | 3.4 | mg/s | | |
| Regulatory Limit | 2 | $mg/m^3$ | | |
| **Hazardous Substances (Metals) Testing** | | | | |
| Test Period | 12:11 | - | 14:12 | |
| Hazardous Substances (Metals) Mass | 0.017 | mg | | |
| Gas Volume Sampled | 1.3 | $m^3$ | | |
| Hazardous Substances (Metals) Emission*1 | 0.013 | $mg/m^3$ | | |
| Hazardous Substances (Metals) Mass Emission Rate*2 | 0.31 | mg/s | | |
| Regulatory Limit | 10 | $mg/m^3$ | | |
| **Moisture Content (%)** | **2.0** | | | |
| **Gas Density (dry at 1 atmosphere)** | **1.29** | **$kg/m^3$** | | |
| **Dry Molecular Weight** | **28.9** | **g/g-mole** | | |

Notes *1 Emission concentration at Standard conditions of $0^0$C, 1 atm, dry gas

*2 Mass emission rate determined from pre and post test sampling flow measurements and the respective test moisture content. See $Q_{std}$ in field sheets and final calculations "Stack Analysis - Final Calculations" for each test.

**Table 11 Stack 1 Hydrogen Chloride, Chlorine, Sulfuric Acid Mist 9H2SO4 as SO3) and Sulfur Dioxide (S02 as SO3) Results, 16 December 2015**

| | | | | |
|---|---|---|---|---|
| **Sampling Conditions:** | | | | |
| Stack internal diameter at test location | 1650 | mm | | |
| Stack gas temperature (average) | 73.6 | $^{o}$C | 346.8 | K |
| Stack pressure (average) | 1013 | hPa | | |
| Stack gas velocity (average, stack conditions) | 15 | m/s | | |
| Stack gas flowrate (stack conditions) | 32 | $m^3/s$ | | |
| Stack gas flowrate ($0^0$C, dry gas, 1 atm pressure) | 24 | $m^3/s$ | | |
| **Hydrogen Chloride Testing** | | | | |
| Test Period | 10:18 | - | 11:59 | |
| Hydrogen Chloride Mass | <5 | mg | | |
| Gas Volume Sampled | 0.937 | $m^3$ | | |
| Hydrogen Chloride Emission*1 | <5.3 | $mg/m^3$ | | |
| Hydrogen Chloride Mass Emission Rate*2 | <130 | mg/s | | |
| Regulatory Limit | 400 | $mg/m^3$ | | |
| **Chlorine Testing** | | | | |
| Test Period | 10:18 | - | 11:59 | |
| Chlorine Mass | <5 | mg | | |
| Gas Volume Sampled | 0.937 | $m^3$ | | |
| Chlorine Emission*1 | <5.3 | $mg/m^3$ | | |
| Chlorine Mass Emission Rate*2 | <130 | mg/s | | |
| Regulatory Limit | NA | $mg/m^3$ | | |
| **Sulfuric Acid Mist (H2SO4 as SO3) Testing** | | | | |
| Test Period | 10:18 | - | 11:59 | |
| Sulfuric Acid Mist (H2SO4 as SO3) Mass | <2 | mg | | |
| Gas Volume Sampled | 1.07 | $m^3$ | | |
| Sulfuric Acid Mist (H2SO4 as SO3) Emission*1 | <1.9 | $mg/m^3$ | | |
| Sulfuric Acid Mist (H2SO4 as SO3) Mass Emission Rate*2 | <47 | mg/s | | |
| Regulatory Limit | 100 | $mg/m^3$ | | |
| **Sulfur Dioxide (SO2 as SO3) Testing** | | | | |
| Test Period | 10:18 | - | 11:59 | |
| Sulfur Dioxide (SO2 as SO3) Mass | <10 | mg | | |
| Gas Volume Sampled | 1.07 | $m^3$ | | |
| Sulfur Dioxide (SO2 as SO3) Emission*1 | <9.3 | $mg/m^3$ | | |
| Sulfur Dioxide (SO2 as SO3) Mass Emission Rate*2 | <230 | mg/s | | |
| Regulatory Limit | NA | $mg/m^3$ | | |
| **Moisture Content (%)** | **2.8** | | | |
| **Gas Density (dry at 1 atmosphere)** | **1.29** | **$kg/m^3$** | | |
| **Dry Molecular Weight** | **28.9** | **g/g-mole** | | |

Notes *1 Emission concentration at Standard conditions of $0^0$C, 1 atm, dry gas

*2 Mass emission rate determined from pre and post test sampling flow measurements and the respective test moisture content. See $Q_{std}$ in field sheets and final calculations "Stack Analysis - Final Calculations" for each test.

**Table 12 Stack 1 Polycyclic Aromatic Hydrocarbon (PAH), Dioxins and Furans Results, 16 December 2015**

| | | | | |
|---|---|---|---|---|
| **Sampling Conditions:** | | | | |
| Stack internal diameter at test location | 1650 | mm | | |
| Stack gas temperature (average) | 79.2 | $^{o}$C | 352.4 | K |
| Stack pressure (average) | 1013 | hPa | | |
| Stack gas velocity (average, stack conditions) | 15 | m/s | | |
| Stack gas flowrate (stack conditions) | 31 | $m^3/s$ | | |
| Stack gas flowrate ($0^0$C, dry gas, 1 atm pressure) | 24 | $m^3/s$ | | |
| **Dioxins and Furans Lower Bound Testing** | | | | |
| Test Period | 8:15 | - | 14:17 | |
| Dioxins and Furans Lower Bound Mass | 0.003 | ng | | |
| Gas Volume Sampled | 3.83 | $m^3$ | | |
| Dioxins and Furans Lower Bound Emission*1 | 0.00078 | $ng/m^3$ | | |
| Dioxins and Furans Lower Bound Mass Emission Rate*2 | 0.019 | ng/s | | |
| Regulatory Limit | 0.1 | $ng/m^3$ | | |
| **Dioxins and Furans Middle Bound Testing** | | | | |
| Test Period | 8:15 | - | 14:17 | |
| Dioxins and Furans Middle Bound Mass | 0.0048 | ng | | |
| Gas Volume Sampled | 3.85 | $m^3$ | | |
| Dioxins and Furans Middle Bound Emission*1 | 0.0012 | $ng/m^3$ | | |
| Dioxins and Furans Middle Bound Mass Emission Rate*2 | 0.028 | ng/s | | |
| Regulatory Limit | 0.1 | $ng/m^3$ | | |
| **Polycyclic Aromatic Hydrocarbons Testing** | | | | |
| Test Period | 8:15 | - | 14:17 | |
| Polycyclic Aromatic Hydrocarbons Mass | 1.1 | mg | | |
| Gas Volume Sampled | 3.83 | $m^3$ | | |
| Polycyclic Aromatic Hydrocarbons Emission*1 | 0.29 | $mg/m^3$ | | |
| Polycyclic Aromatic Hydrocarbons Mass Emission Rate*2 | 6.9 | mg/s | | |
| Regulatory Limit | NA | $mg/m^3$ | | |
| **Moisture Content (%)** | **2.1** | | | |
| **Gas Density (dry at 1 atmosphere)** | **1.29** | **$kg/m^3$** | | |
| **Dry Molecular Weight** | **28.9** | **g/g-mole** | | |

Notes *1 Emission concentration at Standard conditions of $0^0$C, 1 atm, dry gas

*2 Mass emission rate determined from pre and post test sampling flow measurements and the respective test moisture content. See $Q_{std}$ in field sheets and final calculations "Stack Analysis - Final Calculations" for each test.

**Table 13 Stack 1 Speciated Volatile Organic Compounds Results, 16 December 2015**

| Analyte | Sample µg | Blank µg | Sample Blank Corrected µg | ($mg/m^3$) | mg/s |
|---|---|---|---|---|---|
| Acetone | <1.0 | <1.0 | <1.0 | <0.18 | <4.3 |
| 1,1-dichloroethane | <1.0 | <1.0 | <1.0 | <0.18 | <4.3 |
| 2-Butanone | <1.0 | <1.0 | <1.0 | <0.18 | <4.3 |
| Chloroform | <1.0 | <1.0 | <1.0 | <0.18 | <4.3 |
| Benzene | <1.0 | <1.0 | <1.0 | <0.18 | <4.3 |
| 1-heptene | <1.0 | <1.0 | <1.0 | <0.18 | <4.3 |
| n-heptane | <1.0 | <1.0 | <1.0 | <0.18 | <4.3 |
| Trichloroethene | <1.0 | <1.0 | <1.0 | <0.18 | <4.3 |
| MIBK | <1.0 | <1.0 | <1.0 | <0.18 | <4.3 |
| Toluene | 1.1 | <1.0 | 0.6 | 0.11 | 2.6 |
| 2-hexanone | <1.0 | <1.0 | <1.0 | <0.18 | <4.3 |
| Chlorobenzene | <1.0 | <1.0 | <1.0 | <0.18 | <4.3 |
| Ethyl Benzene | <1.0 | <1.0 | <1.0 | <0.18 | <4.3 |
| m- & p-xylene | <2.0 | <0.2 | <2.0 | <0.36 | <8.6 |
| o-xylene | <1.0 | <1.0 | <1.0 | <0.18 | <4.3 |
| Styrene | <1.0 | <1.0 | <1.0 | <0.18 | <4.3 |
| Cyclohexanone | <1.0 | <1.0 | <1.0 | <0.18 | <4.3 |
| Isopropylbenzene | <1.0 | <1.0 | <1.0 | <0.18 | <4.3 |
| 2-chlorotoluene | <1.0 | <1.0 | <1.0 | <0.18 | <4.3 |
| 4-chlorotoluene | <1.0 | <1.0 | <1.0 | <0.18 | <4.3 |
| 1,3,5-trimethylbenzene | <1.0 | <1.0 | <1.0 | <0.18 | <4.3 |
| n-decane | <1.0 | <1.0 | <1.0 | <0.18 | <4.3 |
| 1,2,4-trimethylbenzene | <1.0 | <1.0 | <1.0 | <0.18 | <4.3 |
| 1,3-dichlorobenzene | <1.0 | <1.0 | <1.0 | <0.18 | <4.3 |
| 1,4-dichlorobenzene | <1.0 | <1.0 | <1.0 | <0.18 | <4.3 |
| 1,2-dichlorobenzne | <1.0 | <1.0 | <1.0 | <0.18 | <4.3 |
| n-butylbenzene | <1.0 | <1.0 | <1.0 | <0.18 | <4.3 |
| Hexachlorobutadiene | <1.0 | <1.0 | <1.0 | <0.18 | <4.3 |
| **Total** | **1.1** | | **0.6** | **0.11** | **2.6** |

Note: Where the blank has returned a less than value, the analysed value has been corrected for half of that blank value. i.e. a blank value of <0.5 has had 0.25 subtracted from the analysed value.

**Table 14 Stack 1 Speciated Dioxins And Furans Results, 16 December 2016**

| Analyte | Mass ng | Toxic Equivalency Factor (1 - TEFs) | Total Toxic Equivalence (1 - TEQs) ng | Concentration ng/m$^3$ | Total Toxic Equivalence (1-TEQs) ng/m$^3$ |
|---|---|---|---|---|---|
| 2,3,7,8-TCDF | 0.014 | 0.1 | 0.0014 | 0.0037 | 0.00037 |
| Total TCDF isomers | 0.45 | | | | |
| 2,3,7,8-TCDD | <0.002 | 1 | 0.001 | <0.00052 | 0.00026 |
| Total TCDD isomers | 0.034 | | | | |
| | | | | | |
| 1,2,3,7,8-PeCDF | 0.0029 | 0.05 | 0.000145 | 0.00076 | 0.000038 |
| 2,3,4,7,8-PeCDF | <0.002 | 0.5 | 0.0005 | <0.00052 | 0.00013 |
| Total PeCDF isomers | 0.018 | | | | |
| 1,2,3,7,8-PeCDD | 0.0025 | 0.5 | 0.00125 | 0.00065 | 0.00033 |
| Total PeCDD isomers | 0.012 | | | | |
| | | | | | |
| 1,2,3,4,7,8-HxCDF | <0.002 | 0.1 | 0.0001 | <0.00052 | 0.000026 |
| 1,2,3,6,7,8-HxCDF | 0.0016 | 0.1 | 0.00016 | 0.00042 | 0.000042 |
| 2,3,4,6,7,8-HxCDF | <0.0009 | 0.1 | 0.000045 | <0.00023 | 0.000012 |
| 1,2,3,7,8,9-HxCDF | <0.001 | 0.1 | 0.00005 | <0.00026 | 0.000013 |
| Total HxCDF isomers | 0.0037 | | | | |
| 1,2,3,4,7,8-HxCDD | <0.001 | 0.1 | 0.00005 | <0.00026 | 0.000013 |
| 1,2,3,6,7,8-HxCDD | <0.001 | 0.1 | 0.00005 | <0.00026 | 0.000013 |
| 1,2,3,7,8,9-HxCDD | <0.001 | 0.1 | 0.00005 | <0.00026 | 0.000013 |
| Total HxCDD isomers | <0.004 | | | | |
| | | | | | |
| 1,2,3,4,6,7,8-HpCDF | <0.002 | 0.01 | 0.00001 | <0.00052 | 0.0000026 |
| 1,2,3,4,7,8,9-Hp CDF | <0.001 | 0.01 | 0.000005 | <0.00026 | 0.0000013 |
| Total HpCDF isomers | <0.003 | | | | |
| 1,2,3,4,6,7,8-HpCDD | <0.002 | 0.01 | 0.00001 | <0.00052 | 0.0000026 |
| Total HpCDD isomers | <0.004 | | | | |
| | | | | | |
| OCDF | <0.002 | 0.001 | 0.000001 | <0.00052 | 0.00000026 |
| OCDD | 0.0094 | 0.001 | 0.0000094 | 0.0025 | 0.0000025 |

I-TEQ$_{DF}$

| | | | |
|---|---|---|---|
| Lower Bound (excluding LOD Values) | | 0.003 | ng |
| Middle Bound (including half LOD Values) | | 0.0048 | ng |
| Date Tested | 16-Dec-15 | | |

**Table 15 Stack 1 Elemental Metals Results, 16 December 2015**

| Sample | Total Particulate Metals (mg) | Total Particulate Metals ($mg/m^3$) | Total Gaseous Metals (mg) | Total Gaseous Metals ($mg/m^3$) | Total Oxidisable Mercury (mg) | Total Oxidisable Mercury ($mg/m^3$) | Total (mg) | Total ($mg/m^3$) | Mass Emission Rate (mg/s) |
|---|---|---|---|---|---|---|---|---|---|
| Antimony | <0.0002 | <0.00015 | <0.0001 | <0.000077 | | | <0.0002 | <0.00015 | <0.0036 |
| Arsenic | 0.0001 | 0.000077 | <0.0001 | <0.000077 | | | 0.0001 | 0.000077 | 0.0019 |
| Beryllium | <0.0002 | <0.00015 | <0.0001 | <0.000077 | | | <0.0002 | <0.00015 | <0.0036 |
| Cadmium | 0.0063 | 0.0049 | <0.0008 | <0.00062 | | | 0.0063 | 0.0049 | 0.12 |
| Chromium | 0.0015 | 0.0012 | <0.0001 | <0.000077 | | | 0.0015 | 0.0012 | 0.029 |
| Cobalt | <0.0002 | <0.00015 | <0.0001 | <0.000077 | | | <0.0002 | <0.00015 | <0.0036 |
| Copper | 0.0036 | 0.0028 | 0.0001 | 0.000077 | | | 0.004 | 0.0031 | 0.075 |
| Lead | 0.0016 | 0.0012 | <0.0001 | <0.000077 | | | 0.0016 | 0.0012 | 0.029 |
| Magnesium | 0.019 | 0.015 | <0.035 | <0.027 | | | 0.019 | 0.015 | 0.36 |
| Manganese | <0.006 | <0.0046 | <0.0062 | <0.0048 | | | <0.0002 | <0.00015 | <0.0036 |
| Mercury | <0.0002 | <0.00015 | <0.0001 | <0.000077 | <0.0005 | <0.00039 | <0.0002 | <0.00015 | <0.0036 |
| Nickel | 0.0011 | 0.00085 | 0.0037 | 0.0029 | | | 0.005 | 0.0039 | 0.094 |
| Selenium | <0.0002 | <0.00015 | <0.0003 | <0.00023 | | | <0.0002 | <0.00015 | <0.0036 |
| Thallium | <0.0002 | <0.00015 | <0.0001 | <0.000077 | | | <0.0002 | <0.00015 | <0.0036 |
| Tin | 0.0019 | 0.0015 | <0.0001 | <0.000077 | | | 0.0019 | 0.0015 | 0.036 |
| Vanadium | 0.0003 | 0.00023 | <0.0001 | <0.000077 | | | 0.0003 | 0.00023 | 0.0055 |
| Zinc | 0.65 | 0.5 | 0.0016 | 0.0012 | | | 0.7 | 0.54 | 13 |
| **Total Hazardous Metals*** | **0.011** | **0.0085** | **0.0037** | **0.0029** | **<0.0005** | **<0.00039** | **0.017** | **0.013** | **0.31** |
| **Total Metals** | **0.69** | **0.53** | **0.0054** | **0.0042** | | | **0.74** | **0.57** | **14** |

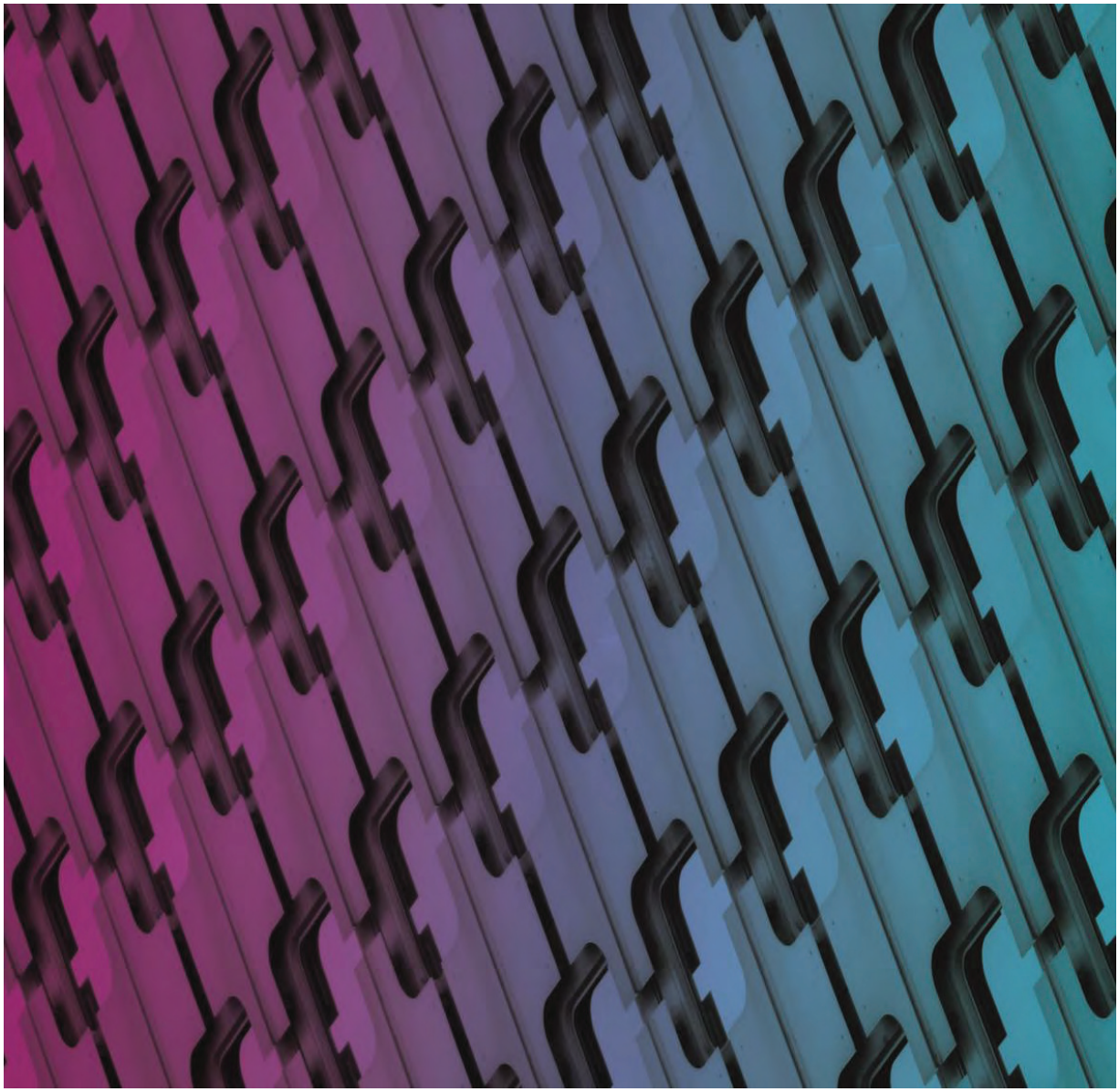
* Total does not include Copper, Magnesium and Zinc as they are classed non-hazardous

**Table 16 Stack 1 Speciated Polycyclic Aromatic Hydrocarbons Results, 16 December 2015**

| | Sample Result | | | Emission | | Mass Emission Rate | |
|---|---|---|---|---|---|---|---|
| | (ng) | (µg) | (mg) | (µg/m$^3$) | (mg/m$^3$) | (µg/s) | (mg/s) |
| Naphthalene | 160000 | 160 | 0.16 | 42 | 0.042 | 990 | 0.99 |
| 2 - Methylnaphthalene | 55000 | 55 | 0.055 | 14 | 0.014 | 340 | 0.34 |
| Acenaphthylene | 330000 | 330 | 0.33 | 86 | 0.086 | 2000 | 2 |
| Acenaphthene | 11000 | 11 | 0.011 | 2.9 | 0.0029 | 68 | 0.068 |
| Fluorene | 91000 | 91 | 0.091 | 24 | 0.024 | 560 | 0.56 |
| Phenanthrene | 300000 | 300 | 0.3 | 78 | 0.078 | 1900 | 1.9 |
| Anthracene | 37000 | 37 | 0.037 | 9.7 | 0.0097 | 230 | 0.23 |
| Fluoranthene | 62000 | 62 | 0.062 | 16 | 0.016 | 380 | 0.38 |
| Pyrene | 62000 | 62 | 0.062 | 16 | 0.016 | 380 | 0.38 |
| Benz(a)anthracene | 32 | 0.032 | 0.000032 | 0.0084 | 0.0000084 | 0.2 | 0.0002 |
| Chrysene | 73 | 0.073 | 0.000073 | 0.019 | 0.000019 | 0.45 | 0.00045 |
| Benzo(b)fluoranthene | <20 | <0.02 | <0.00002 | <0.0052 | <0.0000052 | <0.12 | <0.00012 |
| Benzo(k)fluoranthene | <20 | <0.02 | <0.00002 | <0.0052 | <0.0000052 | <0.12 | <0.00012 |
| Benzo(e)pyrene | <20 | <0.02 | <0.00002 | <0.0052 | <0.0000052 | <0.12 | <0.00012 |
| Benzo(a)pyrene | <20 | <0.02 | <0.00002 | <0.0052 | <0.0000052 | <0.12 | <0.00012 |
| Perylene | <20 | <0.02 | <0.00002 | <0.0052 | <0.0000052 | <0.12 | <0.00012 |
| Indeno(123:cd)pyrene | <20 | <0.02 | <0.00002 | <0.0052 | <0.0000052 | <0.12 | <0.00012 |
| Dibenzo(ah)anthracene | <20 | <0.02 | <0.00002 | <0.0052 | <0.0000052 | <0.12 | <0.00012 |
| Benzo(ghi)perylene | 29 | 0.029 | 0.000029 | 0.0076 | 0.0000076 | 0.18 | 0.00018 |
| **Sum of reported PAH's** | **1100000** | **1100** | **1.1** | **290** | **0.29** | **6800** | **6.8** |

# Stack 1 Emissions Testing Report March 2016

## Pharmaceutical Waste Trial



# Stack 1 Emissions Testing Report March 2016

Pharmaceutical Waste Trial

Client: Weston Aluminium

ABN: 91 075 245 108

Prepared by

**AECOM Australia Pty Ltd**
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10-May-2016

Job No.: 60489919

AECOM in Australia and New Zealand is certified to the latest version of ISO9001, ISO14001, AS/NZS4801 and OHSAS18001.

