Preliminary Project Application
Environmental Assessment Scoping Report
Spent Potliner Processing Facility at Tomago Aluminium

21 September 2006

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Preliminary Project Application
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Spent Potliner Processing Facility at Tomago Aluminium
21 September 2006

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This document was prepared for the sole use of Regain Services Pty Limited, Tomago Aluminium Pty Ltd and the regulatory agencies that are directly involved in this project, the only intended beneficiaries of our work. No other party should rely on the information contained herein without the prior written consent of HLA-Envirosciences Pty Limited and Regain Services Pty Limited.

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1 INTRODUCTION

This Environmental Assessment Scoping Report (EASR) was prepared by HLA-Envirosciences Pty Limited (HLA) on behalf of Tomago Aluminium Company Pty Limited (Tomago Aluminium) and Regain Services Pty Limited (Regain) to accompany a project application to the Department of Planning for a Spent Potliner (SPL) Processing Facility. The SPL processing facility is to be located within the existing Tomago Aluminium smelter site at Tomago.

1.1 Background

Tomago Aluminium operates an aluminium smelter at Tomago, located approximately 13 km northwest of Newcastle. The plant processes alumina in pots that are lined with carbon and refractory materials (known as potlining), which are used to separate the alumina into aluminium metal and oxygen. The carbon lining functions as a cathode, while the refractory insulation material protects the steel casing of the pot from the high temperatures used in the smelting process. The potlining material becomes compromised over time, and needs to be replaced. This material is known as spent potliner (SPL), and is a hazardous waste due to the presence of soluble cyanide and fluoride. SPL also poses a potential explosion hazard due to the reactive compounds contained within the material.

Tomago Aluminium has historically disposed of its SPL waste by stockpiling it on site, and shipping it overseas for reprocessing. A condition of the development consent for the Tomago Aluminium facility, however, requires the investigation of alternative options for the management of the SPL material.

1.2 Project Context

Regain has developed a system for treating SPL material from aluminium smelters that oxidises the cyanide and neutralises the reactive compounds such that the explosion hazard is removed, producing a valuable end-product. A demonstration plant was commissioned at Tomago Aluminium in June 2002, and the first stage of a full scale plant is planned for installation at Kurri Kurri in 2006. Regain now wishes to install and operate a full scale plant at Tomago with the capacity to treat up to 15,000 tonnes of SPL material per annum, which is approximately 50 % above the current generation rate of SPL waste at the site. This scale of operation will enable the existing waste stockpiles of SPL material at Tomago to be reduced over time.

Regain’s process generates a number of mineral end-products that enable the valuable components of the SPL, such as carbon and minerals, to be reused by other industries. Regain’s facility will not only fully recycle SPL material, but will generate end-products that will reduce the consumption of fuel in the brick and cement industries.

1.3 Location

The proposed SPL facility is to be located at the Tomago Aluminium smelter in Tomago, approximately 13 km northwest of Newcastle (see **Figure 1**). The land on which the plant is to be located would be leased from Tomago Aluminium by Regain. The smelter is close to the North Arm of the Hunter River, and is also in the vicinity of the Kooragang Nature Reserve and the Tomago Sandbeds Water Supply Works. A vegetative buffer zone separates the smelter from view from roads and residences.

Neighbouring premises include the Tomago Detention Centre (approximately 500 m south of the site) and a caravan park (approximately 1.5 km west of the site), with a number of small industrial facilities located nearby. Neighbouring residences are primarily located on Tomago Road (approximately 1 – 4 km from the site), including the historic Tomago House. The closest high density residential areas (with approximate distances provided in parentheses) are at Raymond Terrace (8 km north) and Williamtown (12 km east).

1.4 Purpose of this Report

The Director-General of the Department of Planning (DOP) determined that the proposal meets the criteria for consideration as a major project under State Environmental Planning Policy 2005 (SEPP 2005). As such, this EASR has been prepared to accompany a major project application in accordance with DOP's Draft Preliminary Assessment Guidelines (DOP, 2005) in order to outline the scope of the project and potential community or environmental impacts. This EASR is intended to provide DOP and other statutory authorities with sufficient information to establish the key environmental issues associated with the project. The information contained in this report will be used to determine the Director-General's Requirements for the Environmental Assessment.