# Quality Information

Document Stack 1 Emissions Testing Report March 2016

Ref 60489919

Date 10-May-2016

Prepared by James Lang

Reviewed by Chad Whitburn Approved Signatory

Revision History

| Revision | Revision Date | Details | Authorised | |
|---|---|---|---|---|
| | | | Name/Position | Signature |
| 1.0 | 10 -May-2016 | Final Report | Chad Whitburn<br>Compliance Services -<br>Team Leader | |

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# Table of Contents



**List of Tables**

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# 1.0 Introduction

AECOM was appointed by Weston Aluminium Pty Ltd to conduct a series of measurements to determine air emissions from Stack 1 located at their Weston plant in Kurri Kurri, NSW while processing Pharmaceutical waste. Emission testing was a compliance requirement of Environmental Protection Licence (EPL) number 6423.

Testing was conducted on 18 March 2016 to determine emission concentrations for the following parameters:

**Stack 1 (EPL Point 1)**

- Total Particulate;
- Fine Particulate ($PM_{10}$);
- Sulfuric Acid Mist ($H_2SO_4$ as $SO_3$);
- Sulfur Dioxide ($SO_2$ as $SO_3$);
- Chlorine;
- Hydrogen Chloride;
- Gaseous Fluoride;
- Particulate Fluoride;
- Hazardous Substances (Metals);
- Volatile Organic Compounds (VOC);
- Oxides of Nitrogen;
- Carbon Monoxide;
- Carbon Dioxide;
- Oxygen;
- Cyanide;
- Polycyclic Aromatic Hydrocarbon (PAH); and
- Dioxins and Furans.

Laboratory analysis was conducted by the following laboratories, which hold NATA accreditation for the specified tests:

- Steel River Testing Pty. Ltd., NATA accreditation number 18079, performed the following analysis detailed in report number 10918-1-P, 11046-0-P, and 10918-0-M:
    - Moisture;
    - Fine Particulate ($PM_{10}$); and
    - Total Particulate.
- Australian Laboratory Services, NATA accreditation number 18079, performed the following analysis detailed in report number EN1601130 and EN1601220:
    - Fluoride;
    - Cyanide;
    - Sulfuric Acid Mist;
    - Sulfur Dioxide;
    - Hydrogen Chloride;
    - Chlorine; and
    - Volatile Organic Compounds.

- National Measurements Institute, NATA accreditation number 198, performed the following analysis detailed in report number ORG16_014 and DAU16-070:
    - Polycyclic Aromatic Hydrocarbons; and
    - Dioxins and Furans.
- SGS Leeder Consulting, NATA accreditation number 14429, performed the following analysis detailed in report number M160684:
    - Hazardous Substances (Metals).

# 2.0 Sampling Plane Requirements

The criteria for sampling planes are specified in AS 4323.1-1995 (R2014).

**Table 1 Criteria for Selection of Sampling Planes (AS 4323. 1)**

| Type of flow disturbance | Minimum distance upstream from disturbance, diameters (D) | Minimum distance downstream from disturbance, diameters (D) |
|---|---|---|
| Bend, connection, junction, direction change | >2D | >6D |
| Louvre, butterfly damper (partially closed or closed) | >3D | >6D |
| Axial fan | >3D | >8D (see Note) |
| Centrifugal fan | >3D | >6D |

*NOTE: The plane should be selected as far as practicable from a fan. Flow straighteners may be required to ensure the position chosen meets the check criteria listed in Items (a) to (f) below.*

*a. The gas flow is basically in the same direction at all points along each sampling traverse.*

*b. The gas velocity at all sampling points is greater than 3 m/s.*

*c. The gas flow profile at the sampling plane shall be steady, evenly distributed and not have a cyclonic component which exceeds an angle of 15$^{o}$ to the duct axis, when measured near the periphery of a circular sampling plane.*

*d. The temperature difference between adjacent points of the survey along each sampling traverse is less than 10% of the absolute temperature, and the temperature at any point differs by less than 10% from the mean.*

*e. The ratio of the highest to lowest pitot pressure difference shall not exceed 9:1 and the ratio of highest to lowest gas velocities shall not exceed 3:1. For isokinetic testing with the use of impingers, the gas velocity ratio across the sampling plane should not exceed 1.6:1.*

*f. The gas temperature at the sampling plane should preferably be above the dewpoint.*

Stack 1 (EPA Identification No. 1) did not satisfy the requirements of AS 4323.1 Section 4.1 with regard to the upstream and downstream distances from disturbances. To compensate for this, additional sampling points were added in accordance with AS 4323.1 Section 4.2.

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# 3.0 Methodology

## 3.1 NATA Accredited Methods

The following methods are accredited with the National Association of Testing Authorities (NATA), Accreditation No. 2778 (14391), and are approved for the sampling and analysis of gases and aerosols. Specific details of the methods are available on request.

All sampling and analysis is conducted according to the methods in **Table 2**.

**Table 2 AECOM NATA Endorsed Methods**

| NSW EPA Approved Methods | USEPA Methods | Parameter Measured |
|---|---|---|
| NSW EPA TM-1 (AS 4323.1-1995) | USEPA (2000) Method 1 under approved circumstances | Selection of sampling positions |
| NSW EPA TM-2 | USEPA (2000) Method 2 or 2C or USEPA (1999) Method 2F or 2G or 2H (as appropriate) | Velocity or volumetric flow rate or temperature or pressure of stack gases |
| NSW EPA TM-3 | USEPA (2000) Method 8 (for sampling and analysis) or APHA (1998) Method 4110B (for analysis only if interference from fluorides, free ammonia and/or dimethyl aniline has been demonstrated to the satisfaction of the Chief Scientist) (as appropriate) | Sulfuric acid mist ($H_2SO_4$) or sulphur trioxide ($SO_3$) |
| NSW EPA TM-4 | USEPA (2000) Method 6 or 6A or 6B or USEPA (1996) Method 6C or ISO (1989) Method 7934 or ISO (1992) Method 7935 or ISO (1993) Method 10396 or ISO (1998) Method 11632 (as appropriate) | Sulfur dioxide ($SO_2$) |
| NSW EPA TM-7 | USEPA (2000) 26A | Chlorine ($Cl_2$) |
| NSW EPA TM-8 | USEPA (2000) 26A | Hydrogen chloride (HCl) |
| NSW EPA TM-9 | USEPA (2000) Method 13A or 13B (as appropriate) | Fluorine ($F_2$) or any compound containing fluorine, except where emitted by a primary aluminium smelter while manufacturing aluminium from alumina |
| NSW EPA TM-12 | USEPA (2000) Method 29 or USEPA (2000) Method 102 (for mercury only in hydrogen rich streams) (as appropriate) | Type 1 substances (elements antimony (Sb), arsenic (As), cadmium (Cd), lead (Pb) or mercury (Hg) or any compound containing one or more of those elements) |
| NSW EPA TM-13 | USEPA (2000) Method 29 (Analysis for tin and vanadium to be done by Inductively Coupled Argon Plasma Emission Spectroscopy (ICAP) as defined in USEPA Method 29) or USEPA (1986) Method 7910 (for vanadium only) or USEPA (1986) Method 7911 (for vanadium only) (as appropriate) | Type 2 substances (elements beryllium (Be), chromium (Cr), cobalt (Co), manganese (Mn), nickel (Ni), selenium (Se), tin (Sn) or vanadium (V) or any compound containing one or more of those elements) |
| NSW EPA TM-14 | Cadmium (Cd) or mercury (Hg) or any compound containing one or more of those elements | USEPA (2000) Method 29 or USEPA (2000) Method 102 (for mercury only in hydrogen rich streams) (as appropriate) |
| NSW EPA TM-15 (AS 4323.2-1995) | USEPA (2000) Method 5 under approved circumstances | Solid particles (Total) |

| NSW EPA Approved Methods | USEPA Methods | Parameter Measured |
|---|---|---|
| NSW EPA TM-22 | USEPA (2000) Method 4 | Moisture content in stack gases |
| NSW EPA TM-23 | USEPA (2000) Method 3 | Dry gas density or molecular weight of stack gases |
| NSW EPA TM-34 | USEPA (2000) Method 18 or USEPA (2000) Method 25 or 25A or 25B or 25C or 25D or 25E (as appropriate) | Volatile organic compounds |
| NSW EPA OM-5 | USEPA (1997) Method 201 or 201A (as appropriate) | 'Fine' particulates ($PM_{10}$) |
| NSW EPA OM-6 | California EPA Air Resources Board (1997) Method 429 | Polycyclic aromatic hydrocarbons (PAHs) |
| NSW EPA TM-32 | USEPA Method 10 | Determination of Carbon Monoxide emissions from stationary sources |
| NSW EPA TM-25 | USEPA (1990) Method 3A | Determination of Oxygen concentrations from stationary sources |
| NSW EPA TM-24 | USEPA (1990) Method 3A | Carbon dioxide ($CO_2$) in stack gases |
| NSW EPA TM-11 | USEPA(2000) Method 7C | Determination of Nitrogen dioxide or nitric oxide emissions from stationary sources |
| NSW EPA TM-18 | USEPA (1995) Method 23 | Dioxins and Furans |

## 3.2 Deviations from NATA Accredited Methods

The following method is not accredited with the National Association of Testing Authorities (NATA), Accreditation No. 2778 (14391). Specific details of the methods are available on request.

All sampling and analysis is conducted according to the method in **Table 3**.

**Table 3 NATA Method Deviations**

| USEPA Methods | Parameter Measured |
|---|---|
| USEPA (2011) Other Test Method 29 | Sampling and analysis for Hydrogen Cyanide emissions from stationary sources |

# 4.0 Sampling Location

## 4.1 Sampling Location Summary

**Table 4** provides a summary of the location sampled by AECOM on 18 March 2016 at the Weston Aluminium plant in Kurri Kurri, NSW.

**Table 4 Sampling Location Summary**

| Discharge Description | Stack 1 (EPA Identification No. 1) |
|---|---|
| Duct Shape | Circular |
| Construction Material | Metal |
| Duct Diameter (mm) | 1650 |
| Minimum No. Sampling Points | 16 |
| Sampling Ports | 2 |
| Min. Points/Traverse | 8 |
| Disturbance | Yes |
| Distance from Upstream Disturbance | 2D |
| Type of Disturbance | Fan entry |
| Distance from Downstream Disturbance | 4D |
| Type of Disturbance | Stack Exit |
| Ideal Sampling Location | No |
| Correction Factors Applied | Yes |
| Total No. Points Sampled | 20 |
| Points/Traverse | 10 |
| Sampling Performed to Standard* | Yes[2] |

*AS 4323.1 Stationary source emissions Method 1 – Selection of sampling positions

[1] AS 4323.1 Section 4.1

[2] AS 4323.1 Section 4.2

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# 5.0 Equipment Calibration

AECOM has a calibration schedule to ensure the emission testing equipment is maintained in good order and with known calibration. Equipment used in this project was calibrated according to the procedures and frequency identified in the AECOM calibration schedule. Details of the schedule and the calibration calculations are available on request.

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# 6.0 Results

A summary of test results for March 2016 testing is presented in **Table 5**. Calculated Fine Particulate ($PM_{10}$) cut size is displayed in **Table 6**. Gas Data Concentrations and Mass Emission Rate summaries are reported in **Tables 7 & 8** respectively. Detailed results along with gas stream properties during the testing periods can be found in **Tables 9** to **12**. Speciated Volatile Organic Carbons and Dioxins and Furan results can be found in **Tables 13 &14,** Hazardous Substances (Metals) results in **Table 15**, and Polycyclic Aromatic Hydrocarbons results in **Table 16**.

All emission concentrations are converted to standard conditions of 0°C, dry gas and 1 atm pressure for comparison with regulatory limits outlined in the Weston Aluminium Environmental Protection Licence 6423.

Field notes recorded during the project are attached as **Appendix A**. with Laboratory Analysis Reports attached as **Appendix B**, and Raw & Calculated Gas Data as **Appendix C**.

**Table 5 Stack Emissions Results Summary 18 March 2016**

| Parameter | Stack 1<br>EPL Point 1 |
|---|---|
| Carbon Monoxide (CO) (ppm) | 76 *(100)* |
| Chlorine ($mg/m^3$) | <0.5 |
| Cyanide | 0.35 *(0.5)* |
| Fine Particulate ($PM_{10}$) ($mg/m^3$) | 0.049 |
| Gaseous Fluoride ($mg/m^3$) | 0.018 *(2)* |
| Hydrogen Chloride ($mg/m^3$) | <1 *(400)* |
| Oxides of Nitrogen (as Equivalent $NO_2$) ($mg/m^3$) | 2 *(2500)* |
| Oxygen (%) | 20.5 |
| Carbon Dioxide (%) | <0.1 |
| Particulate Fluoride ($mg/m^3$) | 0.055 |
| Sulfur Dioxide ($SO_2$ as $SO_3$) ($mg/m^3$) | <8.5 |
| Sulfuric Acid Mist ($H_2SO_4$ as $SO_3$) ($mg/m^3$) | <1.7 *(100)* |
| Total Particulate ($mg/m^3$) | 1.0 *(25)* |
| Total Polycyclic Aromatic Hydrocarbons ($mg/m^3$) | 0.082 |
| Dioxins and Furans Lower Bound | 0.0014 |
| Dioxins and Furans Middle Bound | 0.0016 |
| Type 1 and 2 Substances in Aggregate (Metals) ($mg/m^3$) | 0.011 *(10)* |
| Volatile Organic Compounds (VOC) ($mg/m^3$) | 5.2 |

Note – EPL Limits are in parenthesis

USEPA method 201A, section 6.3.5 (Determination of $PM_{10}$ Emissions) and USEPA Conditional Test Method 040, Section 17, Table 2 (Determination of $PM_{2.5}$ Emissions) specifies that results are acceptable provided the calculated aerodynamic cut size ($D_{50}$) for the test lies between 9.0μm and 11.0μm. Post sampling cut size calculations performed for the sampling conducted are displayed in **Table 6**.

Cut size, or $D_{50}$, refers to the aerodynamic diameter of the particles contained in the gas stream which can be captured with a 50% efficiency and is a calculated value. For a Fine Particulate ($PM_{10}$) test particle sizes of 10μm and less are expected.

The cut size ($D_{50}$) is calculated prior to testing and is based on the pre-test measurements such as stack gas velocity, stack gas temperature, moisture content of the gas stream and stack gas density. This pre-test calculation of cut size ($D_{50}$) is used in conjunction with the pre-test measurements, some of which are stated above, to establish the sampling conditions or parameters.

**Table 6 Calculated $PM_{10}$ Cut Size**

| Sampling Location | $PM_{10}$ Cut Size ($D_{50}$) |
|---|---|
| Stack 1 | 10.0 |

The calculated cut sizes meet the criteria for cut size conditions stated above.

**Table 7 Calculated Gas Concentrations Data Summary, 18 March 2016**

| Parameter | Stack 1 |
|---|---|
| Time Period | 6:01-7:01 |
| Nitrogen Oxide (NO) ($mg/m^3$) | 1 |
| Nitrogen Dioxide ($NO_2$) ($mg/m^3$) | <0.1 |
| Nitrogen Oxides ($NO_x$) ($mg/m^3$) | 1 |
| Oxides of Nitrogen as Equivalent $NO_2$ ($mg/m^3$) | 2*(2500)* |
| Carbon Monoxide (ppm) | 76*(100)* |
| Carbon Monoxide ($mg/m^3$) | 95 |
| Carbon Dioxide (%) | <0.1 |
| Oxygen (%) | 20.5 |

Note – EPL Limits are provided in parenthesis.

**Table 8 Gas Mass Emission Rates Summary, 18 March 2016**

| Parameter | Stack 1 |
|---|---|
| Time Period | 6:01-7:01 |
| Stack Gas Flow Rate (0°C, dry gas, 1 atm pressure) | 26 |
| Nitrogen Oxide (NO) (mg/s) | 26 |
| Nitrogen Dioxide ($NO_2$) (mg/s) | <2.6 |
| Nitrogen Oxides ($NO_x$) (mg/s) | 26 |
| Oxides of Nitrogen as Equivalent $NO_2$ (mg/s) | 52 |
| Carbon Monoxide (mg/s) | 2470 |

**Table 9 Stack 1 Fine Particulate ($PM_{10}$), Total Particulate, and Cyanide Results, 18 March 2016**

| | | | | |
|---|---|---|---|---|
| **Sampling Conditions:** | | | | |
| Stack internal diameter at test location | 1650 | mm | | |
| Stack gas temperature (average) | 74.5 | °C | 347.7 | K |
| Stack pressure (average) | 1004 | hPa | | |
| Stack gas velocity (average, stack conditions) | 16 | m/s | | |
| Stack gas flowrate (stack conditions) | 34 | $m^3/s$ | | |
| Stack gas flowrate (0°C, dry gas, 1 atm pressure) | 26 | $m^3/s$ | | |
| **Fine Particulate ($PM_{10}$) Testing** | | | | |
| Test Period | 6:29 | - | 8:09 | |
| Fine Particulate ($PM_{10}$) Mass | 0.06 | mg | | |
| Gas Volume Sampled | 1.21 | $m^3$ | | |
| Fine Particulate ($PM_{10}$) Emission*[1] | 0.049 | $mg/m^3$ | | |
| Fine Particulate ($PM_{10}$) Mass Emission Rate*[2] | 1.3 | mg/s | | |
| Regulatory Limit | NA | $mg/m^3$ | | |
| **Total Particulate Testing** | | | | |
| Test Period | 6:29 | - | 8:09 | |
| Total Particulate Mass | 1.8 | mg | | |
| Gas Volume Sampled | 1.72 | $m^3$ | | |
| Total Particulate Emission*[1] | 1.0 | $mg/m^3$ | | |
| Total Particulate Mass Emission Rate*[2] | 26 | mg/s | | |
| Regulatory Limit | 25 | $mg/m^3$ | | |
| **Cyanide Testing** | | | | |
| Test Period | 6:29 | - | 8:09 | |
| Cyanide Mass | 0.61 | mg | | |
| Gas Volume Sampled | 1.72 | $m^3$ | | |
| Cyanide Emission*[1] | 0.35 | $mg/m^3$ | | |
| Cyanide Mass Emission Rate*[2] | 9.2 | mg/s | | |
| Regulatory Limit | 0.5 | $mg/m^3$ | | |
| **Moisture Content (%)** | **1.7** | | | |
| **Gas Density (dry at 1 atmosphere)** | **1.29** | **$kg/m^3$** | | |
| **Dry Molecular Weight** | **28.9** | **g/g-mole** | | |

Notes *1 Emission concentration at Standard conditions of 0°C, 1 atm, dry gas

*2 Mass emission rate determined from pre and post test sampling flow measurements and the respective test moisture content. See $Q_{std}$ in field sheets and final calculations "Stack Analysis - Final Calculations" for each test.

**Table 10 Stack 1 Hazardous Substances (Metals), Particulate Fluoride and Gaseous Fluoride Results, 18 March 2016**

| | | | | |
|---|---|---|---|---|
| **Sampling Conditions:** | | | | |
| Stack internal diameter at test location | 1650 | mm | | |
| Stack gas temperature (average) | 71.0 | °C | 344.2 | K |
| Stack pressure (average) | 1004 | hPa | | |
| Stack gas velocity (average, stack conditions) | 16 | m/s | | |
| Stack gas flowrate (stack conditions) | 33 | $m^3/s$ | | |
| Stack gas flowrate (0°C, dry gas, 1 atm pressure) | 25 | $m^3/s$ | | |
| **Hazardous Substances (Metals) Testing** | | | | |
| Test Period | 10:24 | - | 12:04 | |
| Hazardous Substances (Metals) Mass | 0.015 | mg | | |
| Gas Volume Sampled | 1.37 | $m^3$ | | |
| Hazardous Substances (Metals) Emission*1 | 0.011 | $mg/m^3$ | | |
| Hazardous Substances (Metals) Mass Emission Rate*2 | 0.28 | mg/s | | |
| Regulatory Limit | 10 | $mg/m^3$ | | |
| **Particulate Fluoride Testing** | | | | |
| Test Period | 10:24 | - | 12:04 | |
| Particulate Fluoride Mass | 0.061 | mg | | |
| Gas Volume Sampled | 1.11 | $m^3$ | | |
| Particulate Fluoride Emission*1 | 0.055 | $mg/m^3$ | | |
| Particulate Fluoride Mass Emission Rate*2 | 1.4 | mg/s | | |
| Regulatory Limit | NA | $mg/m^3$ | | |
| **Gaseous Fluoride Testing** | | | | |
| Test Period | 10:24 | - | 12:04 | |
| Gaseous Fluoride Mass | 0.02 | mg | | |
| Gas Volume Sampled | 1.11 | $m^3$ | | |
| Gaseous Fluoride Emission*1 | 0.018 | $mg/m^3$ | | |
| Gaseous Fluoride Mass Emission Rate*2 | 0.45 | mg/s | | |
| Regulatory Limit | 2 | $mg/m^3$ | | |
| **Moisture Content (%)** | **3.5** | | | |
| **Gas Density (dry at 1 atmosphere)** | **1.29** | **$kg/m^3$** | | |
| **Dry Molecular Weight** | **28.9** | **g/g-mole** | | |

Notes *1 Emission concentration at Standard conditions of 0°C, 1 atm, dry gas

*2 Mass emission rate determined from pre and post test sampling flow measurements and the respective test moisture content. See $Q_{std}$ in field sheets and final calculations "Stack Analysis - Final Calculations" for each test.

**Table 11 Stack 1 Hydrogen Chloride, Chlorine, Sulfuric Acid Mist ($H_2SO_4$ as $SO_3$) and Sulfur Dioxide ($SO_2$ as $SO_3$) Results, 18 March 2016**

| | | | | |
|---|---|---|---|---|
| **Sampling Conditions:** | | | | |
| Stack internal diameter at test location | 1650 | mm | | |
| Stack gas temperature (average) | 69.5 | °C | 342.7 | K |
| Stack pressure (average) | 1004 | hPa | | |
| Stack gas velocity (average, stack conditions) | 16 | m/s | | |
| Stack gas flowrate (stack conditions) | 34 | $m^3/s$ | | |
| Stack gas flowrate (0°C, dry gas, 1 atm pressure) | 26 | $m^3/s$ | | |
| **Sulfuric Acid Mist (H2SO4 as SO3) Testing** | | | | |
| Test Period | 8:33 | - | 10:13 | |
| Sulfuric Acid Mist ($H_2SO_4$ as $SO_3$) Mass | <2 | mg | | |
| Gas Volume Sampled | 1.18 | $m^3$ | | |
| Sulfuric Acid Mist ($H_2SO_4$ as $SO_3$) Emission[*1] | <1.7 | $mg/m^3$ | | |
| Sulfuric Acid Mist ($H_2SO_4$ as $SO_3$) Mass Emission Rate[*2] | <44 | mg/s | | |
| Regulatory Limit | 100 | $mg/m^3$ | | |
| **Sulfur Dioxide (SO2 as SO3) Testing** | | | | |
| Test Period | 8:33 | - | 10:13 | |
| Sulfur Dioxide ($SO_2$ as $SO_3$) Mass | <10 | mg | | |
| Gas Volume Sampled | 1.18 | $m^3$ | | |
| Sulfur Dioxide ($SO_2$ as $SO_3$) Emission[*1] | <8.5 | $mg/m^3$ | | |
| Sulfur Dioxide ($SO_2$ as $SO_3$) Mass Emission Rate[*2] | <220 | mg/s | | |
| Regulatory Limit | NA | $mg/m^3$ | | |
| **Hydrogen Chloride Testing** | | | | |
| Test Period | 8:33 | - | 10:13 | |
| Hydrogen Chloride Mass | <10 | mg | | |
| Gas Volume Sampled | 9.95 | $m^3$ | | |
| Hydrogen Chloride Emission[*1] | <1 | $mg/m^3$ | | |
| Hydrogen Chloride Mass Emission Rate[*2] | <27 | mg/s | | |
| Regulatory Limit | 400 | $mg/m^3$ | | |
| **Chlorine Testing** | | | | |
| Test Period | 8:33 | - | 10:13 | |
| Chlorine Mass | <5 | mg | | |
| Gas Volume Sampled | 9.95 | $m^3$ | | |
| Chlorine Emission[*1] | <0.5 | $mg/m^3$ | | |
| Chlorine Mass Emission Rate[*2] | <13 | mg/s | | |
| Regulatory Limit | NA | $mg/m^3$ | | |
| **Moisture Content (%)** | **2.6** | | | |
| **Gas Density (dry at 1 atmosphere)** | **1.29** | **$kg/m^3$** | | |
| **Dry Molecular Weight** | **28.9** | **g/g-mole** | | |

Notes *1 Emission concentration at Standard conditions of 0°C, 1 atm, dry gas

*2 Mass emission rate determined from pre and post test sampling flow measurements and the respective test moisture content. See $Q_{std}$ in field sheets and final calculations "Stack Analysis - Final Calculations" for each test.

**Table 12 Stack 1 Polycyclic Aromatic Hydrocarbon (PAH), Dioxins and Furans Results, 18 March 2016**

| | | | | |
|---|---|---|---|---|
| **Sampling Conditions:** | | | | |
| Stack internal diameter at test location | 1650 | mm | | |
| Stack gas temperature (average) | 76.0 | °C | 349.2 | K |
| Stack pressure (average) | 1004 | hPa | | |
| Stack gas velocity (average, stack conditions) | 16 | m/s | | |
| Stack gas flowrate (stack conditions) | 34 | $m^3/s$ | | |
| Stack gas flowrate (0°C, dry gas, 1 atm pressure) | 25 | $m^3/s$ | | |
| **Polycyclic Aromatic Hydrocarbons Testing** | | | | |
| Test Period | 6:07 | - | 12:07 | |
| Polycyclic Aromatic Hydrocarbons Mass | 0.3571 | mg | | |
| Gas Volume Sampled | 4.37 | $m^3$ | | |
| Polycyclic Aromatic Hydrocarbons Emission*1 | 0.082 | $mg/m^3$ | | |
| Polycyclic Aromatic Hydrocarbons Mass Emission Rate*2 | 2.1 | mg/s | | |
| Regulatory Limit | NA | $mg/m^3$ | | |
| **Dioxins and Furans Lower Bound Testing** | | | | |
| Test Period | 6:07 | - | 12:07 | |
| Dioxins and Furans Lower Bound Mass | 0.0061 | ng | | |
| Gas Volume Sampled | 4.37 | $m^3$ | | |
| Dioxins and Furans Lower Bound Emission*1 | 0.0014 | $ng/m^3$ | | |
| Dioxins and Furans Lower Bound Mass Emission Rate*2 | 0.036 | ng/s | | |
| Regulatory Limit | NA | $ng/m^3$ | | |
| **Dioxins and Furans Middle Bound Testing** | | | | |
| Test Period | 6:07 | - | 12:07 | |
| Dioxins and Furans Middle Bound Mass | 0.0071 | ng | | |
| Gas Volume Sampled | 4.37 | $m^3$ | | |
| Dioxins and Furans Middle Bound Emission*1 | 0.0016 | $ng/m^3$ | | |
| Dioxins and Furans Middle Bound Mass Emission Rate*2 | 0.041 | ng/s | | |
| Regulatory Limit | NA | $ng/m^3$ | | |
| **Moisture Content (%)** | **1.9** | | | |
| **Gas Density (dry at 1 atmosphere)** | **1.29** | **$kg/m^3$** | | |
| **Dry Molecular Weight** | **28.9** | **g/g-mole** | | |

Notes *1 Emission concentration at Standard conditions of 0°C, 1 atm, dry gas

*2 Mass emission rate determined from pre and post test sampling flow measurements and the respective test moisture content. See $Q_{std}$ in field sheets and final calculations "Stack Analysis - Final Calculations" for each test.

**Table 13 Stack 1 Speciated Volatile Organic Compounds Results, 18 March 2016**

| Analyte | Sample µg | Blank µg | Sample Blank Corrected µg | (mg/m$^3$) | mg/s |
|---|---|---|---|---|---|
| Acetone | <1.0 | <1.0 | <1.0 | <0.094 | <2.4 |
| 1,1-dichloroethane | <1.0 | <1.0 | <1.0 | <0.094 | <2.4 |
| 2-Butanone | <1.0 | <1.0 | <1.0 | <0.094 | <2.4 |
| Chloroform | <1.0 | <1.0 | <1.0 | <0.094 | <2.4 |
| Benzene | 16.1 | <1.0 | 15.6 | 1.5 | 38 |
| 1-heptene | <1.0 | <1.0 | <1.0 | <0.094 | <2.4 |
| n-heptane | <1.0 | <1.0 | <1.0 | <0.094 | <2.4 |
| Trichloroethene | <1.0 | <1.0 | <1.0 | <0.094 | <2.4 |
| MIBK | <1.0 | <1.0 | <1.0 | <0.094 | <2.4 |
| Toluene | 39.9 | <1.0 | 39.4 | 3.7 | 93 |
| 2-hexanone | <1.0 | <1.0 | <1.0 | <0.094 | <2.4 |
| Chlorobenzene | <1.0 | <1.0 | <1.0 | <0.094 | <2.4 |
| Ethyl Benzene | <1.0 | <1.0 | <1.0 | <0.094 | <2.4 |
| m- & p-xylene | <2.0 | <0.2 | <2.0 | <0.19 | <4.8 |
| o-xylene | <1.0 | <1.0 | <1.0 | <0.094 | <2.4 |
| Styrene | <1.0 | <1.0 | <1.0 | <0.094 | <2.4 |
| Cyclohexanone | <1.0 | <1.0 | <1.0 | <0.094 | <2.4 |
| Isopropylbenzene | <1.0 | <1.0 | <1.0 | <0.094 | <2.4 |
| 2-chlorotoluene | <1.0 | <1.0 | <1.0 | <0.094 | <2.4 |
| 4-chlorotoluene | <1.0 | <1.0 | <1.0 | <0.094 | <2.4 |
| 1,3,5-trimethylbenzene | <1.0 | <1.0 | <1.0 | <0.094 | <2.4 |
| n-decane | <1.0 | <1.0 | <1.0 | <0.094 | <2.4 |
| 1,2,4-trimethylbenzene | <1.0 | <1.0 | <1.0 | <0.094 | <2.4 |
| 1,3-dichlorobenzene | <1.0 | <1.0 | <1.0 | <0.094 | <2.4 |
| 1,4-dichlorobenzene | <1.0 | <1.0 | <1.0 | <0.094 | <2.4 |
| 1,2-dichlorobenzne | <1.0 | <1.0 | <1.0 | <0.094 | <2.4 |
| n-butylbenzene | <1.0 | <1.0 | <1.0 | <0.094 | <2.4 |
| Hexachlorobutadiene | <1.0 | <1.0 | <1.0 | <0.094 | <2.4 |
| **Total** | **56.0** | | **55.0** | **5.2** | **131** |

Note: Where the blank has returned a less than value, the analysed value has been corrected for half of that blank value. i.e. a blank value of <0.5 has had 0.25 subtracted from the analysed value.

**Table 14 Stack 1 Speciated Dioxins And Furans Results, 18 March 2016**

| Analyte | Mass ng | Toxic Equivalency Factor (1 - TEFs) | Total Toxic Equivalence (1 - TEQs) ng | Concentration ng/m$^3$ | Total Toxic Equivalence (1-TEQs) ng/m$^3$ |
|---|---|---|---|---|---|
| 2,3,7,8-TCDF | 0.014 | 0.1 | 0.0014 | 0.0032 | 0.00032 |
| Total TCDF isomers | 0.27 | | | | |
| 2,3,7,8-TCDD | <0.001 | 1 | 0.0005 | <0.00023 | 0.00011 |
| Total TCDD isomers | 0.01 | | | | |
| | | | | | |
| 1,2,3,7,8-PeCDF | 0.023 | 0.05 | 0.00115 | 0.0053 | 0.00026 |
| 2,3,4,7,8-PeCDF | 0.0026 | 0.5 | 0.0013 | 0.00059 | 0.0003 |
| Total PeCDF isomers | 0.084 | | | | |
| 1,2,3,7,8-PeCDD | <0.0008 | 0.5 | 0.0002 | <0.00018 | 0.000046 |
| Total PeCDD isomers | <0.005 | | | | |
| | | | | | |
| 1,2,3,4,7,8-HxCDF | 0.0092 | 0.1 | 0.00092 | 0.0021 | 0.00021 |
| 1,2,3,6,7,8-HxCDF | 0.008 | 0.1 | 0.0008 | 0.0018 | 0.00018 |
| 2,3,4,6,7,8-HxCDF | 0.0019 | 0.1 | 0.00019 | 0.00043 | 0.000043 |
| 1,2,3,7,8,9-HxCDF | <0.002 | 0.1 | 0.0001 | <0.00046 | 0.000023 |
| Total HxCDF isomers | 0.056 | | | | |
| 1,2,3,4,7,8-HxCDD | <0.001 | 0.1 | 0.00005 | <0.00023 | 0.000011 |
| 1,2,3,6,7,8-HxCDD | <0.001 | 0.1 | 0.00005 | <0.00023 | 0.000011 |
| 1,2,3,7,8,9-HxCDD | <0.001 | 0.1 | 0.00005 | <0.00023 | 0.000011 |
| Total HxCDD isomers | 0.0028 | | | | |
| | | | | | |
| 1,2,3,4,6,7,8-HpCDF | 0.017 | 0.01 | 0.00017 | 0.0039 | 0.000039 |
| 1,2,3,4,7,8,9-Hp CDF | 0.011 | 0.01 | 0.00011 | 0.0025 | 0.000025 |
| Total HpCDF isomers | 0.038 | | | | |
| 1,2,3,4,6,7,8-HpCDD | 0.0049 | 0.01 | 0.000049 | 0.0011 | 0.000011 |
| Total HpCDD isomers | 0.0091 | | | | |
| | | | | | |
| OCDF | 0.028 | 0.001 | 0.000028 | 0.0064 | 0.0000064 |
| OCDD | 0.018 | 0.001 | 0.000018 | 0.0041 | 0.0000041 |

I-TEQ$_{DF}$

| | | |
|---|---|---|
| Lower Bound (excluding LOD Values) | 0.0061 | ng |
| Middle Bound (including half LOD Values) | 0.0071 | ng |
| Date Tested 18-Mar-16 | | |

**Table 15 Stack 1 Elemental Metals Results, 18 March 2016**

| Sample | Total Particulate Metals (mg) | Total Particulate Metals ($mg/m^3$) | Total Gaseous Metals (mg) | Total Gaseous Metals ($mg/m^3$) | Total Oxidisable Mercury (mg) | Total Oxidisable Mercury ($mg/m^3$) | Total (mg) | Total ($mg/m^3$) | Mass Emission Rate (mg/s) |
|---|---|---|---|---|---|---|---|---|---|
| Antimony | <0.0002 | <0.00015 | <0.0001 | <0.000073 | | | <0.0002 | <0.00015 | <0.0038 |
| Arsenic | <0.0002 | <0.00015 | <0.0001 | <0.000073 | | | <0.0002 | <0.00015 | <0.0038 |
| Beryllium | <0.0002 | <0.00015 | <0.0001 | <0.000073 | | | <0.0002 | <0.00015 | <0.0038 |
| Cadmium | 0.0008 | 0.00058 | 0.00075 | 0.00055 | | | 0.002 | 0.0015 | 0.038 |
| Chromium | 0.0002 | 0.00015 | 0.0099 | 0.0072 | | | 0.01 | 0.0073 | 0.19 |
| Cobalt | <0.0002 | <0.00015 | <0.0001 | <0.000073 | | | <0.0002 | <0.00015 | <0.0038 |
| Copper | <0.0012 | <0.00088 | 0.0014 | 0.001 | | | 0.0014 | 0.001 | 0.026 |
| Lead | <0.0002 | <0.00015 | 0.00055 | 0.0004 | | | 0.00055 | 0.0004 | 0.01 |
| Magnesium | <0.0496 | <0.036 | 0.0054 | 0.0039 | | | 0.0054 | 0.0039 | 0.1 |
| Manganese | <0.0011 | <0.0008 | 0.0017 | 0.0012 | | | 0.0017 | 0.0012 | 0.031 |
| Mercury | <0.0002 | <0.00015 | <0.0001 | <0.000073 | <0.0005 | <0.00037 | <0.0005 | <0.00037 | <0.0094 |
| Nickel | <0.0006 | <0.00044 | 0.00079 | 0.00058 | | | 0.00079 | 0.00058 | 0.015 |
| Selenium | <0.0009 | <0.00066 | <0.0009 | <0.00066 | | | <0.0002 | <0.00015 | <0.0038 |
| Thallium | <0.0002 | <0.00015 | <0.0001 | <0.000073 | | | <0.0002 | <0.00015 | <0.0038 |
| Tin | <0.0002 | <0.00015 | <0.0001 | <0.000073 | | | <0.0002 | <0.00015 | <0.0038 |
| Vanadium | <0.0002 | <0.00015 | <0.0001 | <0.000073 | | | <0.0002 | <0.00015 | <0.0038 |
| Zinc | <0.7812 | <0.57 | 0.0052 | 0.0038 | | | 0.0052 | 0.0038 | 0.097 |
| **Total Hazardous Metals*** | **0.001** | **0.00073** | **0.014** | **0.0099** | **<0.0005** | **<0.00037** | **0.015** | **0.011** | **0.28** |
| **Total Metals** | **0.001** | **0.00073** | **0.026** | **0.019** | | | **0.027** | **0.02** | **0.5** |

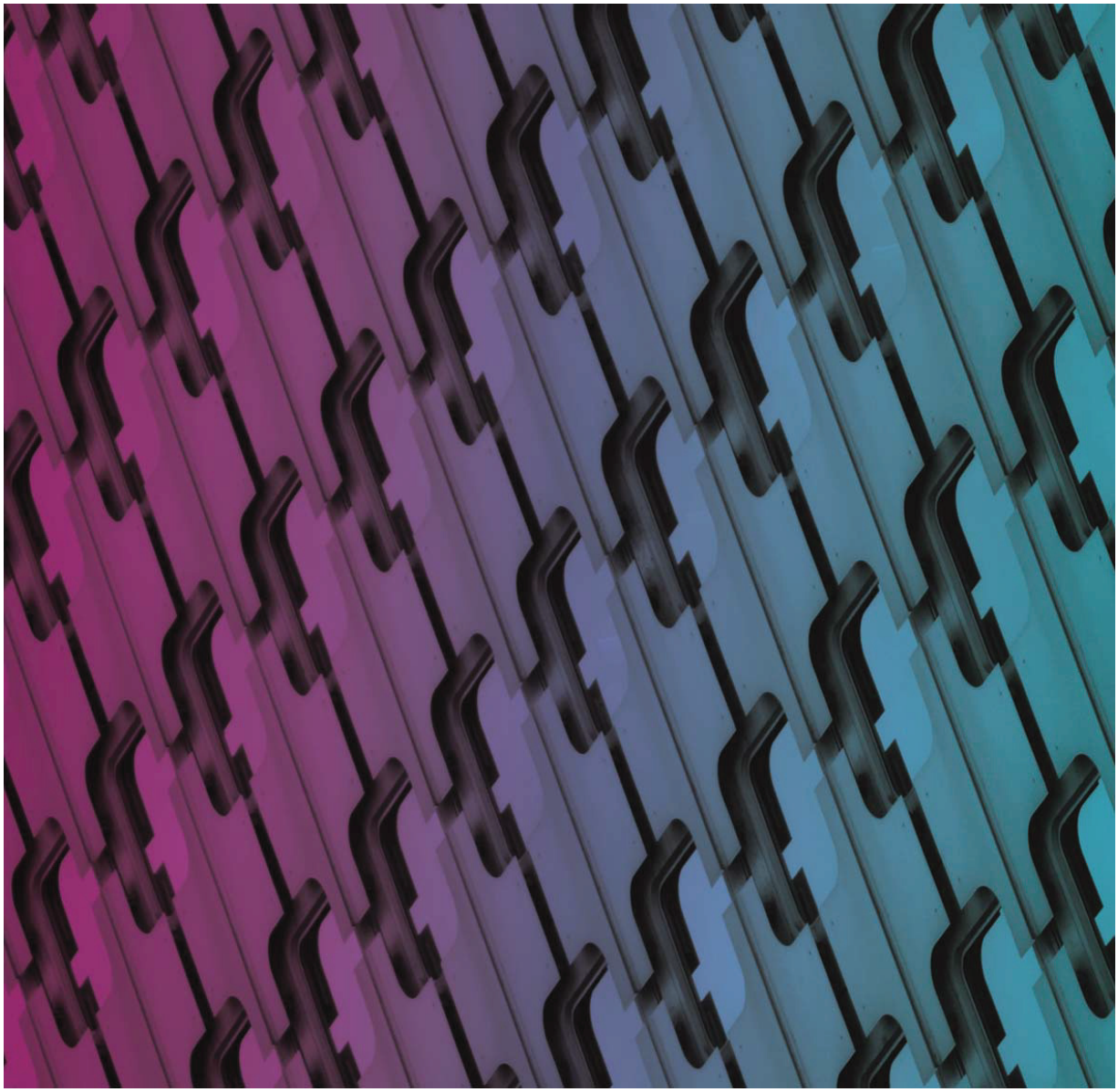
* Total does not include Copper, Magnesium and Zinc as they are classed non-hazardous

**Table 16 Stack 1 Speciated Polycyclic Aromatic Hydrocarbons Results, 18 March 2016**

| | Sample Result | | | Emission | | Mass Emission Rate | |
|---|---|---|---|---|---|---|---|
| | (ng) | (µg) | (mg) | (µg/m$^3$) | (mg/m$^3$) | (µg/s) | (mg/s) |
| Naphthalene | 42000 | 42 | 0.042 | 9.6 | 0.0096 | 240 | 0.24 |
| 2 - Methylnaphthalene | 46000 | 46 | 0.046 | 11 | 0.011 | 270 | 0.27 |
| Acenaphthylene | 120000 | 120 | 0.12 | 27 | 0.027 | 700 | 0.7 |
| Acenaphthene | 11000 | 11 | 0.011 | 2.5 | 0.0025 | 64 | 0.064 |
| Fluorene | 43000 | 43 | 0.043 | 9.8 | 0.0098 | 250 | 0.25 |
| Phenanthrene | 64000 | 64 | 0.064 | 15 | 0.015 | 370 | 0.37 |
| Anthracene | 2200 | 2.2 | 0.0022 | 0.5 | 0.0005 | 13 | 0.013 |
| Fluoranthene | 19000 | 19 | 0.019 | 4.3 | 0.0043 | 110 | 0.11 |
| Pyrene | 9900 | 9.9 | 0.0099 | 2.3 | 0.0023 | 58 | 0.058 |
| Benz(a)anthracene | <20 | <0.02 | <0.00002 | <0.0046 | <0.0000046 | <0.12 | <0.00012 |
| Chrysene | <20 | <0.02 | <0.00002 | <0.0046 | <0.0000046 | <0.12 | <0.00012 |
| Benzo(b)fluoranthene | <20 | <0.02 | <0.00002 | <0.0046 | <0.0000046 | <0.12 | <0.00012 |
| Benzo(k)fluoranthene | <20 | <0.02 | <0.00002 | <0.0046 | <0.0000046 | <0.12 | <0.00012 |
| Benzo(e)pyrene | <20 | <0.02 | <0.00002 | <0.0046 | <0.0000046 | <0.12 | <0.00012 |
| Benzo(a)pyrene | <20 | <0.02 | <0.00002 | <0.0046 | <0.0000046 | <0.12 | <0.00012 |
| Perylene | <20 | <0.02 | <0.00002 | <0.0046 | <0.0000046 | <0.12 | <0.00012 |
| Indeno(123:cd)pyrene | <20 | <0.02 | <0.00002 | <0.0046 | <0.0000046 | <0.12 | <0.00012 |
| Dibenzo(ah)anthracene | <20 | <0.02 | <0.00002 | <0.0046 | <0.0000046 | <0.12 | <0.00012 |
| Benzo(ghi)perylene | <20 | <0.02 | <0.00002 | <0.0046 | <0.0000046 | <0.12 | <0.00012 |
| **Sum of reported PAH's** | **360000** | **360** | **0.36** | **82** | **0.082** | **2100** | **2.1** |

# Stack 1 Emissions Testing Report June 2016

## Pharmaceutical Waste Trial



# Stack 1 Emissions Testing Report June 2016

Pharmaceutical Waste Trial

Client: Weston Aluminium

ABN: 91 075 245 108

Prepared by

**AECOM Australia Pty Ltd**
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02-Sep-2016

Job No.: 60489919

AECOM in Australia and New Zealand is certified to the latest version of ISO9001, ISO14001, AS/NZS4801 and OHSAS18001.

# Quality Information

Document Stack 1 Emissions Testing Report June 2016

Ref 60489919

Date 02-Sep-2016

Prepared by James Lang Approved Signatory 

Reviewed by Paul Wenta

Revision History

| Revision | Revision Date | Details | Authorised | |
|---|---|---|---|---|
| | | | Name/Position | Signature |
| 0 | 02-Sep-2016 | Final Report | Chad Whitburn<br>Compliance Services - Team Leader |  |

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# Table of Contents



**List of Tables**

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# 1.0 Introduction

AECOM was appointed by Weston Aluminium Pty Ltd to conduct a series of measurements to determine air emissions from Stack 1 located at their Weston plant in Kurri Kurri, NSW while processing Pharmaceutical waste. Emission testing was a compliance requirement of Environmental Protection Licence (EPL) number 6423.

Testing was conducted on 30 June 2016 to determine emission concentrations for the following parameters:

**Stack 1 (EPL Point 1)**

- Total Particulate;
- Fine Particulate ($PM_{10}$);
- Sulfuric Acid Mist ($H_2SO_4$ as $SO_3$);
- Sulfur Dioxide ($SO_2$ as $SO_3$);
- Chlorine;
- Hydrogen Chloride;
- Gaseous Fluoride;
- Particulate Fluoride;
- Hazardous Substances (Metals);
- Volatile Organic Compounds (VOC);
- Oxides of Nitrogen;
- Carbon Monoxide;
- Carbon Dioxide;
- Oxygen;
- Cyanide;
- Polycyclic Aromatic Hydrocarbon (PAH); and
- Dioxins and Furans.

Laboratory analysis was conducted by the following laboratories, which hold NATA accreditation for the specified tests:

- Steel River Testing Pty. Ltd., NATA accreditation number 18079, performed the following analysis detailed in report number 11667-0-P, 11667-0-M and 11616-0-M:
    - Moisture;
    - Fine Particulate ($PM_{10}$); and
    - Total Particulate.
- Australian Laboratory Services, NATA accreditation number 18079, performed the following analysis detailed in report number EN1602522:
    - Fluoride;
    - Cyanide;
    - Sulfuric Acid Mist;
    - Sulfur Dioxide;
    - Hydrogen Chloride;
    - Chlorine; and
    - Volatile Organic Compounds.

- National Measurements Institute, NATA accreditation number 198, performed the following analysis detailed in report number ORG16_049 and DAU16-166:
    - Polycyclic Aromatic Hydrocarbons; and
    - Dioxins and Furans.
- SGS Leeder Consulting, NATA accreditation number 14429, performed the following analysis detailed in report number M161500:
    - Hazardous Substances (Metals).

# 2.0 Sampling Plane Requirements

The criteria for sampling planes are specified in AS 4323.1-1995 (R2014).

**Table 1 Criteria for Selection of Sampling Planes (AS 4323. 1)**

| Type of flow disturbance | Minimum distance upstream from disturbance, diameters (D) | Minimum distance downstream from disturbance, diameters (D) |
|---|---|---|
| Bend, connection, junction, direction change | >2D | >6D |
| Louvre, butterfly damper (partially closed or closed) | >3D | >6D |
| Axial fan | >3D | >8D (see Note) |
| Centrifugal fan | >3D | >6D |

*NOTE: The plane should be selected as far as practicable from a fan. Flow straighteners may be required to ensure the position chosen meets the check criteria listed in Items (a) to (f) below.*

*a. The gas flow is basically in the same direction at all points along each sampling traverse.*

*b. The gas velocity at all sampling points is greater than 3 m/s.*

*c. The gas flow profile at the sampling plane shall be steady, evenly distributed and not have a cyclonic component which exceeds an angle of 15$^{o}$ to the duct axis, when measured near the periphery of a circular sampling plane.*

*d. The temperature difference between adjacent points of the survey along each sampling traverse is less than 10% of the absolute temperature, and the temperature at any point differs by less than 10% from the mean.*

*e. The ratio of the highest to lowest pitot pressure difference shall not exceed 9:1 and the ratio of highest to lowest gas velocities shall not exceed 3:1. For isokinetic testing with the use of impingers, the gas velocity ratio across the sampling plane should not exceed 1.6:1.*

*f. The gas temperature at the sampling plane should preferably be above the dewpoint.*

Stack 1 (EPA Identification No. 1) did not satisfy the requirements of AS 4323.1 Section 4.1 with regard to the upstream and downstream distances from disturbances. To compensate for this, additional sampling points were added in accordance with AS 4323.1 Section 4.2.

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# 3.0 Methodology

## 3.1 NATA Accredited Methods

The following methods are accredited with the National Association of Testing Authorities (NATA), Accreditation No. 2778 (14391), and are approved for the sampling and analysis of gases and aerosols. Specific details of the methods are available on request.

All sampling and analysis is conducted according to the methods in **Table 2**.

**Table 2 AECOM NATA Endorsed Methods**

| NSW EPA Approved Methods | USEPA Methods | Parameter Measured |
|---|---|---|
| NSW EPA TM-1 (AS 4323.1-1995) | USEPA (2000) Method 1 under approved circumstances | Selection of sampling positions |
| NSW EPA TM-2 | USEPA (2000) Method 2 or 2C or USEPA (1999) Method 2F or 2G or 2H (as appropriate) | Velocity or volumetric flow rate or temperature or pressure of stack gases |
| NSW EPA TM-3 | USEPA (2000) Method 8 (for sampling and analysis) or APHA (1998) Method 4110B (for analysis only if interference from fluorides, free ammonia and/or dimethyl aniline has been demonstrated to the satisfaction of the Chief Scientist) (as appropriate) | Sulfuric acid mist ($H_2SO_4$) or sulphur trioxide ($SO_3$) |
| NSW EPA TM-4 | USEPA (2000) Method 6 or 6A or 6B or USEPA (1996) Method 6C or ISO (1989) Method 7934 or ISO (1992) Method 7935 or ISO (1993) Method 10396 or ISO (1998) Method 11632 (as appropriate) | Sulfur dioxide ($SO_2$) |
| NSW EPA TM-7 | USEPA (2000) 26A | Chlorine ($Cl_2$) |
| NSW EPA TM-8 | USEPA (2000) 26A | Hydrogen chloride (HCl) |
| NSW EPA TM-9 | USEPA (2000) Method 13A or 13B (as appropriate) | Fluorine ($F_2$) or any compound containing fluorine, except where emitted by a primary aluminium smelter while manufacturing aluminium from alumina |
| NSW EPA TM-12 | USEPA (2000) Method 29 or USEPA (2000) Method 102 (for mercury only in hydrogen rich streams) (as appropriate) | Type 1 substances (elements antimony (Sb), arsenic (As), cadmium (Cd), lead (Pb) or mercury (Hg) or any compound containing one or more of those elements) |
| NSW EPA TM-13 | USEPA (2000) Method 29 (Analysis for tin and vanadium to be done by Inductively Coupled Argon Plasma Emission Spectroscopy (ICAP) as defined in USEPA Method 29) or USEPA (1986) Method 7910 (for vanadium only) or USEPA (1986) Method 7911 (for vanadium only) (as appropriate) | Type 2 substances (elements beryllium (Be), chromium (Cr), cobalt (Co), manganese (Mn), nickel (Ni), selenium (Se), tin (Sn) or vanadium (V) or any compound containing one or more of those elements) |
| NSW EPA TM-14 | Cadmium (Cd) or mercury (Hg) or any compound containing one or more of those elements | USEPA (2000) Method 29 or USEPA (2000) Method 102 (for mercury only in hydrogen rich streams) (as appropriate) |
| NSW EPA TM-15 (AS 4323.2-1995) | USEPA (2000) Method 5 under approved circumstances | Solid particles (Total) |

| NSW EPA Approved Methods | USEPA Methods | Parameter Measured |
|---|---|---|
| NSW EPA TM-22 | USEPA (2000) Method 4 | Moisture content in stack gases |
| NSW EPA TM-23 | USEPA (2000) Method 3 | Dry gas density or molecular weight of stack gases |
| NSW EPA TM-34 | USEPA (2000) Method 18 or USEPA (2000) Method 25 or 25A or 25B or 25C or 25D or 25E (as appropriate) | Volatile organic compounds |
| NSW EPA OM-5 | USEPA (1997) Method 201 or 201A (as appropriate) | 'Fine' particulates ($PM_{10}$) |
| NSW EPA OM-6 | California EPA Air Resources Board (1997) Method 429 | Polycyclic aromatic hydrocarbons (PAHs) |
| NSW EPA TM-32 | USEPA Method 10 | Determination of Carbon Monoxide emissions from stationary sources |
| NSW EPA TM-25 | USEPA (1990) Method 3A | Determination of Oxygen concentrations from stationary sources |
| NSW EPA TM-24 | USEPA (1990) Method 3A | Carbon dioxide ($CO_2$) in stack gases |
| NSW EPA TM-11 | USEPA(2000) Method 7C | Determination of Nitrogen dioxide or nitric oxide emissions from stationary sources |
| NSW EPA TM-18 | USEPA (1995) Method 23 | Dioxins and Furans |

## 3.2 Deviations from NATA Accredited Methods

The following method is not accredited with the National Association of Testing Authorities (NATA), Accreditation No. 2778 (14391). Specific details of the methods are available on request.

All sampling and analysis is conducted according to the method in **Table 3**.

**Table 3 NATA Method Deviations**

| USEPA Methods | Parameter Measured |
|---|---|
| USEPA (2011) Other Test Method 29 | Sampling and analysis for Hydrogen Cyanide emissions from stationary sources |

# 4.0 Sampling Location

## 4.1 Sampling Location Summary

**Table 4** provides a summary of the location sampled by AECOM on 30 June 2016 at the Weston Aluminium plant in Kurri Kurri, NSW.

**Table 4 Sampling Location Summary**

| Discharge Description | Stack 1 (EPA Identification No. 1) |
|---|---|
| Duct Shape | Circular |
| Construction Material | Metal |
| Duct Diameter (mm) | 1650 |
| Minimum No. Sampling Points | 16 |
| Sampling Ports | 2 |
| Min. Points/Traverse | 8 |
| Disturbance | Yes |
| Distance from Upstream Disturbance | 2D |
| Type of Disturbance | Fan entry |
| Distance from Downstream Disturbance | 4D |
| Type of Disturbance | Stack Exit |
| Ideal Sampling Location | No |
| Correction Factors Applied | Yes |
| Total No. Points Sampled | 20 |
| Points/Traverse | 10 |
| Sampling Performed to Standard* | Yes[2] |

*AS 4323.1 Stationary source emissions Method 1 – Selection of sampling positions

[1] AS 4323.1 Section 4.1

[2] AS 4323.1 Section 4.2

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# 5.0 Equipment Calibration

AECOM has a calibration schedule to ensure the emission testing equipment is maintained in good order and with known calibration. Equipment used in this project was calibrated according to the procedures and frequency identified in the AECOM calibration schedule. Details of the schedule and the calibration calculations are available on request.

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# 6.0 Results

A summary of test results for June 2016 testing is presented in **Table 5**. Calculated Fine Particulate ($PM_{10}$) cut size is displayed in **Table 6**. Gas Data Concentrations and Mass Emission Rate summaries are reported in **Tables 7 & 8** respectively. Detailed results along with gas stream properties during the testing periods can be found in **Tables 9** to **12**. Speciated Volatile Organic Carbons and Dioxins and Furan results can be found in **Tables 13 & 14,** Hazardous Substances (Metals) results in **Table 15**, and Polycyclic Aromatic Hydrocarbons results in **Table 16**.

All emission concentrations are converted to standard conditions of 0°C, dry gas and 1 atm pressure for comparison with regulatory limits outlined in the Weston Aluminium Environmental Protection Licence 6423.

Field notes recorded during the project are attached as **Appendix A**. with Laboratory Analysis Reports attached as **Appendix B**, and Raw & Calculated Gas Data as **Appendix C**.

**Table 5 Stack Emissions Results Summary 30 June 2016**

| Parameter | Stack 1<br>EPL Point 1 |
|---|---|
| Carbon Monoxide (CO) (ppm) | 2 *(100)* |
| Chlorine ($mg/m^3$) | <1.8 |
| Cyanide | 0.33 *(0.5)* |
| Fine Particulate ($PM_{10}$) ($mg/m^3$) | 0.83 |
| Gaseous Fluoride ($mg/m^3$) | 0.03 *(2)* |
| Hydrogen Chloride ($mg/m^3$) | <9.1 *(400)* |
| Oxides of Nitrogen (as Equivalent $NO_2$) ($mg/m^3$) | 7 *(2500)* |
| Oxygen (%) | 20.5 |
| Carbon Dioxide (%) | <0.1 |
| Particulate Fluoride ($mg/m^3$) | 0.13 |
| Sulfur Dioxide ($SO_2$ as $SO_3$) ($mg/m^3$) | <9.6 |
| Sulfuric Acid Mist ($H_2SO_4$ as $SO_3$) ($mg/m^3$) | <1.9 *(100)* |
| Total Particulate ($mg/m^3$) | 2.6 *(25)* |
| Total Polycyclic Aromatic Hydrocarbons ($mg/m^3$) | 0.053 |
| Dioxins and Furans Lower Bound | 0.0053 |
| Dioxins and Furans Middle Bound | 0.0053 |
| Type 1 and 2 Substances in Aggregate (Metals) ($mg/m^3$) | 0.0087 *(10)* |
| Volatile Organic Compounds (VOC) ($mg/m^3$) | 0.4 |

Note – EPL Limits are in parenthesis

USEPA method 201A, section 6.3.5 (Determination of $PM_{10}$ Emissions) and USEPA Conditional Test Method 040, Section 17, Table 2 (Determination of $PM_{2.5}$ Emissions) specifies that results are acceptable provided the calculated aerodynamic cut size ($D_{50}$) for the test lies between 9.0μm and 11.0μm. Post sampling cut size calculations performed for the sampling conducted are displayed in **Table 6**.

Cut size, or $D_{50}$, refers to the aerodynamic diameter of the particles contained in the gas stream which can be captured with a 50% efficiency and is a calculated value. For a Fine Particulate ($PM_{10}$) test particle sizes of 10μm and less are expected.

The cut size ($D_{50}$) is calculated prior to testing and is based on the pre-test measurements such as stack gas velocity, stack gas temperature, moisture content of the gas stream and stack gas density. This pre-test calculation of cut size ($D_{50}$) is used in conjunction with the pre-test measurements, some of which are stated above, to establish the sampling conditions or parameters.

**Table 6 Calculated $PM_{10}$ Cut Size**

| Sampling Location | $PM_{10}$ Cut Size ($D_{50}$) |
|---|---|
| Stack 1 | 9.6 |

The calculated cut sizes meet the criteria for cut size conditions stated above.

**Table 7 Calculated Gas Concentrations Data Summary, 30 June 2016**

| Parameter | Stack 1 |
|---|---|
| Time Period | 8:30-9:30 |
| Nitrogen Oxide (NO) ($mg/m^3$) | 4 |
| Nitrogen Dioxide ($NO_2$) ($mg/m^3$) | 0.1 |
| Nitrogen Oxides ($NO_x$) ($mg/m^3$) | 5 |
| Oxides of Nitrogen as Equivalent $NO_2$ ($mg/m^3$) | *7 (2500)* |
| Carbon Monoxide (ppm) | *2 (100)* |
| Carbon Monoxide ($mg/m^3$) | 3 |
| Carbon Dioxide (%) | <0.1 |
| Oxygen (%) | 20.5 |

Note – EPL Limits are provided in parenthesis.

**Table 8 Gas Mass Emission Rates Summary, 30 June 2016**

| Parameter | Stack 1 |
|---|---|
| Time Period | 8:30-9:30 |
| Stack Gas Flow Rate (0°C, dry gas, 1 atm pressure) | 25 |
| Nitrogen Oxide (NO) (mg/s) | 100 |
| Nitrogen Dioxide ($NO_2$) (mg/s) | 0.25 |
| Nitrogen Oxides ($NO_x$) (mg/s) | 125 |
| Oxides of Nitrogen as Equivalent $NO_2$ (mg/s) | 175 |
| Carbon Monoxide (mg/s) | 75 |

**Table 9 Stack 1 Fine Particulate ($PM_{10}$), Total Particulate, Particulate Fluoride and Gaseous Fluoride Results, 30 June 2016**

| | | | | |
|---|---|---|---|---|
| **Sampling Conditions:** | | | | |
| Stack internal diameter at test location | 1650 | mm | | |
| Stack gas temperature (average) | 59.0 | $^{o}$C | 332.2 | K |
| Stack pressure (average) | 1021 | hPa | | |
| Stack gas velocity (average, stack conditions) | 14 | m/s | | |
| Stack gas flowrate (stack conditions) | 31 | $m^3$/s | | |
| Stack gas flowrate ($0^0$C, dry gas, 1 atm pressure) | 25 | $m^3$/s | | |
| **Fine Particulate (PM10) Testing** | | | | |
| Test Period | 9:05 | - | 10:45 | |
| Fine Particulate (PM10) Mass | 1.1 | mg | | |
| Gas Volume Sampled | 1.32 | $m^3$ | | |
| Fine Particulate (PM10) Emission*1 | 0.83 | mg/$m^3$ | | |
| Fine Particulate (PM10) Mass Emission Rate*2 | 21 | mg/s | | |
| Regulatory Limit | NA | mg/$m^3$ | | |
| **Total Particulate Testing** | | | | |
| Test Period | 9:05 | - | 10:45 | |
| Total Particulate Mass | 2.6 | mg | | |
| Gas Volume Sampled | 0.989 | $m^3$ | | |
| Total Particulate Emission*1 | 2.6 | mg/$m^3$ | | |
| Total Particulate Mass Emission Rate*2 | 65 | mg/s | | |
| Regulatory Limit | 25 | mg/$m^3$ | | |
| **Particulate Fluoride Testing** | | | | |
| Test Period | 9:05 | - | 10:45 | |
| Particulate Fluoride Mass | 0.133 | mg | | |
| Gas Volume Sampled | 0.995 | $m^3$ | | |
| Particulate Fluoride Emission*1 | 0.13 | mg/$m^3$ | | |
| Particulate Fluoride Mass Emission Rate*2 | 3.3 | mg/s | | |
| Regulatory Limit | NA | mg/$m^3$ | | |
| **Gaseous Fluoride Testing** | | | | |
| Test Period | 9:05 | - | 10:45 | |
| Gaseous Fluoride Mass | 0.03 | mg | | |
| Gas Volume Sampled | 0.995 | $m^3$ | | |
| Gaseous Fluoride Emission*1 | 0.03 | mg/$m^3$ | | |
| Gaseous Fluoride Mass Emission Rate*2 | 0.75 | mg/s | | |
| Regulatory Limit | 2 | mg/$m^3$ | | |
| **Moisture Content (%)** | **1.3** | | | |
| **Gas Density (dry at 1 atmosphere)** | **1.29** | **kg/$m^3$** | | |
| **Dry Molecular Weight** | **28.9** | **g/g-mole** | | |

Notes *1 Emission concentration at Standard conditions of $0^0$C, 1 atm, dry gas

*2 Mass emission rate determined from pre and post test sampling flow measurements and the respective test moisture content. See $Q_{std}$ in field sheets and final calculations "Stack Analysis - Final Calculations" for each test.

**Table 10 Stack 1 Hazardous Substances (Metals) and Cyanide Results, 30 June 2016**

| | | | | |
|---|---|---|---|---|
| **Sampling Conditions:** | | | | |
| Stack internal diameter at test location | 1650 | mm | | |
| Stack gas temperature (average) | 54.0 | $^{o}$C | 327.2 | K |
| Stack pressure (average) | 1021 | hPa | | |
| Stack gas velocity (average, stack conditions) | 15 | m/s | | |
| Stack gas flowrate (stack conditions) | 32 | $m^3$/s | | |
| Stack gas flowrate ($0^0$C, dry gas, 1 atm pressure) | 27 | $m^3$/s | | |
| **Hazardous Substances (Metals) Testing** | | | | |
| Test Period | 12:54 | - | 14:34 | |
| Hazardous Substances (Metals) Mass | 0.01 | mg | | |
| Gas Volume Sampled | 1.17 | $m^3$ | | |
| Hazardous Substances (Metals) Emission*1 | 0.0087 | $mg/m^3$ | | |
| Hazardous Substances (Metals) Mass Emission Rate*2 | 0.23 | mg/s | | |
| Regulatory Limit | 10 | $mg/m^3$ | | |
| **Cyanide Testing** | | | | |
| Test Period | 12:54 | - | 14:34 | |
| Cyanide Mass | 0.30 | mg | | |
| Gas Volume Sampled | 0.913 | $m^3$ | | |
| Cyanide Emission*1 | 0.33 | $mg/m^3$ | | |
| Cyanide Mass Emission Rate*2 | 8.9 | mg/s | | |
| Regulatory Limit | 0.5 | $mg/m^3$ | | |
| **Moisture Content (%)** | **1.0** | | | |
| **Gas Density (dry at 1 atmosphere)** | **1.29** | **$kg/m^3$** | | |
| **Dry Molecular Weight** | **28.8** | **g/g-mole** | | |

Notes *1 Emission concentration at Standard conditions of $0^0$C, 1 atm, dry gas

*2 Mass emission rate determined from pre and post test sampling flow measurements and the respective test moisture content. See $Q_{std}$ in field sheets and final calculations "Stack Analysis - Final Calculations" for each test.

**Table 11 Stack 1 Hydrogen Chloride, Chlorine, Sulfuric Acid Mist ($H_2SO_4$ as $SO_3$) and Sulfur Dioxide ($SO_2$ as $SO_3$) Results, 30 June 2016**

| | | | |
|---|---|---|---|
| **Sampling Conditions:** | | | |
| Stack internal diameter at test location | 1650 mm | | |
| Stack gas temperature (average) | 63.5 °C | 336.7 | K |
| Stack pressure (average) | 1021 hPa | | |
| Stack gas velocity (average, stack conditions) | 15 m/s | | |
| Stack gas flowrate (stack conditions) | 32 $m^3/s$ | | |
| Stack gas flowrate ($0^0$C, dry gas, 1 atm pressure) | 25 $m^3/s$ | | |
| **Sulfuric Acid Mist (H2SO4 as SO3) Testing** | | | |
| Test Period | 11:04- | 12:44 | |
| Sulfuric Acid Mist (H2SO4 as SO3) Mass | <2 mg | | |
| Gas Volume Sampled | 1.04 $m^3$ | | |
| Sulfuric Acid Mist (H2SO4 as SO3) Emission*1 | <1.9 $mg/m^3$ | | |
| Sulfuric Acid Mist (H2SO4 as SO3) Mass Emission Rate*2 | <48 mg/s | | |
| Regulatory Limit | 100 $mg/m^3$ | | |
| **Sulfur Dioxide (SO2 as SO3) Testing** | | | |
| Test Period | 11:04- | 12:44 | |
| Sulfur Dioxide (SO2 as SO3) Mass | <10 mg | | |
| Gas Volume Sampled | 1.04 $m^3$ | | |
| Sulfur Dioxide (SO2 as SO3) Emission*1 | <9.6 $mg/m^3$ | | |
| Sulfur Dioxide (SO2 as SO3) Mass Emission Rate*2 | <240 mg/s | | |
| Regulatory Limit | NA $mg/m^3$ | | |
| **Hydrogen Chloride Testing** | | | |
| Test Period | 11:04- | 12:44 | |
| Hydrogen Chloride Mass | <10 mg | | |
| Gas Volume Sampled | 1.09 $m^3$ | | |
| Hydrogen Chloride Emission*1 | <9.1 $mg/m^3$ | | |
| Hydrogen Chloride Mass Emission Rate*2 | <230 mg/s | | |
| Regulatory Limit | 400 $mg/m^3$ | | |
| **Chlorine Testing** | | | |
| Test Period | 11:04- | 12:44 | |
| Chlorine Mass | <2 mg | | |
| Gas Volume Sampled | 1.09 $m^3$ | | |
| Chlorine Emission*1 | <1.8 $mg/m^3$ | | |
| Chlorine Mass Emission Rate*2 | <46 mg/s | | |
| Regulatory Limit | NA $mg/m^3$ | | |
| **Moisture Content (%)** | **1.4** | | |
| **Gas Density (dry at 1 atmosphere)** | **1.29 $kg/m^3$** | | |
| **Dry Molecular Weight** | **28.8 g/g-mole** | | |

Notes *1 Emission concentration at Standard conditions of $0^0$C, 1 atm, dry gas
*2 Mass emission rate determined from pre and post test sampling flow measurements and the respective test moisture content. See $Q_{std}$ in field sheets and final calculations "Stack Analysis - Final Calculations" for each test.

**Table 12 Stack 1 Polycyclic Aromatic Hydrocarbon (PAH), Dioxins and Furans Results, 30 June 2016**

| **Sampling Conditions:** | | | | |
|---|---|---|---|---|
| Stack internal diameter at test location | 1650 | mm | | |
| Stack gas temperature (average) | 49.5 | $^{o}$C | 322.7 | K |
| Stack pressure (average) | 1021 | hPa | | |
| Stack gas velocity (average, stack conditions) | 15 | m/s | | |
| Stack gas flowrate (stack conditions) | 31 | $m^3$/s | | |
| Stack gas flowrate ($0^0$C, dry gas, 1 atm pressure) | 26 | $m^3$/s | | |
| **Dioxins and Furans Lower Bound Testing** | | | | |
| Test Period | 8:21 | - | 14:21 | |
| Dioxins and Furans Lower Bound Mass | 0.018 | mg | | |
| Gas Volume Sampled | 3.42 | $m^3$ | | |
| Dioxins and Furans Lower Bound Emission*1 | 0.0053 | mg/$m^3$ | | |
| Dioxins and Furans Lower Bound Mass Emission Rate*2 | 0.14 | mg/s | | |
| Regulatory Limit | NA | mg/$m^3$ | | |
| **Dioxins and Furans Middle Bound Testing** | | | | |
| Test Period | 8:21 | - | 14:21 | |
| Dioxins and Furans Middle Bound Mass | 0.018 | mg | | |
| Gas Volume Sampled | 3.42 | $m^3$ | | |
| Dioxins and Furans Middle Bound Emission*1 | 0.0053 | mg/$m^3$ | | |
| Dioxins and Furans Middle Bound Mass Emission Rate*2 | 0.14 | mg/s | | |
| Regulatory Limit | NA | mg/$m^3$ | | |
| **Polycyclic Aromatic Hydrocarbons Testing** | | | | |
| Test Period | 8:21 | - | 14:21 | |
| Polycyclic Aromatic Hydrocarbons Mass | 0.18 | mg | | |
| Gas Volume Sampled | 3.42 | $m^3$ | | |
| Polycyclic Aromatic Hydrocarbons Emission*1 | 0.053 | mg/$m^3$ | | |
| Polycyclic Aromatic Hydrocarbons Mass Emission Rate*2 | 1.4 | mg/s | | |
| Regulatory Limit | NA | mg/$m^3$ | | |
| **Moisture Content (%)** | **1.3** | | | |
| **Gas Density (dry at 1 atmosphere)** | **1.29** | **kg/$m^3$** | | |
| **Dry Molecular Weight** | **28.8** | **g/g-mole** | | |

Notes *1 Emission concentration at Standard conditions of $0^0$C, 1 atm, dry gas

*2 Mass emission rate determined from pre and post test sampling flow measurements and the respective test moisture content. See $Q_{std}$ in field sheets and final calculations "Stack Analysis - Final Calculations" for each test.

**Table 13 Stack 1 Speciated Volatile Organic Compounds Results, 30 June 2016**

| Analyte | Sample µg | Blank µg | Sample Blank Corrected µg | (mg/m$^3$) | mg/s |
|---|---|---|---|---|---|
| Acetone | <1.0 | <1.0 | <1.0 | <0.18 | <4.9 |
| 1,1-dichloroethane | <1.0 | <1.0 | <1.0 | <0.18 | <4.9 |
| 2-Butanone | <1.0 | <1.0 | <1.0 | <0.18 | <4.9 |
| Chloroform | <1.0 | <1.0 | <1.0 | <0.18 | <4.9 |
| Benzene | 1.1 | <1.0 | 0.6 | 0.11 | 3 |
| 1-heptene | <1.0 | <1.0 | <1.0 | <0.18 | <4.9 |
| n-heptane | <1.0 | <1.0 | <1.0 | <0.18 | <4.9 |
| Trichloroethene | <1.0 | <1.0 | <1.0 | <0.18 | <4.9 |
| MIBK | <1.0 | <1.0 | <1.0 | <0.18 | <4.9 |
| Toluene | 1.9 | <1.0 | 1.4 | 0.25 | 6.8 |
| 2-hexanone | <1.0 | <1.0 | <1.0 | <0.18 | <4.9 |
| Chlorobenzene | <1.0 | <1.0 | <1.0 | <0.18 | <4.9 |
| Ethyl Benzene | <1.0 | <1.0 | <1.0 | <0.18 | <4.9 |
| m- & p-xylene | <2.0 | <0.2 | <2.0 | <0.36 | <9.7 |
| o-xylene | <1.0 | <1.0 | <1.0 | <0.18 | <4.9 |
| Styrene | <1.0 | <1.0 | <1.0 | <0.18 | <4.9 |
| Cyclohexanone | <1.0 | <1.0 | <1.0 | <0.18 | <4.9 |
| Isopropylbenzene | <1.0 | <1.0 | <1.0 | <0.18 | <4.9 |
| 2-chlorotoluene | <1.0 | <1.0 | <1.0 | <0.18 | <4.9 |
| 4-chlorotoluene | <1.0 | <1.0 | <1.0 | <0.18 | <4.9 |
| 1,3,5-trimethylbenzene | <1.0 | <1.0 | <1.0 | <0.18 | <4.9 |
| n-decane | <1.0 | <1.0 | <1.0 | <0.18 | <4.9 |
| 1,2,4-trimethylbenzene | <1.0 | <1.0 | <1.0 | <0.18 | <4.9 |
| 1,3-dichlorobenzene | <1.0 | <1.0 | <1.0 | <0.18 | <4.9 |
| 1,4-dichlorobenzene | <1.0 | <1.0 | <1.0 | <0.18 | <4.9 |
| 1,2-dichlorobenzne | <1.0 | <1.0 | <1.0 | <0.18 | <4.9 |
| n-butylbenzene | <1.0 | <1.0 | <1.0 | <0.18 | <4.9 |
| Hexachlorobutadiene | <1.0 | <1.0 | <1.0 | <0.18 | <4.9 |
| **Total** | **3.0** | | **2.0** | **0.4** | **9.8** |

Note: Where the blank has returned a less than value, the analysed value has been corrected for half of that blank value. i.e. a blank value of <0.5 has had 0.25 subtracted from the analysed value.

**Table 14 Stack 1 Speciated Dioxins And Furans Results, 30 June 2016**

| Analyte | Mass ng | Toxic Equivalency Factor (1 - TEFs) | Total Toxic Equivalence (1 - TEQs) ng | Concentration ng/m$^3$ | Total Toxic Equivalence (1-TEQs) ng/m$^3$ |
|---|---|---|---|---|---|
| 2,3,7,8-TCDF | 0.0049 | 0.1 | 0.00049 | 0.0014 | 0.00014 |
| Total TCDF isomers | 0.057 | | | | |
| 2,3,7,8-TCDD | 0.0054 | 1 | 0.0054 | 0.0016 | 0.0016 |
| Total TCDD isomers | 0.038 | | | | |
| | | | | | |
| 1,2,3,7,8-PeCDF | 0.0041 | 0.05 | 0.000205 | 0.0012 | 0.00006 |
| 2,3,4,7,8-PeCDF | 0.0035 | 0.5 | 0.00175 | 0.001 | 0.00051 |
| Total PeCDF isomers | 0.026 | | | | |
| 1,2,3,7,8-PeCDD | 0.0017 | 0.5 | 0.00085 | 0.0005 | 0.00025 |
| Total PeCDD isomers | 0.027 | | | | |
| | | | | | |
| 1,2,3,4,7,8-HxCDF | 0.0092 | 0.1 | 0.00092 | 0.0027 | 0.00027 |
| 1,2,3,6,7,8-HxCDF | 0.003 | 0.1 | 0.0003 | 0.00088 | 0.000088 |
| 2,3,4,6,7,8-HxCDF | <0.001 | 0.1 | 0.00005 | <0.00029 | 0.000015 |
| 1,2,3,7,8,9-HxCDF | <0.001 | 0.1 | 0.00005 | <0.00029 | 0.000015 |
| Total HxCDF isomers | 0.019 | | | | |
| 1,2,3,4,7,8-HxCDD | <0.002 | 0.1 | 0.0001 | <0.00058 | 0.000029 |
| 1,2,3,6,7,8-HxCDD | 0.0056 | 0.1 | 0.00056 | 0.0016 | 0.00016 |
| 1,2,3,7,8,9-HxCDD | 0.0022 | 0.1 | 0.00022 | 0.00064 | 0.000064 |
| Total HxCDD isomers | 0.067 | | | | |
| | | | | | |
| 1,2,3,4,6,7,8-HpCDF | 0.0091 | 0.01 | 0.000091 | 0.0027 | 0.000027 |
| 1,2,3,4,7,8,9-Hp CDF | 0.0018 | 0.01 | 0.000018 | 0.00053 | 0.0000053 |
| Total HpCDF isomers | 0.029 | | | | |
| 1,2,3,4,6,7,8-HpCDD | 0.12 | 0.01 | 0.0012 | 0.035 | 0.00035 |
| Total HpCDD isomers | 0.25 | | | | |
| | | | | | |
| OCDF | 0.018 | 0.001 | 0.000018 | 0.0053 | 0.0000053 |
| OCDD | 6.23 | 0.001 | 0.00623 | 1.8 | 0.0018 |

I-TEQ$_{DF}$

| | | |
|---|---|---|
| Lower Bound (excluding LOD Values) | 0.018 | ng |
| Middle Bound (including half LOD Values) | 0.018 | ng |
| Date Tested | 30-Jun-16 | |

**Table 15 Stack 1 Elemental Metals Results, 30 June 2016**

| Sample | Total Particulate Metals (mg) | Total Particulate Metals ($mg/m^3$) | Total Gaseous Metals (mg) | Total Gaseous Metals ($mg/m^3$) | Total Oxidisable Mercury (mg) | Total Oxidisable Mercury ($mg/m^3$) | Total (mg) | Total ($mg/m^3$) | Mass Emission Rate (mg/s) |
|---|---|---|---|---|---|---|---|---|---|
| Antimony | <0.0002 | <0.00017 | <0.0001 | <0.000085 | | | <0.0002 | <0.00017 | <0.0045 |
| Arsenic | <0.0002 | <0.00017 | <0.0001 | <0.000085 | | | <0.0002 | <0.00017 | <0.0045 |
| Beryllium | <0.0002 | <0.00017 | <0.0001 | <0.000085 | | | <0.0002 | <0.00017 | <0.0045 |
| Cadmium | <0.0002 | <0.00017 | <0.0001 | <0.000085 | | | <0.0002 | <0.00017 | <0.0045 |
| Chromium | 0.0001 | 0.000085 | 0.0073 | 0.0062 | | | 0.007 | 0.006 | 0.16 |
| Cobalt | <0.0002 | <0.00017 | <0.0001 | <0.000085 | | | <0.0002 | <0.00017 | <0.0045 |
| Copper | <0.0003 | <0.00026 | 0.0008 | 0.00068 | | | 0.0008 | 0.00068 | 0.018 |
| Lead | <0.0002 | <0.00017 | 0.00065 | 0.00055 | | | 0.00065 | 0.00055 | 0.015 |
| Magnesium | 0.003 | 0.0026 | <0.0012 | <0.001 | | | 0.003 | 0.0026 | 0.069 |
| Manganese | 0.0012 | 0.001 | 0.0005 | 0.00043 | | | 0.002 | 0.0017 | 0.045 |
| Mercury | <0.0002 | <0.00017 | <0.0001 | <0.000085 | <0.0005 | <0.00043 | <0.0002 | <0.00017 | <0.0045 |
| Nickel | <0.0002 | <0.00017 | 0.00025 | 0.00021 | | | 0.00025 | 0.00021 | 0.0056 |
| Selenium | <0.0002 | <0.00017 | <0.0001 | <0.000085 | | | <0.0002 | <0.00017 | <0.0045 |
| Thallium | <0.0002 | <0.00017 | <0.0001 | <0.000085 | | | <0.0002 | <0.00017 | <0.0045 |
| Tin | <0.0002 | <0.00017 | 0.00035 | 0.0003 | | | 0.00035 | 0.0003 | 0.008 |
| Vanadium | <0.0005 | <0.00043 | <0.0001 | <0.000085 | | | <0.0002 | <0.00017 | <0.0045 |
| Zinc | 0.011 | 0.0094 | 0.0005 | 0.00043 | | | 0.01 | 0.0085 | 0.23 |
| **Total Hazardous Metals*** | **0.0013** | **0.0011** | **0.0087** | **0.0074** | **<0.0005** | **<0.00043** | **0.01** | **0.0087** | **0.23** |
| **Total Metals** | **0.015** | **0.013** | **0.01** | **0.0088** | | | **0.024** | **0.021** | **0.55** |

* Total does not include Copper, Magnesium and Zinc as they are classed non-hazardous

**Table 16 Stack 1 Speciated Polycyclic Aromatic Hydrocarbons Results, 30 June 2016**

| | Sample Result | | | Emission | | Mass Emission Rate | |
|---|---|---|---|---|---|---|---|
| | (ng) | (µg) | (mg) | (µg/m$^3$) | (mg/m$^3$) | (µg/s) | (mg/s) |
| Naphthalene | 120000 | 120 | 0.12 | 35 | 0.035 | 920 | 0.92 |
| 2 - Methylnaphthalene | 6400 | 6.4 | 0.0064 | 1.9 | 0.0019 | 49 | 0.049 |
| Acenaphthylene | 34000 | 34 | 0.034 | 9.9 | 0.0099 | 260 | 0.26 |
| Acenaphthene | 440 | 0.44 | 0.00044 | 0.13 | 0.00013 | 3.4 | 0.0034 |
| Fluorene | 3800 | 3.8 | 0.0038 | 1.1 | 0.0011 | 29 | 0.029 |
| Phenanthrene | 9800 | 9.8 | 0.0098 | 2.9 | 0.0029 | 75 | 0.075 |
| Anthracene | 330 | 0.33 | 0.00033 | 0.096 | 0.000096 | 2.5 | 0.0025 |
| Fluoranthene | 710 | 0.71 | 0.00071 | 0.21 | 0.00021 | 5.5 | 0.0055 |
| Pyrene | 550 | 0.55 | 0.00055 | 0.16 | 0.00016 | 4.2 | 0.0042 |
| Benz(a)anthracene | 190 | 0.19 | 0.00019 | 0.056 | 0.000056 | 1.5 | 0.0015 |
| Chrysene | 250 | 0.25 | 0.00025 | 0.073 | 0.000073 | 1.9 | 0.0019 |
| Benzo(b)fluoranthene | 170 | 0.17 | 0.00017 | 0.05 | 0.00005 | 1.3 | 0.0013 |
| Benzo(k)fluoranthene | 130 | 0.13 | 0.00013 | 0.038 | 0.000038 | 1 | 0.001 |
| Benzo(e)pyrene | 130 | 0.13 | 0.00013 | 0.038 | 0.000038 | 1 | 0.001 |
| Benzo(a)pyrene | 87 | 0.087 | 0.000087 | 0.025 | 0.000025 | 0.67 | 0.00067 |
| Perylene | 270 | 0.27 | 0.00027 | 0.079 | 0.000079 | 2.1 | 0.0021 |
| Indeno(123:cd)pyrene | 120 | 0.12 | 0.00012 | 0.035 | 0.000035 | 0.92 | 0.00092 |
| Dibenzo(ah)anthracene | 63 | 0.063 | 0.000063 | 0.018 | 0.000018 | 0.48 | 0.00048 |
| Benzo(ghi)perylene | 160 | 0.16 | 0.00016 | 0.047 | 0.000047 | 1.2 | 0.0012 |
| **Sum of reported PAH's** | **180000** | **180** | **0.18** | **52** | **0.052** | **1400** | **1.4** |

AECOM

Weston Aluminium
09-Dec-2016
Doc No. 60489919_1.9_RPT_Sept16

Commercial-in-Confidence

# Stack 1 Emissions Testing Report September 2016

## Pharmaceutical Waste and Illicit Substance Destruction Trial

# Stack 1 Emissions Testing Report September 2016

Pharmaceutical Waste and Illicit Substance Destruction Trial

Client: Weston Aluminium

ABN: 91 075 245 108

Prepared by

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09-Dec-2016

Job No.: 60489919

AECOM in Australia and New Zealand is certified to ISO9001, ISO14001 AS/NZS4801 and OHSAS18001.

# Quality Information

Document Stack 1 Emissions Testing Report September 2016

Ref 60489919

Date 09-Dec-2016

Prepared by James Lang Approved Signatory

Reviewed by Paul Wenta

Revision History

| Rev | Revision Date | Details | Authorised | |
|---|---|---|---|---|
| | | | Name/Position | Signature |
| 0 | 09-Dec-2016 | Final Report | Chad Whitburn Compliance Services - Team Leader | |

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# Table of Contents



**List of Tables**

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# 1.0 Introduction

AECOM was appointed by Weston Aluminium Pty Ltd to conduct a series of measurements to determine air emissions from Stack 1 located at their Weston plant in Kurri Kurri, NSW while processing Pharmaceutical waste and Illicit Substances. Emission testing was a compliance requirement of Environmental Protection Licence (EPL) number 6423.

Testing was conducted on 28 September 2016 to determine emission concentrations for the following parameters:

**Stack 1 (EPL Point 1)**

- Total Particulate;
- Fine Particulate ($PM_{10}$);
- Sulfuric Acid Mist ($H_2SO_4$ as $SO_3$);
- Sulfur Dioxide ($SO_2$ as $SO_3$);
- Chlorine;
- Hydrogen Chloride;
- Gaseous Fluoride;
- Particulate Fluoride;
- Hazardous Substances (Metals);
- Volatile Organic Compounds (VOC);
- Oxides of Nitrogen;
- Carbon Monoxide;
- Carbon Dioxide;
- Oxygen;
- Cyanide;
- Polycyclic Aromatic Hydrocarbon (PAH); and
- Dioxins and Furans.

Laboratory analysis was conducted by the following laboratories, which hold NATA accreditation for the specified tests:

- Steel River Testing Pty. Ltd., NATA accreditation number 18079, performed the following analysis detailed in report number 12197-0-P, 12197-0-M:
  - Moisture;
  - Fine Particulate ($PM_{10}$); and
  - Total Particulate.
- Australian Laboratory Services, NATA accreditation number 18079, performed the following analysis detailed in report number EN1603502:
  - Fluoride;
  - Cyanide;
  - Sulfuric Acid Mist;
  - Sulfur Dioxide;
  - Hydrogen Chloride;

  - Chlorine; and
  - Volatile Organic Compounds.
- National Measurements Institute, NATA accreditation number 198, performed the following analysis detailed in report number ORG16_060 and DAU16-225:
  - Polycyclic Aromatic Hydrocarbons; and
  - Dioxins and Furans.
- SGS Leeder Consulting, NATA accreditation number 14429, performed the following analysis detailed in report number M161982:
  - Hazardous Substances (Metals).

# 2.0 Sampling Plane Requirements

The criteria for sampling planes are specified in AS 4323.1-1995 (R2014).

**Table 1 Criteria for Selection of Sampling Planes (AS 4323. 1)**

| Type of flow disturbance | Minimum distance upstream from disturbance, diameters (D) | Minimum distance downstream from disturbance, diameters (D) |
|---|---|---|
| Bend, connection, junction, direction change | >2D | >6D |
| Louvre, butterfly damper (partially closed or closed) | >3D | >6D |
| Axial fan | >3D | >8D (see Note) |
| Centrifugal fan | >3D | >6D |

*NOTE: The plane should be selected as far as practicable from a fan. Flow straighteners may be required to ensure the position chosen meets the check criteria listed in Items (a) to (f) below.*

*a. The gas flow is basically in the same direction at all points along each sampling traverse.*

*b. The gas velocity at all sampling points is greater than 3 m/s.*

*c. The gas flow profile at the sampling plane shall be steady, evenly distributed and not have a cyclonic component which exceeds an angle of 15$^{o}$ to the duct axis, when measured near the periphery of a circular sampling plane.*

*d. The temperature difference between adjacent points of the survey along each sampling traverse is less than 10% of the absolute temperature, and the temperature at any point differs by less than 10% from the mean.*

*e. The ratio of the highest to lowest pitot pressure difference shall not exceed 9:1 and the ratio of highest to lowest gas velocities shall not exceed 3:1. For isokinetic testing with the use of impingers, the gas velocity ratio across the sampling plane should not exceed 1.6:1.*

*f. The gas temperature at the sampling plane should preferably be above the dewpoint.*

Stack 1 (EPA Identification No. 1) did not satisfy the requirements of AS 4323.1 Section 4.1 with regard to the upstream and downstream distances from disturbances. To compensate for this, additional sampling points were added in accordance with AS 4323.1 Section 4.2.

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# 3.0 Methodology

## 3.1 NATA Accredited Methods

The following methods are accredited with the National Association of Testing Authorities (NATA), Accreditation No. 2778 (14391), and are approved for the sampling and analysis of gases and aerosols. Specific details of the methods are available on request.

All sampling and analysis is conducted according to the methods in **Table 2**.

**Table 2 AECOM NATA Endorsed Methods**

| NSW EPA Approved Methods | USEPA Methods | Parameter Measured |
|---|---|---|
| NSW EPA TM-1 (AS 4323.1-1995) | USEPA (2000) Method 1 under approved circumstances | Selection of sampling positions |
| NSW EPA TM-2 | USEPA (2000) Method 2 or 2C or USEPA (1999) Method 2F or 2G or 2H (as appropriate) | Velocity or volumetric flow rate or temperature or pressure of stack gases |
| NSW EPA TM-3 | USEPA (2000) Method 8 (for sampling and analysis) or APHA (1998) Method 4110B (for analysis only if interference from fluorides, free ammonia and/or dimethyl aniline has been demonstrated to the satisfaction of the Chief Scientist) (as appropriate) | Sulfuric acid mist ($H_2SO_4$) or sulphur trioxide ($SO_3$) |
| NSW EPA TM-4 | USEPA (2000) Method 6 or 6A or 6B or USEPA (1996) Method 6C or ISO (1989) Method 7934 or ISO (1992) Method 7935 or ISO (1993) Method 10396 or ISO (1998) Method 11632 (as appropriate) | Sulfur dioxide ($SO_2$) |
| NSW EPA TM-7 | USEPA (2000) 26A | Chlorine ($Cl_2$) |
| NSW EPA TM-8 | USEPA (2000) 26A | Hydrogen chloride (HCl) |
| NSW EPA TM-9 | USEPA (2000) Method 13A or 13B (as appropriate) | Fluorine ($F_2$) or any compound containing fluorine, except where emitted by a primary aluminium smelter while manufacturing aluminium from alumina |
| NSW EPA TM-12 | USEPA (2000) Method 29 or USEPA (2000) Method 102 (for mercury only in hydrogen rich streams) (as appropriate) | Type 1 substances (elements antimony (Sb), arsenic (As), cadmium (Cd), lead (Pb) or mercury (Hg) or any compound containing one or more of those elements) |
| NSW EPA TM-13 | USEPA (2000) Method 29 (Analysis for tin and vanadium to be done by Inductively Coupled Argon Plasma Emission Spectroscopy (ICAP) as defined in USEPA Method 29) or USEPA (1986) Method 7910 (for vanadium only) or USEPA (1986) Method 7911 (for vanadium only) (as appropriate) | Type 2 substances (elements beryllium (Be), chromium (Cr), cobalt (Co), manganese (Mn), nickel (Ni), selenium (Se), tin (Sn) or vanadium (V) or any compound containing one or more of those elements) |
| NSW EPA TM-14 | Cadmium (Cd) or mercury (Hg) or any compound containing one or more of those elements | USEPA (2000) Method 29 or USEPA (2000) Method 102 (for mercury only in hydrogen rich streams) (as appropriate) |

| NSW EPA Approved Methods | USEPA Methods | Parameter Measured |
|---|---|---|
| NSW EPA TM-15 (AS 4323.2-1995) | USEPA (2000) Method 5 under approved circumstances | Solid particles (Total) |
| NSW EPA TM-22 | USEPA (2000) Method 4 | Moisture content in stack gases |
| NSW EPA TM-23 | USEPA (2000) Method 3 | Dry gas density or molecular weight of stack gases |
| NSW EPA TM-34 | USEPA (2000) Method 18 or USEPA (2000) Method 25 or 25A or 25B or 25C or 25D or 25E (as appropriate) | Volatile organic compounds |
| NSW EPA OM-5 | USEPA (1997) Method 201 or 201A (as appropriate) | 'Fine' particulates ($PM_{10}$) |
| NSW EPA OM-6 | California EPA Air Resources Board (1997) Method 429 | Polycyclic aromatic hydrocarbons (PAHs) |
| NSW EPA TM-32 | USEPA Method 10 | Determination of Carbon Monoxide emissions from stationary sources |
| NSW EPA TM-25 | USEPA (1990) Method 3A | Determination of Oxygen concentrations from stationary sources |
| NSW EPA TM-24 | USEPA (1990) Method 3A | Carbon dioxide ($CO_2$) in stack gases |
| NSW EPA TM-11 | USEPA(2000) Method 7C | Determination of Nitrogen dioxide or nitric oxide emissions from stationary sources |
| NSW EPA TM-18 | USEPA (1995) Method 23 | Dioxins and Furans |

## 3.2 Deviations from NATA Accredited Methods

The following method is not accredited with the National Association of Testing Authorities (NATA), Accreditation No. 2778 (14391). Specific details of the methods are available on request.

All sampling and analysis is conducted according to the method in **Table 3**.

**Table 3 NATA Method Deviations**

| USEPA Methods | Parameter Measured |
|---|---|
| USEPA (2011) Other Test Method 29 | Sampling and analysis for Hydrogen Cyanide emissions from stationary sources |

# 4.0 Sampling Location

## 4.1 Sampling Location Summary

**Table 4** provides a summary of the location sampled by AECOM on 28 September 2016 at the Weston Aluminium plant in Kurri Kurri, NSW.

**Table 4 Sampling Location Summary**

| Discharge Description | Stack 1 (EPA Identification No. 1) |
|---|---|
| Duct Shape | Circular |
| Construction Material | Metal |
| Duct Diameter (mm) | 1650 |
| Minimum No. Sampling Points | 16 |
| Sampling Ports | 2 |
| Min. Points/Traverse | 8 |
| Disturbance | Yes |
| Distance from Upstream Disturbance | 2D |
| Type of Disturbance | Fan entry |
| Distance from Downstream Disturbance | 4D |
| Type of Disturbance | Stack Exit |
| Ideal Sampling Location | No |
| Correction Factors Applied | Yes |
| Total No. Points Sampled | 20 |
| Points/Traverse | 10 |
| Sampling Performed to Standard* | Yes[2] |

*AS 4323.1 Stationary source emissions Method 1 – Selection of sampling positions

[1] AS 4323.1 Section 4.1

[2] AS 4323.1 Section 4.2

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# 5.0 Equipment Calibration

AECOM has a calibration schedule to ensure the emission testing equipment is maintained in good order and with known calibration. Equipment used in this project was calibrated according to the procedures and frequency identified in the AECOM calibration schedule. Details of the schedule and the calibration calculations are available on request.

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# 6.0 Results

A summary of test results for September 2016 testing is presented in **Table 5**. Calculated Fine Particulate ($PM_{10}$) cut size is displayed in **Table 6**. Gas Data Concentrations and Mass Emission Rate summaries are reported in **Tables 7 & 8** respectively. Detailed results along with gas stream properties during the testing periods can be found in **Tables 9** to **12**. Speciated Volatile Organic Carbons and Dioxins and Furan results can be found in **Tables 13 & 14,** Hazardous Substances (Metals) results in **Table 15**, and Polycyclic Aromatic Hydrocarbons results in **Table 16**.

All emission concentrations are converted to standard conditions of 0°C, dry gas and 1 atm pressure for comparison with regulatory limits outlined in the Weston Aluminium Environmental Protection Licence 6423.

Field notes recorded during the project are attached as **Appendix A**. with Laboratory Analysis Reports attached as **Appendix B**, and Raw & Calculated Gas Data as **Appendix C**.

**Table 5 Stack Emissions Results Summary 28 September 2016**

| Parameter | Stack 1 EPL Point 1 |
|---|---|
| Carbon Monoxide (CO) (ppm) | 28 *(100)* |
| Chlorine ($mg/m^3$) | <4.6 |
| Cyanide | 0.25 *(0.5)* |
| Fine Particulate ($PM_{10}$) ($mg/m^3$) | 2.0 |
| Gaseous Fluoride ($mg/m^3$) | 0.095 *(2)* |
| Hydrogen Chloride ($mg/m^3$) | <9.3 *(400)* |
| Oxides of Nitrogen (as Equivalent $NO_2$) ($mg/m^3$) | 12 *(2500)* |
| Oxygen (%) | 20.1 |
| Carbon Dioxide (%) | 0.2 |
| Particulate Fluoride ($mg/m^3$) | 0.11 |
| Sulfur Dioxide ($SO_2$ as $SO_3$) ($mg/m^3$) | <1.7 |
| Sulfuric Acid Mist ($H_2SO_4$ as $SO_3$) ($mg/m^3$) | <8.5 *(100)* |
| Total Particulate ($mg/m^3$) | 4.9 *(25)* |
| Total Polycyclic Aromatic Hydrocarbons ($mg/m^3$) | 0.015 |
| Dioxins and Furans Lower Bound | 0.000017 |
| Dioxins and Furans Middle Bound | 0.00055 |
| Type 1 and 2 Substances in Aggregate (Metals) ($mg/m^3$) | 0.017 *(10)* |
| Volatile Organic Compounds (VOC) ($mg/m^3$) | <0.36 |

Note – EPL Limits are in parenthesis

USEPA method 201A, section 6.3.5 (Determination of $PM_{10}$ Emissions) and USEPA Conditional Test Method 040, Section 17, Table 2 (Determination of $PM_{2.5}$ Emissions) specifies that results are acceptable provided the calculated aerodynamic cut size ($D_{50}$) for the test lies between 9.0μm and 11.0μm. Post sampling cut size calculations performed for the sampling conducted are displayed in **Table 6**.

Cut size, or $D_{50}$, refers to the aerodynamic diameter of the particles contained in the gas stream which can be captured with a 50% efficiency and is a calculated value. For a Fine Particulate ($PM_{10}$) test particle sizes of 10μm and less are expected.

The cut size ($D_{50}$) is calculated prior to testing and is based on the pre-test measurements such as stack gas velocity, stack gas temperature, moisture content of the gas stream and stack gas density. This pre-test calculation of cut size ($D_{50}$) is used in conjunction with the pre-test measurements, some of which are stated above, to establish the sampling conditions or parameters.

**Table 6 Calculated $PM_{10}$ Cut Size**

| Sampling Location | $PM_{10}$ Cut Size ($D_{50}$) |
|---|---|
| Stack 1 | 10.1 |

The calculated cut sizes meet the criteria for cut size conditions stated above.

**Table 7 Calculated Gas Concentrations Data Summary, 28 September 2016**

| Parameter | Stack 1 |
|---|---|
| Time Period | 10:20-11:20 |
| Nitrogen Oxide (NO) ($mg/m^3$) | 6 |
| Nitrogen Dioxide ($NO_2$) ($mg/m^3$) | 2 |
| Nitrogen Oxides ($NO_x$) ($mg/m^3$) | 8 |
| Oxides of Nitrogen as Equivalent $NO_2$ ($mg/m^3$) | 12 *(2500)* |
| Carbon Monoxide (ppm) | 28 *(100)* |
| Carbon Monoxide ($mg/m^3$) | 35 |
| Carbon Dioxide (%) | 0.2 |
| Oxygen (%) | 20.1 |

Note – EPL Limits are provided in parenthesis.

**Table 8 Gas Mass Emission Rates Summary, 28 September 2016**

| Parameter | Stack 1 |
|---|---|
| Time Period | 10:20-11:20 |
| Stack Gas Flow Rate (0°C, dry gas, 1 atm pressure) | 26 |
| Nitrogen Oxide (NO) (mg/s) | 156 |
| Nitrogen Dioxide ($NO_2$) (mg/s) | 52 |
| Nitrogen Oxides ($NO_x$) (mg/s) | 208 |
| Oxides of Nitrogen as Equivalent $NO_2$ (mg/s) | 312 |
| Carbon Monoxide (mg/s) | 910 |

**Table 9 Stack 1 Fine Particulate ($PM_{10}$), Total Particulate, and Cyanide, 28 September 2016**

| | | | | |
|---|---|---|---|---|
| **Sampling Conditions:** | | | | |
| Stack internal diameter at test location | 1650 | mm | | |
| Stack gas temperature (average) | 80.7 | °C | 353.9 | K |
| Stack pressure (average) | 1009 | hPa | | |
| Stack gas velocity (average, stack conditions) | 16 | m/s | | |
| Stack gas flowrate (stack conditions) | 34 | $m^3/s$ | | |
| Stack gas flowrate (0°C, dry gas, 1 atm pressure) | 26 | $m^3/s$ | | |
| **Fine Particulate ($PM_{10}$) Testing** | | | | |
| Test Period | 9:55 | - | 11:39 | |
| Fine Particulate ($PM_{10}$) Mass | 2.5 | mg | | |
| Gas Volume Sampled | 1.23 | $m^3$ | | |
| Fine Particulate ($PM_{10}$) Emission*1 | 2.0 | $mg/m^3$ | | |
| Fine Particulate ($PM_{10}$) Mass Emission Rate*2 | 52 | mg/s | | |
| Regulatory Limit | NA | $mg/m^3$ | | |
| **Total Particulate Testing** | | | | |
| Test Period | 9:55 | - | 11:39 | |
| Total Particulate Mass | 6.1 | mg | | |
| Gas Volume Sampled | 1.25 | $m^3$ | | |
| Total Particulate Emission*1 | 4.9 | $mg/m^3$ | | |
| Total Particulate Mass Emission Rate*2 | 130 | mg/s | | |
| Regulatory Limit | 25 | $mg/m^3$ | | |
| **Cyanide Testing** | | | | |
| Test Period | 9:55 | - | 11:39 | |
| Cyanide Mass | 0.4 | mg | | |
| Gas Volume Sampled | 1.59 | $m^3$ | | |
| Cyanide Emission*1 | 0.25 | $mg/m^3$ | | |
| Cyanide Mass Emission Rate*2 | 6.5 | mg/s | | |
| Regulatory Limit | 0.5 | $mg/m^3$ | | |
| **Moisture Content (%)** | **2.2** | | | |
| **Gas Density (dry at 1 atmosphere)** | **1.29** | **kg/m3** | | |
| **Dry Molecular Weight** | **28.8** | **g/g-mole** | | |

Notes *1 Emission concentration at Standard conditions of 0°C, 1 atm, dry gas
*2 Mass emission rate determined from pre and post test sampling flow measurements and the respective test moisture content. See $Q_{std}$ in field sheets and final calculations "Stack Analysis - Final Calculations" for each test.

**Table 10 Stack 1 Sulfuric Acid Mist ($H_2SO_4$ as $SO_3$), Sulfur Dioxide ($SO_2$ as $SO_3$), Hydrogen Chloride and Chlorine Results, 28 September 2016**

| | | | | |
|---|---|---|---|---|
| **Sampling Conditions:** | | | | |
| Stack internal diameter at test location | 1650 | mm | | |
| Stack gas temperature (average) | 76.1 | °C | 349.3 | K |
| Stack pressure (average) | 1009 | hPa | | |
| Stack gas velocity (average, stack conditions) | 16 | m/s | | |
| Stack gas flowrate (stack conditions) | 34 | $m^3/s$ | | |
| Stack gas flowrate (0°C, dry gas, 1 atm pressure) | 26 | $m^3/s$ | | |
| **Sulfuric Acid Mist ($H_2SO_4$ as $SO_3$) Testing** | | | | |
| Test Period | 11:58 | - | 13:40 | |
| Sulfuric Acid Mist ($H_2SO_4$ as $SO_3$) Mass | <2 | mg | | |
| Gas Volume Sampled | 1.18 | $m^3$ | | |
| Sulfuric Acid Mist ($H_2SO_4$ as $SO_3$) Emission*1 | <1.7 | $mg/m^3$ | | |
| Sulfuric Acid Mist ($H_2SO_4$ as $SO_3$) Mass Emission Rate*2 | <44 | mg/s | | |
| Regulatory Limit | 100 | $mg/m^3$ | | |
| **Sulfur Dioxide ($SO_2$ as $SO_3$) Testing** | | | | |
| Test Period | 11:58 | - | 13:40 | |
| Sulfur Dioxide ($SO_2$ as $SO_3$) Mass | <10 | mg | | |
| Gas Volume Sampled | 1.18 | $m^3$ | | |
| Sulfur Dioxide ($SO_2$ as $SO_3$) Emission*1 | <8.5 | $mg/m^3$ | | |
| Sulfur Dioxide ($SO_2$ as $SO_3$) Mass Emission Rate*2 | <220 | mg/s | | |
| Regulatory Limit | NA | $mg/m^3$ | | |
| **Hydrogen Chloride Testing** | | | | |
| Test Period | 11:58 | - | 13:40 | |
| Hydrogen Chloride Mass | <10 | mg | | |
| Gas Volume Sampled | 1.08 | $m^3$ | | |
| Hydrogen Chloride Emission*1 | <9.3 | $mg/m^3$ | | |
| Hydrogen Chloride Mass Emission Rate*2 | <240 | mg/s | | |
| Regulatory Limit | 400 | $mg/m^3$ | | |
| **Chlorine Testing** | | | | |
| Test Period | 11:58 | - | 13:40 | |
| Chlorine Mass | <5 | mg | | |
| Gas Volume Sampled | 1.08 | $m^3$ | | |
| Chlorine Emission*1 | <4.6 | $mg/m^3$ | | |
| Chlorine Mass Emission Rate*2 | <120 | mg/s | | |
| Regulatory Limit | NA | $mg/m^3$ | | |
| **Moisture Content (%)** | **1.4** | | | |
| **Gas Density (dry at 1 atmosphere)** | **1.29** | **$kg/m^3$** | | |
| **Dry Molecular Weight** | **28.9** | **g/g-mole** | | |

Notes *1 Emission concentration at Standard conditions of 0°C, 1 atm, dry gas

*2 Mass emission rate determined from pre and post test sampling flow measurements and the respective test moisture content. See $Q_{std}$ in field sheets and final calculations "Stack Analysis - Final Calculations" for each test.

**Table 11 Stack 1 Hazardous Substances (Metals), Particulate Fluoride and Gaseous Fluoride Results, 28 September 2016**

| | | | | |
|---|---|---|---|---|
| **Sampling Conditions:** | | | | |
| Stack internal diameter at test location | 1650 | mm | | |
| Stack gas temperature (average) | 71.9 | °C | 345.1 | K |
| Stack pressure (average) | 1009 | hPa | | |
| Stack gas velocity (average, stack conditions) | 16 | m/s | | |
| Stack gas flowrate (stack conditions) | 34 | $m^3/s$ | | |
| Stack gas flowrate (0°C, dry gas, 1 atm pressure) | 26 | $m^3/s$ | | |
| **Hazardous Substances (Metals) Testing** | | | | |
| Test Period | 14:05 | - | 15:49 | |
| Hazardous Substances (Metals) Mass | 0.023 | mg | | |
| Gas Volume Sampled | 1.34 | $m^3$ | | |
| Hazardous Substances (Metals) Emission*1 | 0.017 | $mg/m^3$ | | |
| Hazardous Substances (Metals) Mass Emission Rate*2 | 0.44 | mg/s | | |
| Regulatory Limit | 10 | $mg/m^3$ | | |
| **Particulate Fluoride Testing** | | | | |
| Test Period | 14:05 | - | 15:49 | |
| Particulate Fluoride Mass | 0.142 | mg | | |
| Gas Volume Sampled | 1.27 | $m^3$ | | |
| Particulate Fluoride Emission*1 | 0.11 | $mg/m^3$ | | |
| Particulate Fluoride Mass Emission Rate*2 | 2.8 | mg/s | | |
| Regulatory Limit | NA | $mg/m^3$ | | |
| **Gaseous Fluoride Testing** | | | | |
| Test Period | 14:05 | - | 15:49 | |
| Gaseous Fluoride Mass | 0.12 | mg | | |
| Gas Volume Sampled | 1.27 | $m^3$ | | |
| Gaseous Fluoride Emission*1 | 0.095 | $mg/m^3$ | | |
| Gaseous Fluoride Mass Emission Rate*2 | 2.4 | mg/s | | |
| Regulatory Limit | 2 | $mg/m^3$ | | |
| **Moisture Content (%)** | **2.7** | | | |
| **Gas Density (dry at 1 atmosphere)** | **1.29** | **$kg/m^3$** | | |
| **Dry Molecular Weight** | **28.9** | **g/g-mole** | | |

Notes *1 Emission concentration at Standard conditions of 0°C, 1 atm, dry gas

*2 Mass emission rate determined from pre and post test sampling flow measurements and the respective test moisture content. See $Q_{std}$ in field sheets and final calculations "Stack Analysis - Final Calculations" for each test.

**Table 12 Stack 1 Polycyclic Aromatic Hydrocarbon (PAH), Dioxins and Furans Results, 28 September 2016**

| | | | | |
|---|---|---|---|---|
| **Sampling Conditions:** | | | | |
| Stack internal diameter at test location | 1650 | mm | | |
| Stack gas temperature (average) | 76.5 | °C | 349.7 | K |
| Stack pressure (average) | 1009 | hPa | | |
| Stack gas velocity (average, stack conditions) | 16 | m/s | | |
| Stack gas flowrate (stack conditions) | 34 | $m^3/s$ | | |
| Stack gas flowrate (0°C, dry gas, 1 atm pressure) | 26 | $m^3/s$ | | |
| **Polycyclic Aromatic Hydrocarbons Testing** | | | | |
| Test Period | 9:55 | - | 15:59 | |
| Polycyclic Aromatic Hydrocarbons Mass | 0.064733 | mg | | |
| Gas Volume Sampled | 4.36 | $m^3$ | | |
| Polycyclic Aromatic Hydrocarbons Emission*[1] | 0.015 | $mg/m^3$ | | |
| Polycyclic Aromatic Hydrocarbons Mass Emission Rate*[2] | 0.39 | mg/s | | |
| Regulatory Limit | NA | $mg/m^3$ | | |
| **Dioxins and Furans Lower Bound Testing** | | | | |
| Test Period | 9:55 | - | 15:59 | |
| Dioxins and Furans Lower Bound Mass | 0.000074 | ng | | |
| Gas Volume Sampled | 4.36 | $m^3$ | | |
| Dioxins and Furans Lower Bound Emission*[1] | 0.000017 | $ng/m^3$ | | |
| Dioxins and Furans Lower Bound Mass Emission Rate*[2] | 0.00044 | ng/s | | |
| Regulatory Limit | NA | $ng/m^3$ | | |
| **Dioxins and Furans Middle Bound Testing** | | | | |
| Test Period | 9:55 | - | 15:59 | |
| Dioxins and Furans Middle Bound Mass | 0.0024 | ng | | |
| Gas Volume Sampled | 4.36 | $m^3$ | | |
| Dioxins and Furans Middle Bound Emission*[1] | 0.00055 | $ng/m^3$ | | |
| Dioxins and Furans Middle Bound Mass Emission Rate*[2] | 0.014 | ng/s | | |
| Regulatory Limit | NA | $ng/m^3$ | | |
| **Moisture Content (%)** | **1.7** | | | |
| **Gas Density (dry at 1 atmosphere)** | **1.29** | **$kg/m^3$** | | |
| **Dry Molecular Weight** | **28.9** | **g/g-mole** | | |

Notes *1 Emission concentration at Standard conditions of 0°C, 1 atm, dry gas

*2 Mass emission rate determined from pre and post test sampling flow measurements and the respective test moisture content. See $Q_{std}$ in field sheets and final calculations "Stack Analysis - Final Calculations" for each test.

**Table 13 Stack 1 Speciated Volatile Organic Compounds Results, 28 September 2016**

| Analyte | Sample µg | Blank µg | Sample Blank Corrected µg | (mg/m$^3$) | mg/s |
|---|---|---|---|---|---|
| Acetone | <1.0 | <1.0 | <1.0 | <0.18 | <4.7 |
| 1,1-dichloroethane | <1.0 | <1.0 | <1.0 | <0.18 | <4.7 |
| 2-Butanone | <1.0 | <1.0 | <1.0 | <0.18 | <4.7 |
| Chloroform | <1.0 | <1.0 | <1.0 | <0.18 | <4.7 |
| Benzene | <1.0 | <1.0 | <1.0 | <0.18 | <4.7 |
| 1-heptene | <1.0 | <1.0 | <1.0 | <0.18 | <4.7 |
| n-heptane | <1.0 | <1.0 | <1.0 | <0.18 | <4.7 |
| Trichloroethene | <1.0 | <1.0 | <1.0 | <0.18 | <4.7 |
| MIBK | <1.0 | <1.0 | <1.0 | <0.18 | <4.7 |
| Toluene | <1.0 | <1.0 | <1.0 | <0.18 | <4.7 |
| 2-hexanone | <1.0 | <1.0 | <1.0 | <0.18 | <4.7 |
| Chlorobenzene | <1.0 | <1.0 | <1.0 | <0.18 | <4.7 |
| Ethyl Benzene | <1.0 | <1.0 | <1.0 | <0.18 | <4.7 |
| m- & p-xylene | <2.0 | <2.0 | <2.0 | <0.36 | <9.4 |
| o-xylene | <1.0 | <1.0 | <1.0 | <0.18 | <4.7 |
| Styrene | <1.0 | <1.0 | <1.0 | <0.18 | <4.7 |
| Cyclohexanone | <1.0 | <1.0 | <1.0 | <0.18 | <4.7 |
| Isopropylbenzene | <1.0 | <1.0 | <1.0 | <0.18 | <4.7 |
| 2-chlorotoluene | <1.0 | <1.0 | <1.0 | <0.18 | <4.7 |
| 4-chlorotoluene | <1.0 | <1.0 | <1.0 | <0.18 | <4.7 |
| 1,3,5-trimethylbenzene | <1.0 | <1.0 | <1.0 | <0.18 | <4.7 |
| n-decane | <1.0 | <1.0 | <1.0 | <0.18 | <4.7 |
| 1,2,4-trimethylbenzene | <1.0 | <1.0 | <1.0 | <0.18 | <4.7 |
| 1,3-dichlorobenzene | <1.0 | <1.0 | <1.0 | <0.18 | <4.7 |
| 1,4-dichlorobenzene | <1.0 | <1.0 | <1.0 | <0.18 | <4.7 |
| 1,2-dichlorobenzne | <1.0 | <1.0 | <1.0 | <0.18 | <4.7 |
| n-butylbenzene | <1.0 | <1.0 | <1.0 | <0.18 | <4.7 |
| Hexachlorobutadiene | <1.0 | <1.0 | <1.0 | <0.18 | <4.7 |
| **Total** | **<1** | | **<1** | **<0.36** | **<9.4** |

Note: Where the blank has returned a less than value, the analysed value has been corrected for half of that blank value. i.e. a blank value of <0.5 has had 0.25 subtracted from the analysed value.

**Table 14 Stack 1 Speciated Dioxins And Furans Results, 28 September 2016**

| Analyte | Mass ng | Toxic Equivalency Factor (1 - TEFs) | Total Toxic Equivalence (1 - TEQs) ng | Concentration ng/m$^3$ | Total Toxic Equivalence (1-TEQs) ng/m$^3$ |
|---|---|---|---|---|---|
| 2,3,7,8-TCDF | <0.001 | 0.1 | 0.00005 | <0.00023 | 0.000011 |
| Total TCDF isomers | 0.011 | | | | |
| 2,3,7,8-TCDD | <0.002 | 1 | 0.001 | <0.00046 | 0.00023 |
| Total TCDD isomers | 0.0055 | | | | |
| | | | | | |
| 1,2,3,7,8-PeCDF | <0.001 | 0.05 | 0.000025 | <0.00023 | 0.0000057 |
| 2,3,4,7,8-PeCDF | <0.001 | 0.5 | 0.00025 | <0.00023 | 0.000057 |
| Total PeCDF isomers | <0.007 | | | | |
| 1,2,3,7,8-PeCDD | <0.002 | 0.5 | 0.0005 | <0.00046 | 0.00011 |
| Total PeCDD isomers | <0.01 | | | | |
| | | | | | |
| 1,2,3,4,7,8-HxCDF | <0.001 | 0.1 | 0.00005 | <0.00023 | 0.000011 |
| 1,2,3,6,7,8-HxCDF | <0.001 | 0.1 | 0.00005 | <0.00023 | 0.000011 |
| 2,3,4,6,7,8-HxCDF | <0.001 | 0.1 | 0.00005 | <0.00023 | 0.000011 |
| 1,2,3,7,8,9-HxCDF | <0.001 | 0.1 | 0.00005 | <0.00023 | 0.000011 |
| Total HxCDF isomers | <0.006 | | | | |
| 1,2,3,4,7,8-HxCDD | <0.002 | 0.1 | 0.0001 | <0.00046 | 0.000023 |
| 1,2,3,6,7,8-HxCDD | <0.002 | 0.1 | 0.0001 | <0.00046 | 0.000023 |
| 1,2,3,7,8,9-HxCDD | <0.002 | 0.1 | 0.0001 | <0.00046 | 0.000023 |
| Total HxCDD isomers | <0.007 | | | | |
| | | | | | |
| 1,2,3,4,6,7,8-HpCDF | <0.001 | 0.01 | 0.000005 | <0.00023 | 0.0000011 |
| 1,2,3,4,7,8,9-Hp CDF | <0.002 | 0.01 | 0.00001 | <0.00046 | 0.0000023 |
| Total HpCDF isomers | <0.003 | | | | |
| 1,2,3,4,6,7,8-HpCDD | 0.0028 | 0.01 | 0.000028 | 0.00064 | 0.0000064 |
| Total HpCDD isomers | 0.0071 | | | | |
| | | | | | |
| OCDF | <0.003 | 0.001 | 0.0000015 | <0.00069 | 0.00000034 |
| OCDD | 0.046 | 0.001 | 0.000046 | 0.011 | 0.000011 |

| | | |
|---|---|---|
| I-TEQ$_{DF}$ | | |
| Lower Bound (excluding LOD Values) | 0.000074 | ng |
| Middle Bound (including half LOD Values) | 0.0024 | ng |

**Table 15 Stack 1 Elemental Metals Results, 28 September 2016**

| Sample | Total Particulate Metals (mg) | Total Particulate Metals ($mg/m^3$) | Total Gaseous Metals (mg) | Total Gaseous Metals ($mg/m^3$) | Total Oxidisable Mercury (mg) | Total Oxidisable Mercury ($mg/m^3$) | Total (mg) | Total ($mg/m^3$) | Mass Emission Rate (mg/s) |
|---|---|---|---|---|---|---|---|---|---|
| Antimony | <0.0002 | <0.00015 | <0.0001 | <0.000075 | | | <0.0002 | <0.00015 | <0.0038 |
| Arsenic | <0.0005 | <0.00037 | 0.000048 | 0.000036 | | | 0.000048 | 0.000036 | 0.00092 |
| Beryllium | <0.0002 | <0.00015 | <0.0001 | <0.000075 | | | <0.0002 | <0.00015 | <0.0038 |
| Cadmium | <0.0006 | <0.00045 | <0.0001 | <0.000075 | | | <0.0002 | <0.00015 | <0.0038 |
| Chromium | <0.0022 | <0.0016 | 0.011 | 0.0082 | | | 0.011 | 0.0082 | 0.21 |
| Cobalt | <0.0002 | <0.00015 | <0.0001 | <0.000075 | | | <0.0002 | <0.00015 | <0.0038 |
| Copper | <0.0019 | <0.0014 | 0.0014 | 0.001 | | | 0.0014 | 0.001 | 0.026 |
| Lead | <0.0011 | <0.00082 | 0.0018 | 0.0013 | | | 0.0018 | 0.0013 | 0.033 |
| Magnesium | <0.18 | <0.13 | 0.00035 | 0.00026 | | | 0.00035 | 0.00026 | 0.0067 |
| Manganese | <0.0017 | <0.0013 | 0.0075 | 0.0056 | | | 0.0075 | 0.0056 | 0.14 |
| Mercury | <0.0002 | <0.00015 | <0.0001 | <0.000075 | <0.0005 | <0.00037 | <0.0005 | <0.00037 | <0.0095 |
| Nickel | <0.0017 | <0.0013 | 0.0021 | 0.0016 | | | 0.0021 | 0.0016 | 0.041 |
| Selenium | <0.0002 | <0.00015 | 0.00065 | 0.00048 | | | 0.00065 | 0.00048 | 0.012 |
| Thallium | <0.0002 | <0.00015 | <0.0001 | <0.000075 | | | <0.0002 | <0.00015 | <0.0038 |
| Tin | <0.0002 | <0.00015 | <0.0001 | <0.000075 | | | <0.0002 | <0.00015 | <0.0038 |
| Vanadium | <0.0004 | <0.0003 | <0.0001 | <0.000075 | | | <0.0002 | <0.00015 | <0.0038 |
| Zinc | <3.1 | <2.3 | 0.001 | 0.00075 | | | 0.001 | 0.00075 | 0.019 |
| **Total Hazardous Metals*** | **<0.0002** | **<0.00015** | **0.023** | **0.017** | **<0.0005** | **<0.00037** | **0.023** | **0.017** | **0.44** |
| **Total Metals** | **<0.0002** | **<0.00015** | **0.026** | **0.019** | | | **0.026** | **0.019** | **0.49** |

* Total does not include Copper, Magnesium and Zinc as they are classed non-hazardous

**Table 16 Stack 1 Speciated Polycyclic Aromatic Hydrocarbons Results, 28 September 2016**

| | Sample Result | | | Emission | | Mass Emission Rate | |
|---|---|---|---|---|---|---|---|
| | (ng) | (µg) | (mg) | (µg/m$^3$) | (mg/m$^3$) | (µg/s) | (mg/s) |
| Naphthalene | 45000 | 45 | 0.045 | 10 | 0.01 | 270 | 0.27 |
| 2 - Methylnaphthalene | 7000 | 7 | 0.007 | 1.6 | 0.0016 | 41 | 0.041 |
| Acenaphthylene | 7100 | 7.1 | 0.0071 | 1.6 | 0.0016 | 42 | 0.042 |
| Acenaphthene | 470 | 0.47 | 0.00047 | 0.11 | 0.00011 | 2.8 | 0.0028 |
| Fluorene | 1600 | 1.6 | 0.0016 | 0.37 | 0.00037 | 9.4 | 0.0094 |
| Phenanthrene | 2000 | 2 | 0.002 | 0.46 | 0.00046 | 12 | 0.012 |
| Anthracene | 120 | 0.12 | 0.00012 | 0.028 | 0.000028 | 0.71 | 0.00071 |
| Fluoranthene | 550 | 0.55 | 0.00055 | 0.13 | 0.00013 | 3.2 | 0.0032 |
| Pyrene | 440 | 0.44 | 0.00044 | 0.1 | 0.0001 | 2.6 | 0.0026 |
| Benz(a)anthracene | 62 | 0.062 | 0.000062 | 0.014 | 0.000014 | 0.37 | 0.00037 |
| Chrysene | 85 | 0.085 | 0.000085 | 0.02 | 0.00002 | 0.5 | 0.0005 |
| Benzo(b)fluoranthene | 100 | 0.1 | 0.0001 | 0.023 | 0.000023 | 0.59 | 0.00059 |
| Benzo(k)fluoranthene | 46 | 0.046 | 0.000046 | 0.011 | 0.000011 | 0.27 | 0.00027 |
| Benzo(e)pyrene | 48 | 0.048 | 0.000048 | 0.011 | 0.000011 | 0.28 | 0.00028 |
| Benzo(a)pyrene | 39 | 0.039 | 0.000039 | 0.009 | 0.000009 | 0.23 | 0.00023 |
| Perylene | <20 | <0.02 | <0.00002 | <0.0046 | <0.0000046 | <0.12 | <0.00012 |
| Indeno(123:cd)pyrene | <20 | <0.02 | <0.00002 | <0.0046 | <0.0000046 | <0.12 | <0.00012 |
| Dibenzo(ah)anthracene | <20 | <0.02 | <0.00002 | <0.0046 | <0.0000046 | <0.12 | <0.00012 |
| Benzo(ghi)perylene | 73 | 0.073 | 0.000073 | 0.017 | 0.000017 | 0.43 | 0.00043 |
| **Sum of reported PAH's** | **65000** | **65** | **0.065** | **15** | **0.015** | **390** | **0.39** |

AECOM

Weston Aluminium
01-Aug-2017
Doc No. 60539866_3_RPT_June17

Commercial-in-Confidence

# Stack 1 Emissions Testing Report June 2017

## Pharmaceutical Waste and Illicit Substance Destruction Trial

# Stack 1 Emissions Testing Report June 2017

Pharmaceutical Waste and Illicit Substance Destruction Trial

Client: Weston Aluminium

ABN: 91 075 245 108

Prepared by

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01-Aug-2017

Job No.: 60539866

AECOM in Australia and New Zealand is certified to ISO9001, ISO14001 AS/NZS4801 and OHSAS18001.

# Quality Information

Document Stack 1 Emissions Testing Report June 2017

Ref 60539866

Date 01-Aug-2017

Prepared by James Lang Approved Signatory _____

Reviewed by Paul Wenta

Revision History

| Rev | Revision Date | Details | Authorised | |
|---|---|---|---|---|
| | | | Name/Position | Signature |
| 0 | 1-Aug-2017 | Final Report | Chad Whitburn Compliance Services - Team Leader | |

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# Table of Contents



**List of Tables**

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# 1.0 Introduction

AECOM was appointed by Weston Aluminium Pty Ltd to conduct a series of measurements to determine air emissions from Stack 1 located at their Weston plant in Kurri Kurri, NSW while processing Pharmaceutical waste and Illicit Substances. Emission testing was a compliance requirement of Environmental Protection Licence (EPL) number 6423.

Testing was conducted on 8 June 2017 to determine emission concentrations for the following parameters:

**Stack 1 (EPL Point 1)**

- Total Particulate;
- Fine Particulate ($PM_{10}$);
- Sulfuric Acid Mist ($H_2SO_4$ as $SO_3$);
- Sulfur Dioxide ($SO_2$ as $SO_3$);
- Chlorine;
- Hydrogen Chloride;
- Gaseous Fluoride;
- Particulate Fluoride;
- Hazardous Substances (Metals);
- Volatile Organic Compounds (VOC);
- Oxides of Nitrogen;
- Carbon Monoxide;
- Carbon Dioxide;
- Oxygen;
- Cyanide;
- Polycyclic Aromatic Hydrocarbon (PAH); and
- Dioxins and Furans.

Laboratory analysis was conducted by the following laboratories, which hold NATA accreditation for the specified tests:

- Steel River Testing Pty. Ltd., NATA accreditation number 18079, performed the following analysis detailed in report number 13761-0-P, 13761-0-M:
  - Moisture;
  - Fine Particulate ($PM_{10}$); and
  - Total Particulate.
- Australian Laboratory Services, NATA accreditation number 18079, performed the following analysis detailed in report number EN1702503:
  - Fluoride;
  - Cyanide;
  - Sulfuric Acid Mist;
  - Sulfur Dioxide;
  - Hydrogen Chloride;

  - Chlorine; and
  - Volatile Organic Compounds.
- National Measurements Institute, NATA accreditation number 198, performed the following analysis detailed in report number ORG17_026 and DAU17-122:
  - Polycyclic Aromatic Hydrocarbons; and
  - Dioxins and Furans.
- SGS Australia Pty Ltd, NATA accreditation number 14429, performed the following analysis detailed in report number ME303133-R0:
  - Hazardous Substances (Metals).

# 2.0 Sampling Plane Requirements

The criteria for sampling planes are specified in AS 4323.1-1995 (R2014).

**Table 1 Criteria for Selection of Sampling Planes (AS 4323. 1)**

| Type of flow disturbance | Minimum distance upstream from disturbance, diameters (D) | Minimum distance downstream from disturbance, diameters (D) |
|---|---|---|
| Bend, connection, junction, direction change | >2D | >6D |
| Louvre, butterfly damper (partially closed or closed) | >3D | >6D |
| Axial fan | >3D | >8D (see Note) |
| Centrifugal fan | >3D | >6D |

*NOTE: The plane should be selected as far as practicable from a fan. Flow straighteners may be required to ensure the position chosen meets the check criteria listed in Items (a) to (f) below.*

*a. The gas flow is basically in the same direction at all points along each sampling traverse.*

*b. The gas velocity at all sampling points is greater than 3 m/s.*

*c. The gas flow profile at the sampling plane shall be steady, evenly distributed and not have a cyclonic component which exceeds an angle of 15$^{o}$ to the duct axis, when measured near the periphery of a circular sampling plane.*

*d. The temperature difference between adjacent points of the survey along each sampling traverse is less than 10% of the absolute temperature, and the temperature at any point differs by less than 10% from the mean.*

*e. The ratio of the highest to lowest pitot pressure difference shall not exceed 9:1 and the ratio of highest to lowest gas velocities shall not exceed 3:1. For isokinetic testing with the use of impingers, the gas velocity ratio across the sampling plane should not exceed 1.6:1.*

*f. The gas temperature at the sampling plane should preferably be above the dewpoint.*

Stack 1 (EPA Identification No. 1) did not satisfy the requirements of AS 4323.1 Section 4.1 with regard to the upstream and downstream distances from disturbances. To compensate for this, additional sampling points were added in accordance with AS 4323.1 Section 4.2.

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# 3.0 Methodology

## 3.1 NATA Accredited Methods

The following methods are accredited with the National Association of Testing Authorities (NATA), Accreditation No. 2778 (14391), and are approved for the sampling and analysis of gases and aerosols. Specific details of the methods are available on request.

All sampling and analysis is conducted according to the methods in **Table 2**.

**Table 2 AECOM NATA Endorsed Methods**

| NSW EPA Approved Methods | USEPA Methods | Parameter Measured |
|---|---|---|
| NSW EPA TM-1 (AS 4323.1-1995) | USEPA (2000) Method 1 under approved circumstances | Selection of sampling positions |
| NSW EPA TM-2 | USEPA (2000) Method 2 or 2C or USEPA (1999) Method 2F or 2G or 2H (as appropriate) | Velocity or volumetric flow rate or temperature or pressure of stack gases |
| NSW EPA TM-3 | USEPA (2000) Method 8 (for sampling and analysis) or APHA (1998) Method 4110B (for analysis only if interference from fluorides, free ammonia and/or dimethyl aniline has been demonstrated to the satisfaction of the Chief Scientist) (as appropriate) | Sulfuric acid mist ($H_2SO_4$) or sulphur trioxide ($SO_3$) |
| NSW EPA TM-4 | USEPA (2000) Method 6 or 6A or 6B or USEPA (1996) Method 6C or ISO (1989) Method 7934 or ISO (1992) Method 7935 or ISO (1993) Method 10396 or ISO (1998) Method 11632 (as appropriate) | Sulfur dioxide ($SO_2$) |
| NSW EPA TM-7 | USEPA (2000) 26A | Chlorine ($Cl_2$) |
| NSW EPA TM-8 | USEPA (2000) 26A | Hydrogen chloride (HCl) |
| NSW EPA TM-9 | USEPA (2000) Method 13A or 13B (as appropriate) | Fluorine ($F_2$) or any compound containing fluorine, except where emitted by a primary aluminium smelter while manufacturing aluminium from alumina |
| NSW EPA TM-12 | USEPA (2000) Method 29 or USEPA (2000) Method 102 (for mercury only in hydrogen rich streams) (as appropriate) | Type 1 substances (elements antimony (Sb), arsenic (As), cadmium (Cd), lead (Pb) or mercury (Hg) or any compound containing one or more of those elements) |
| NSW EPA TM-13 | USEPA (2000) Method 29 (Analysis for tin and vanadium to be done by Inductively Coupled Argon Plasma Emission Spectroscopy (ICAP) as defined in USEPA Method 29) or USEPA (1986) Method 7910 (for vanadium only) or USEPA (1986) Method 7911 (for vanadium only) (as appropriate) | Type 2 substances (elements beryllium (Be), chromium (Cr), cobalt (Co), manganese (Mn), nickel (Ni), selenium (Se), tin (Sn) or vanadium (V) or any compound containing one or more of those elements) |
| NSW EPA TM-14 | Cadmium (Cd) or mercury (Hg) or any compound containing one or more of those elements | USEPA (2000) Method 29 or USEPA (2000) Method 102 (for mercury only in hydrogen rich streams) (as appropriate) |

| NSW EPA Approved Methods | USEPA Methods | Parameter Measured |
|---|---|---|
| NSW EPA TM-15 (AS 4323.2-1995) | USEPA (2000) Method 5 under approved circumstances | Solid particles (Total) |
| NSW EPA TM-22 | USEPA (2000) Method 4 | Moisture content in stack gases |
| NSW EPA TM-23 | USEPA (2000) Method 3 | Dry gas density or molecular weight of stack gases |
| NSW EPA TM-34 | USEPA (2000) Method 18 or USEPA (2000) Method 25 or 25A or 25B or 25C or 25D or 25E (as appropriate) | Volatile organic compounds |
| NSW EPA OM-5 | USEPA (1997) Method 201 or 201A (as appropriate) | 'Fine' particulates ($PM_{10}$) |
| NSW EPA OM-6 | California EPA Air Resources Board (1997) Method 429 | Polycyclic aromatic hydrocarbons (PAHs) |
| NSW EPA TM-32 | USEPA Method 10 | Determination of Carbon Monoxide emissions from stationary sources |
| NSW EPA TM-25 | USEPA (1990) Method 3A | Determination of Oxygen concentrations from stationary sources |
| NSW EPA TM-24 | USEPA (1990) Method 3A | Carbon dioxide ($CO_2$) in stack gases |
| NSW EPA TM-11 | USEPA(2000) Method 7C | Determination of Nitrogen dioxide or nitric oxide emissions from stationary sources |
| NSW EPA TM-18 | USEPA (1995) Method 23 | Dioxins and Furans |

## 3.2 Deviations from NATA Accredited Methods

The following method is not accredited with the National Association of Testing Authorities (NATA), Accreditation No. 2778 (14391). Specific details of the methods are available on request.

All sampling and analysis is conducted according to the method in **Table 3**.

**Table 3 NATA Method Deviations**

| USEPA Methods | Parameter Measured |
|---|---|
| USEPA (2011) Other Test Method 29 | Sampling and analysis for Hydrogen Cyanide emissions from stationary sources |

# 4.0 Sampling Location

## 4.1 Sampling Location Summary

**Table 4** provides a summary of the location sampled by AECOM on 8 June 2017 at the Weston Aluminium plant in Kurri Kurri, NSW.

**Table 4 Sampling Location Summary**

| Discharge Description | Stack 1 (EPA Identification No. 1) |
|---|---|
| Duct Shape | Circular |
| Construction Material | Metal |
| Duct Diameter (mm) | 1650 |
| Minimum No. Sampling Points | 16 |
| Sampling Ports | 2 |
| Min. Points/Traverse | 8 |
| Disturbance | Yes |
| Distance from Upstream Disturbance | 2D |
| Type of Disturbance | Fan entry |
| Distance from Downstream Disturbance | 4D |
| Type of Disturbance | Stack Exit |
| Ideal Sampling Location | No |
| Correction Factors Applied | Yes |
| Total No. Points Sampled | 20 |
| Points/Traverse | 10 |
| Sampling Performed to Standard* | Yes[2] |

*AS 4323.1 Stationary source emissions Method 1 – Selection of sampling positions

[1] AS 4323.1 Section 4.1

[2] AS 4323.1 Section 4.2

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# 5.0 Equipment Calibration

AECOM has a calibration schedule to ensure the emission testing equipment is maintained in good order and with known calibration. Equipment used in this project was calibrated according to the procedures and frequency identified in the AECOM calibration schedule. Details of the schedule and the calibration calculations are available on request.

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# 6.0 Results

A summary of test results for June 2017 testing is presented in **Table 5**. Calculated Fine Particulate ($PM_{10}$) cut size is displayed in **Table 6**. Gas Data Concentrations and Mass Emission Rate summaries are reported in **Tables 7 & 8** respectively. Detailed results along with gas stream properties during the testing periods can be found in **Tables 9** to **12**. Speciated Volatile Organic Carbons and Dioxins and Furan results can be found in **Tables 13 & 14,** Hazardous Substances (Metals) results in **Table 15**, and Polycyclic Aromatic Hydrocarbons results in **Table 16**.

All emission concentrations are converted to standard conditions of 0°C, dry gas and 1 atm pressure for comparison with regulatory limits outlined in the Weston Aluminium Environmental Protection Licence 6423.

Field notes recorded during the project are attached as **Appendix A**. with Laboratory Analysis Reports attached as **Appendix B**, and Raw & Calculated Gas Data as **Appendix C**.

**Table 5 Stack Emissions Results Summary 8 June 2017**

| Parameter | Stack 1 EPL Point 1 |
|---|---|
| Carbon Monoxide (CO) (ppm) | 20 *(100)* |
| Chlorine ($mg/m^3$) | 11 |
| Cyanide | 0.38 *(0.5)* |
| Fine Particulate ($PM_{10}$) ($mg/m^3$) | 3.7 |
| Gaseous Fluoride ($mg/m^3$) | 0.028 *(2)* |
| Hydrogen Chloride ($mg/m^3$) | <7.7 *(400)* |
| Oxides of Nitrogen (as Equivalent $NO_2$) ($mg/m^3$) | 12 *(2500)* |
| Oxygen (%) | 20.6 |
| Carbon Dioxide (%) | 0.3 |
| Particulate Fluoride ($mg/m^3$) | 0.38 |
| Sulfur Dioxide ($SO_2$ as $SO_3$) ($mg/m^3$) | <8 |
| Sulfuric Acid Mist ($H_2SO_4$ as $SO_3$) ($mg/m^3$) | <1.6 *(100)* |
| Total Particulate ($mg/m^3$) | 8.7 *(25)* |
| Total Polycyclic Aromatic Hydrocarbons ($mg/m^3$) | 0.11 |
| Dioxins and Furans Lower Bound | 0.000002 |
| Dioxins and Furans Middle Bound | 0.00023 |
| Type 1 and 2 Substances in Aggregate (Metals) ($mg/m^3$) | 0.071 *(10)* |
| Volatile Organic Compounds (VOC) ($mg/m^3$) | <0.35 |

Note – EPL Limits are in parenthesis

USEPA method 201A, section 6.3.5 (Determination of $PM_{10}$ Emissions) and USEPA Conditional Test Method 040, Section 17, Table 2 (Determination of $PM_{2.5}$ Emissions) specifies that results are acceptable provided the calculated aerodynamic cut size ($D_{50}$) for the test lies between 9.0μm and 11.0μm. Post sampling cut size calculations performed for the sampling conducted are displayed in **Table 6**.

Cut size, or $D_{50}$, refers to the aerodynamic diameter of the particles contained in the gas stream which can be captured with a 50% efficiency and is a calculated value. For a Fine Particulate ($PM_{10}$) test particle sizes of 10μm and less are expected.

The cut size ($D_{50}$) is calculated prior to testing and is based on the pre-test measurements such as stack gas velocity, stack gas temperature, moisture content of the gas stream and stack gas density. This pre-test calculation of cut size ($D_{50}$) is used in conjunction with the pre-test measurements, some of which are stated above, to establish the sampling conditions or parameters.

**Table 6 Calculated $PM_{10}$ Cut Size**

| Sampling Location | $PM_{10}$ Cut Size ($D_{50}$) |
|---|---|
| Stack 1 | 10.0 |

The calculated cut sizes meet the criteria for cut size conditions stated above.

**Table 7 Calculated Gas Concentrations Data Summary, 8 June 2017**

| Parameter | Stack 1 |
|---|---|
| Time Period | 10:01-11:01 |
| Nitrogen Oxide (NO) ($mg/m^3$) | 4 |
| Nitrogen Dioxide ($NO_2$) ($mg/m^3$) | 6 |
| Nitrogen Oxides ($NO_x$) ($mg/m^3$) | 10 |
| Oxides of Nitrogen as Equivalent $NO_2$ ($mg/m^3$) | 12 *(2500)* |
| Carbon Monoxide (ppm) | 20 *(100)* |
| Carbon Monoxide ($mg/m^3$) | 25 |
| Carbon Dioxide (%) | 0.2 |
| Oxygen (%) | 20.6 |

Note – EPL Limits are provided in parenthesis.

**Table 8 Gas Mass Emission Rates Summary, 8 June 2017**

| Parameter | Stack 1 |
|---|---|
| Time Period | 10:01-11:01 |
| Stack Gas Flow Rate (0°C, dry gas, 1 atm pressure) | 26 |
| Nitrogen Oxide (NO) (mg/s) | 104 |
| Nitrogen Dioxide ($NO_2$) (mg/s) | 156 |
| Nitrogen Oxides ($NO_x$) (mg/s) | 260 |
| Oxides of Nitrogen as Equivalent $NO_2$ (mg/s) | 315 |
| Carbon Monoxide (mg/s) | 650 |

**Table 9 Stack 1 Fine Particulate ($PM_{10}$), Total Particulate, Particulate Fluoride and gaseous Fluoride Results, 8 June 2017**

| | | | | |
|---|---|---|---|---|
| **Sampling Conditions:** | | | | |
| Stack internal diameter at test location | 1650 | mm | | |
| Stack gas temperature (average) | 50.0 | °C | 323.2 | K |
| Stack pressure (average) | 1021 | hPa | | |
| Stack gas velocity (average, stack conditions) | 15 | m/s | | |
| Stack gas flowrate (stack conditions) | 32 | $m^3/s$ | | |
| Stack gas flowrate (0 °C, dry gas, 1 atm pressure) | 26 | $m^3/s$ | | |
| **Fine Particulate ($PM_{10}$) Testing** | | | | |
| Test Period | 10:55 | - | 12:37 | |
| Fine Particulate ($PM_{10}$) Mass | 4.6 | mg | | |
| Gas Volume Sampled | 1.24 | $m^3$ | | |
| Fine Particulate ($PM_{10}$) Emission*1 | 3.7 | $mg/m^3$ | | |
| Fine Particulate ($PM_{10}$) Mass Emission Rate*2 | 96 | mg/s | | |
| Regulatory Limit | NA | $mg/m^3$ | | |
| **Total Particulate Testing** | | | | |
| Test Period | 10:55 | - | 12:37 | |
| Total Particulate Mass | 12.6 | mg | | |
| Gas Volume Sampled | 1.45 | $m^3$ | | |
| Total Particulate Emission*1 | 8.7 | $mg/m^3$ | | |
| Total Particulate Mass Emission Rate*2 | 230 | mg/s | | |
| Regulatory Limit | 25 | $mg/m^3$ | | |
| **Particulate Fluoride Testing** | | | | |
| Test Period | 10:55 | - | 12:37 | |
| Particulate Fluoride Mass | 0.401 | mg | | |
| Gas Volume Sampled | 1.07 | $m^3$ | | |
| Particulate Fluoride Emission*1 | 0.38 | $mg/m^3$ | | |
| Particulate Fluoride Mass Emission Rate*2 | 9.9 | mg/s | | |
| Regulatory Limit | NA | $mg/m^3$ | | |
| **Gaseous Fluoride Testing** | | | | |
| Test Period | 10:55 | - | 12:37 | |
| Gaseous Fluoride Mass | 0.03 | mg | | |
| Gas Volume Sampled | 1.07 | $m^3$ | | |
| Gaseous Fluoride Emission*1 | 0.028 | $mg/m^3$ | | |
| Gaseous Fluoride Mass Emission Rate*2 | 0.73 | mg/s | | |
| Regulatory Limit | 2 | $mg/m^3$ | | |
| **Moisture Content (%)** | **2.7** | | | |
| **Gas Density (dry at 1 atmosphere)** | **1.29** | **$kg/m^3$** | | |
| **Dry Molecular Weight** | **28.9** | **g/g-mole** | | |

Notes *1 Emission concentration at Standard conditions of 0 °C, 1 atm, dry gas

*2 Mass emission rate determined from pre and post-test sampling flow measurements and the respective test moisture content. See $Q_{std}$ in field sheets and final calculations "Stack Analysis - Final Calculations" for each test.

**Table 10 Stack Cyanide, Hydrogen Chloride and Chlorine Results, 8 June 2017**

| | | | | |
|---|---|---|---|---|
| **Sampling Conditions:** | | | | |
| Stack internal diameter at test location | 1650 | mm | | |
| Stack gas temperature (average) | 53.6 | °C | 326.8 | K |
| Stack pressure (average) | 1021 | hPa | | |
| Stack gas velocity (average, stack conditions) | 15 | m/s | | |
| Stack gas flowrate (stack conditions) | 32 | $m^3/s$ | | |
| Stack gas flowrate (0 °C, dry gas, 1 atm pressure) | 26 | $m^3/s$ | | |
| **Cyanide Testing** | | | | |
| Test Period | 12:55 | - | 14:37 | |
| Cyanide Mass | 0.7 | mg | | |
| Gas Volume Sampled | 1.83 | $m^3$ | | |
| Cyanide Emission*1 | 0.38 | $mg/m^3$ | | |
| Cyanide Mass Emission Rate*2 | 10 | mg/s | | |
| Regulatory Limit | 0.5 | $mg/m^3$ | | |
| **Hydrogen Chloride Testing** | | | | |
| Test Period | 12:55 | - | 14:37 | |
| Hydrogen Chloride Mass | <10 | mg | | |
| Gas Volume Sampled | 1.31 | $m^3$ | | |
| Hydrogen Chloride Emission*1 | <7.7 | $mg/m^3$ | | |
| Hydrogen Chloride Mass Emission Rate*2 | <200 | mg/s | | |
| Regulatory Limit | 400 | $mg/m^3$ | | |
| **Chlorine Testing** | | | | |
| Test Period | 12:55 | - | 14:37 | |
| Chlorine Mass | 14.6 | mg | | |
| Gas Volume Sampled | 1.34 | $m^3$ | | |
| Chlorine Emission*1 | 11 | $mg/m^3$ | | |
| Chlorine Mass Emission Rate*2 | 290 | mg/s | | |
| Regulatory Limit | NA | $mg/m^3$ | | |
| **Moisture Content (%)** | **2.8** | | | |
| **Gas Density (dry at 1 atmosphere)** | **1.29** | **$kg/m^3$** | | |
| **Dry Molecular Weight** | **28.9** | **g/g-mole** | | |

Notes *1 Emission concentration at Standard conditions of 0°C, 1 atm, dry gas

*2 Mass emission rate determined from pre and post-test sampling flow measurements and the respective test moisture content. See $Q_{std}$ in field sheets and final calculations "Stack Analysis - Final Calculations" for each test.

**Table 11 Stack 1 Hazardous Substances (Metals), Sulfuric Acid Mist ($H_2SO_4$ as $SO_3$) and Sulfur Dioxide ($SO_2$ as $SO_3$) Results, 8 June 2017**

| | | | | |
|---|---|---|---|---|
| **Sampling Conditions:** | | | | |
| Stack internal diameter at test location | 1650 | mm | | |
| Stack gas temperature (average) | 45.5 | °C | 318.7 | K |
| Stack pressure (average) | 1021 | hPa | | |
| Stack gas velocity (average, stack conditions) | 15 | m/s | | |
| Stack gas flowrate (stack conditions) | 32 | $m^3/s$ | | |
| Stack gas flowrate (0 °C, dry gas, 1 atm pressure) | 27 | $m^3/s$ | | |
| **Hazardous Substances (Metals) Testing** | | | | |
| Test Period | 8:50 | - | 10:33 | |
| Hazardous Substances (Metals) Mass | 0.092 | mg | | |
| Gas Volume Sampled | 1.3 | $m^3$ | | |
| Hazardous Substances (Metals) Emission*1 | 0.071 | $mg/m^3$ | | |
| Hazardous Substances (Metals) Mass Emission Rate*2 | 1.9 | mg/s | | |
| Regulatory Limit | 10 | $mg/m^3$ | | |
| **Sulfuric Acid Mist ($H_2SO_4$ as $SO_3$) Testing** | | | | |
| Test Period | 8:50 | - | 10:33 | |
| Sulfuric Acid Mist ($H_2SO_4$ as $SO_3$) Mass | <2 | mg | | |
| Gas Volume Sampled | 1.25 | $m^3$ | | |
| Sulfuric Acid Mist ($H_2SO_4$ as $SO_3$) Emission*1 | <1.6 | $mg/m^3$ | | |
| Sulfuric Acid Mist ($H_2SO_4$ as $SO_3$) Mass Emission Rate*2 | <44 | mg/s | | |
| Regulatory Limit | 100 | $mg/m^3$ | | |
| **Sulfur Dioxide ($SO_2$ as $SO_3$) Testing** | | | | |
| Test Period | 8:50 | - | 10:33 | |
| Sulfur Dioxide ($SO_2$ as $SO_3$) Mass | <10 | mg | | |
| Gas Volume Sampled | 1.25 | $m^3$ | | |
| Sulfur Dioxide ($SO_2$ as $SO_3$) Emission*1 | <8 | $mg/m^3$ | | |
| Sulfur Dioxide ($SO_2$ as $SO_3$) Mass Emission Rate*2 | <220 | mg/s | | |
| Regulatory Limit | NA | $mg/m^3$ | | |
| **Moisture Content (%)** | **2.6** | | | |
| **Gas Density (dry at 1 atmosphere)** | **1.29** | **$kg/m^3$** | | |
| **Dry Molecular Weight** | **28.9** | **g/g-mole** | | |

Notes *1 Emission concentration at Standard conditions of 0°C, 1 atm, dry gas

*2 Mass emission rate determined from pre and post-test sampling flow measurements and the respective test moisture content. See $Q_{std}$ in field sheets and final calculations "Stack Analysis - Final Calculations" for each test.

**Table 12 Stack 1 Polycyclic Aromatic Hydrocarbon (PAH), Dioxins and Furans Results, 8 June 2017**

| **Sampling Conditions:** | | | | |
|---|---|---|---|---|
| Stack internal diameter at test location | 1650 | mm | | |
| Stack gas temperature (average) | 47.7 | °C | 320.9 | K |
| Stack pressure (average) | 1021 | hPa | | |
| Stack gas velocity (average, stack conditions) | 15 | m/s | | |
| Stack gas flowrate (stack conditions) | 32 | $m^3/s$ | | |
| Stack gas flowrate (0°C, dry gas, 1 atm pressure) | 27 | $m^3/s$ | | |
| **Polycyclic Aromatic Hydrocarbons Testing** | | | | |
| Test Period | 8:30 | - | 14:37 | |
| Polycyclic Aromatic Hydrocarbons Mass | 0.4 | mg | | |
| Gas Volume Sampled | 3.7 | $m^3$ | | |
| Polycyclic Aromatic Hydrocarbons Emission*[1] | 0.11 | $mg/m^3$ | | |
| Polycyclic Aromatic Hydrocarbons Mass Emission Rate*[2] | 3 | mg/s | | |
| Regulatory Limit | NA | $mg/m^3$ | | |
| **Dioxins and Furans Lower Bound Testing** | | | | |
| Test Period | 8:30 | - | 14:37 | |
| Dioxins and Furans Lower Bound Mass | 0.0000074 | ng | | |
| Gas Volume Sampled | 3.7 | $m^3$ | | |
| Dioxins and Furans Lower Bound Emission*[1] | 0.000002 | $ng/m^3$ | | |
| Dioxins and Furans Lower Bound Mass Emission Rate*[2] | 0.000054 | ng/s | | |
| Regulatory Limit | NA | $ng/m^3$ | | |
| **Dioxins and Furans Middle Bound Testing** | | | | |
| Test Period | 8:30 | - | 14:37 | |
| Dioxins and Furans Middle Bound Mass | 0.0008474 | ng | | |
| Gas Volume Sampled | 3.7 | $m^3$ | | |
| Dioxins and Furans Middle Bound Emission*[1] | 0.00023 | $ng/m^3$ | | |
| Dioxins and Furans Middle Bound Mass Emission Rate*[2] | 0.0062 | ng/s | | |
| Regulatory Limit | NA | $ng/m^3$ | | |
| **Moisture Content (%)** | **1.6** | | | |
| **Gas Density (dry at 1 atmosphere)** | **1.29** | **$kg/m^3$** | | |
| **Dry Molecular Weight** | **28.9** | **g/g-mole** | | |

Notes *1 Emission concentration at Standard conditions of 0°C, 1 atm, dry gas

*2 Mass emission rate determined from pre and post-test sampling flow measurements and the respective test moisture content. See $Q_{std}$ in field sheets and final calculations "Stack Analysis - Final Calculations" for each test.

**Table 13 Stack 1 Speciated Volatile Organic Compounds Results, 8 June 2017**

| Analyte | Sample µg | Blank µg | Sample Blank Corrected µg | (mg/m$^3$) | mg/s |
|---|---|---|---|---|---|
| Acetone | <1.0 | <1.0 | <1.0 | <0.18 | <4.7 |
| 1,1-dichloroethane | <1.0 | <1.0 | <1.0 | <0.18 | <4.7 |
| 2-Butanone | <1.0 | <1.0 | <1.0 | <0.18 | <4.7 |
| Chloroform | <1.0 | <1.0 | <1.0 | <0.18 | <4.7 |
| Benzene | <1.0 | <1.0 | <1.0 | <0.18 | <4.7 |
| 1-heptene | <1.0 | <1.0 | <1.0 | <0.18 | <4.7 |
| n-heptane | <1.0 | <1.0 | <1.0 | <0.18 | <4.7 |
| Trichloroethene | <1.0 | <1.0 | <1.0 | <0.18 | <4.7 |
| MIBK | <1.0 | <1.0 | <1.0 | <0.18 | <4.7 |
| Toluene | <1.0 | <1.0 | <1.0 | <0.18 | <4.7 |
| 2-hexanone | <1.0 | <1.0 | <1.0 | <0.18 | <4.7 |
| Chlorobenzene | <1.0 | <1.0 | <1.0 | <0.18 | <4.7 |
| Ethyl Benzene | <1.0 | <1.0 | <1.0 | <0.18 | <4.7 |
| m- & p-xylene | <2.0 | <0.2 | <2.0 | <0.35 | <9.1 |
| o-xylene | <1.0 | <1.0 | <1.0 | <0.18 | <4.7 |
| Styrene | <1.0 | <1.0 | <1.0 | <0.18 | <4.7 |
| Cyclohexanone | <1.0 | <1.0 | <1.0 | <0.18 | <4.7 |
| Isopropylbenzene | <1.0 | <1.0 | <1.0 | <0.18 | <4.7 |
| 2-chlorotoluene | <1.0 | <1.0 | <1.0 | <0.18 | <4.7 |
| 4-chlorotoluene | <1.0 | <1.0 | <1.0 | <0.18 | <4.7 |
| 1,3,5-trimethylbenzene | <1.0 | <1.0 | <1.0 | <0.18 | <4.7 |
| n-decane | <1.0 | <1.0 | <1.0 | <0.18 | <4.7 |
| 1,2,4-trimethylbenzene | <1.0 | <1.0 | <1.0 | <0.18 | <4.7 |
| 1,3-dichlorobenzene | <1.0 | <1.0 | <1.0 | <0.18 | <4.7 |
| 1,4-dichlorobenzene | <1.0 | <1.0 | <1.0 | <0.18 | <4.7 |
| 1,2-dichlorobenzne | <1.0 | <1.0 | <1.0 | <0.18 | <4.7 |
| n-butylbenzene | <1.0 | <1.0 | <1.0 | <0.18 | <4.7 |
| Hexachlorobutadiene | <1.0 | <1.0 | <1.0 | <0.18 | <4.7 |
| **Total** | **<1** | | **<1** | **<0.35** | **<9.1** |

Note: Where the blank has returned a less than value, the analysed value has been corrected for half of that blank value. i.e. a blank value of <0.5 has had 0.25 subtracted from the analysed value.

**Table 14 Stack 1 Speciated Dioxins And Furans Results, 8 June 2017**

| Analyte | Mass ng | Toxic Equivalency Factor (1 - TEFs) | Total Toxic Equivalence (1 - TEQs) ng | Concentration ng/m$^3$ | Total Toxic Equivalence (1-TEQs) ng/m$^3$ |
|---|---|---|---|---|---|
| 2,3,7,8-TCDF | <0.002 | 0.1 | 0.0001 | <0.00054 | 0.000027 |
| Total TCDF isomers | 0.015 | | | | |
| 2,3,7,8-TCDD | <0.001 | 1 | 0.0005 | <0.00027 | 0.00013 |
| Total TCDD isomers | <0.0007 | | | | |
| | | | | | |
| 1,2,3,7,8-PeCDF | <0.001 | 0.05 | 0.000025 | <0.00027 | 0.0000067 |
| 2,3,4,7,8-PeCDF | <0.0002 | 0.5 | 0.00005 | <0.000054 | 0.000013 |
| Total PeCDF isomers | <0.004 | | | | |
| 1,2,3,7,8-PeCDD | <0.0003 | 0.5 | 0.000075 | <0.000081 | 0.00002 |
| Total PeCDD isomers | <0.002 | | | | |
| | | | | | |
| 1,2,3,4,7,8-HxCDF | <0.0003 | 0.1 | 0.000015 | <0.000081 | 0.000004 |
| 1,2,3,6,7,8-HxCDF | <0.0003 | 0.1 | 0.000015 | <0.000081 | 0.000004 |
| 2,3,4,6,7,8-HxCDF | <0.0002 | 0.1 | 0.00001 | <0.000054 | 0.0000027 |
| 1,2,3,7,8,9-HxCDF | <0.0002 | 0.1 | 0.00001 | <0.000054 | 0.0000027 |
| Total HxCDF isomers | <0.002 | | | | |
| 1,2,3,4,7,8-HxCDD | <0.0002 | 0.1 | 0.00001 | <0.000054 | 0.0000027 |
| 1,2,3,6,7,8-HxCDD | <0.0002 | 0.1 | 0.00001 | <0.000054 | 0.0000027 |
| 1,2,3,7,8,9-HxCDD | <0.0002 | 0.1 | 0.00001 | <0.000054 | 0.0000027 |
| Total HxCDD isomers | <0.002 | | | | |
| | | | | | |
| 1,2,3,4,6,7,8-HpCDF | <0.0007 | 0.01 | 0.0000035 | <0.00019 | 0.00000094 |
| 1,2,3,4,7,8,9-Hp CDF | <0.0004 | 0.01 | 0.000002 | <0.00011 | 0.00000054 |
| Total HpCDF isomers | <0.002 | | | | |
| 1,2,3,4,6,7,8-HpCDD | <0.0009 | 0.01 | 0.0000045 | <0.00024 | 0.0000012 |
| Total HpCDD isomers | <0.002 | | | | |
| | | | | | |
| OCDF | 0.0013 | 0.001 | 0.0000013 | 0.00035 | 0.00000035 |
| OCDD | 0.0061 | 0.001 | 0.0000061 | 0.0016 | 0.0000016 |

| | | |
|---|---|---|
| I-TEQ$_{DF}$ | | |
| Lower Bound (excluding LOD Values) | 0.000074 | ng |
| Middle Bound (including half LOD Values) | 0.00085 | ng |

**Table 15 Stack 1 Elemental Metals Results, 8 June 2017**

| Sample | Total Particulate Metals (mg) | Total Particulate Metals ($mg/m^3$) | Total Gaseous Metals (mg) | Total Gaseous Metals ($mg/m^3$) | Total Oxidisable Mercury (mg) | Total Oxidisable Mercury ($mg/m^3$) | Total (mg) | Total ($mg/m^3$) | Mass Emission Rate (mg/s) |
|---|---|---|---|---|---|---|---|---|---|
| Antimony | <0.0002 | <0.00015 | <0.0001 | <0.000077 | | | <0.0002 | <0.00015 | <0.004 |
| Arsenic | 0.0001 | 0.000077 | <0.0001 | <0.000077 | | | 0.0001 | 0.000077 | 0.0021 |
| Beryllium | <0.0002 | <0.00015 | 0.000047 | 0.000036 | | | 0.000047 | 0.000036 | 0.00097 |
| Cadmium | 0.035 | 0.027 | 0.0013 | 0.001 | | | 0.04 | 0.031 | 0.84 |
| Chromium | 0.027 | 0.021 | 0.0013 | 0.001 | | | 0.03 | 0.023 | 0.62 |
| Cobalt | <0.0002 | <0.00015 | <0.0001 | <0.000077 | | | <0.0002 | <0.00015 | <0.004 |
| Copper | 0.002 | 0.0015 | 0.00025 | 0.00019 | | | 0.002 | 0.0015 | 0.04 |
| Lead | 0.0011 | 0.00085 | 0.00095 | 0.00073 | | | 0.002 | 0.0015 | 0.04 |
| Magnesium | <0.124 | <0.096 | 0.0033 | 0.0025 | | | 0.0033 | 0.0025 | 0.067 |
| Manganese | 0.0052 | 0.004 | <0.0016 | <0.0012 | | | 0.0052 | 0.004 | 0.11 |
| Mercury | <0.0001 | <0.000077 | 0.00049 | 0.00038 | <0.0001 | <0.000077 | 0.00049 | 0.00038 | 0.01 |
| Nickel | 0.0083 | 0.0064 | 0.00095 | 0.00073 | | | 0.009 | 0.0069 | 0.19 |
| Selenium | 0.0047 | 0.0036 | 0.00025 | 0.00019 | | | 0.005 | 0.0039 | 0.11 |
| Thallium | <0.0002 | <0.00015 | <0.0001 | <0.000077 | | | <0.0002 | <0.00015 | <0.004 |
| Tin | 0.0004 | 0.00031 | 0.00015 | 0.00012 | | | 0.0006 | 0.00046 | 0.012 |
| Vanadium | <0.0088 | <0.0068 | <0.0057 | <0.0044 | | | <0.0002 | <0.00015 | <0.004 |
| Zinc | 0.92 | 0.71 | 0.014 | 0.011 | | | 0.9 | 0.69 | 19 |
| **Total Hazardous Metals*** | **0.081** | **0.063** | **0.0053** | **0.0041** | **<0.0001** | **<0.000077** | **0.092** | **0.071** | **1.9** |
| **Total Metals** | **1** | **0.77** | **0.023** | **0.018** | | | **1** | **0.77** | **21** |

* Total does not include Copper, Magnesium and Zinc as they are classed non-hazardous

**Table 16 Stack 1 Speciated Polycyclic Aromatic Hydrocarbons Results, 8 June 2017**

| | Sample Result | | | Emission | | Mass Emission Rate | |
|---|---|---|---|---|---|---|---|
| | (ng) | (µg) | (mg) | (µg/m$^3$) | (mg/m$^3$) | (µg/s) | (mg/s) |
| Naphthalene | 290000 | 290 | 0.29 | 78 | 0.078 | 2100 | 2.1 |
| 2 - Methylnaphthalene | 20000 | 20 | 0.02 | 5.4 | 0.0054 | 140 | 0.14 |
| Acenaphthylene | 46000 | 46 | 0.046 | 12 | 0.012 | 330 | 0.33 |
| Acenaphthene | 3200 | 3.2 | 0.0032 | 0.86 | 0.00086 | 23 | 0.023 |
| Fluorene | 4700 | 4.7 | 0.0047 | 1.3 | 0.0013 | 34 | 0.034 |
| Phenanthrene | 34000 | 34 | 0.034 | 9.2 | 0.0092 | 250 | 0.25 |
| Anthracene | 260 | 0.26 | 0.00026 | 0.07 | 0.00007 | 1.9 | 0.0019 |
| Fluoranthene | 4500 | 4.5 | 0.0045 | 1.2 | 0.0012 | 33 | 0.033 |
| Pyrene | 1100 | 1.1 | 0.0011 | 0.3 | 0.0003 | 8 | 0.008 |
| Benz(a)anthracene | 38 | 0.038 | 0.000038 | 0.01 | 0.00001 | 0.28 | 0.00028 |
| Chrysene | 110 | 0.11 | 0.00011 | 0.03 | 0.00003 | 0.8 | 0.0008 |
| Benzo(b)fluoranthene | 55 | 0.055 | 0.000055 | 0.015 | 0.000015 | 0.4 | 0.0004 |
| Benzo(k)fluoranthene | 32 | 0.032 | 0.000032 | 0.0086 | 0.0000086 | 0.23 | 0.00023 |
| Benzo(e)pyrene | 49 | 0.049 | 0.000049 | 0.013 | 0.000013 | 0.36 | 0.00036 |
| Benzo(a)pyrene | 360 | 0.36 | 0.00036 | 0.097 | 0.000097 | 2.6 | 0.0026 |
| Perylene | <20 | <0.02 | <0.00002 | <0.0054 | <0.0000054 | <0.14 | <0.00014 |
| Indeno(123:cd)pyrene | 32 | 0.032 | 0.000032 | 0.0086 | 0.0000086 | 0.23 | 0.00023 |
| Dibenzo(ah)anthracene | <20 | <0.02 | <0.00002 | <0.0054 | <0.0000054 | <0.14 | <0.00014 |
| Benzo(ghi)perylene | 28 | 0.028 | 0.000028 | 0.0076 | 0.0000076 | 0.2 | 0.0002 |
| **Sum of reported PAH's** | **400000** | **400** | **0.4** | **110** | **0.11** | **2900** | **2.9** |