1.5 Report Structure

To inform relevant statutory authorities of the level and detail of environmental assessment required for the proposed project, this EASR has been structured to provide information in the following broad areas:

- **Sections 1** and **2** provide an introduction to the proposed project, including the background and need for the project;
- **Section 3** describes the legislation applying to the proposed project;
- **Sections 4** and **5** report on the environmental implications of the proposal in terms of physical and biological effects, including the baseline situation and anticipated impacts;
- **Section 6** examines the likely impacts of the proposed project on community, transport and natural resources;
- **Section 7** outlines the potential effects of the project on the community in terms of social, heritage and cultural impacts, together with the economic implications of the proposal; and
- **Section 8** presents a summary of the findings of the EASR and provides recommendations for the level of environmental assessment required to support the project application.

1.6 The Proponent

Regain is a Hunter-based mineral trading and processing company that focuses on mineral products manufactured from aluminium smelter by-products. Regain has worked with a number of aluminium smelters in Australia to recycle minerals from a range of smelter waste products, including bake furnace and cast house refractory wastes, spent anodes and SPL. Products produced include fuel and minerals for cement manufacturing, and flux for use in brick kilns.

2 EXISTING DEVELOPMENT

2.1 The Aluminium Smelting Process

The aluminium smelting process involves the manufacture of carbon anodes, the reduction of alumina to aluminium and casting of the molten metal.

The reduction of alumina to aluminium is performed in large electrolytic cells known as pots. These pots are lined with refractory materials with an inner carbon cathode shell. Tomago Aluminium has three potlines, each containing 280 pots. Alumina is fed into the pots via a closed-system feed hopper that sits above the pot, and is dissolved in a bath of molten cryolite (sodium aluminium fluoride).

Carbon anodes are used to introduce electricity into the pots to drive the reduction process. They are manufactured on site in the Carbon Plant from petroleum coke and liquid pitch, which are mixed together to form a paste and then compacted and shaped. The anodes are baked in one of two gas-fired baking furnaces for several weeks at temperatures of up to 1200^{o}C, and then fitted with rods and transported to the potlines. The baked carbon anodes are consumed in the aluminium smelting process.

The molten aluminium produced is siphoned off into a ladle using a vacuum system, and transported to the Cast House where it is poured into large holding furnaces. The composition of the metal is determined, and alloying elements such as silicon, manganese, magnesium, copper and zinc are added if required. The molten metal is then cast as small ingots, tee ingots, billets or slabs.

2.2 Spent Potliner

The pots used to reduce alumina are lined with carbon and refractory lining, which are collectively referred to as potlining. Potlining has a life cycle of six to seven years, over which time it becomes contaminated with materials such as alumina, aluminium, calcium, fluoride compounds and sodium. Cyanide compounds and aluminium carbide can also be created in the reducing atmosphere of the pots and infiltrate the potlining. The deteriorated potlining, known as SPL, is regularly replaced as part of the periodic individual rebuilding of the pots.

Potlining is typically removed in two stages. First-cut SPL is the removed carbon cathode lining, whilst second-cut SPL is the removed refractory lining. SPL materials are currently stored on the Tomago Aluminium site, and were shipped internationally for processing prior to the commissioning of the demonstration plant.

The composition of the SPL material is highly variable. Up to 10 % of the SPL is typically aluminium and sodium nitrides and carbides, which are created through the diffusion of air into the carbon lining and chemical reactions occurring in the pot. When water is introduced, these materials can react to form ammonia, hydrogen, methane and acetylene. Fluoride compounds, which are potentially hazardous materials, can also be present in the SPL at concentrations of up to 10 %. The majority of the SPL consists of non-activated carbon (10 – 70%), aluminium oxide (10 – 30 %), and aluminium (10 – 30 %) (refer to **Appendix 1**).

The fluxing properties and calorific value of the SPL are inherently useful to the cement manufacturing sector. Therefore, the reprocessing of the SPL creates valuable products as well as reducing the waste disposal issues for the aluminium smelter.

2.3 Existing Spent Potliner Handling and Storage

The SPL is classified as a Dangerous Good and an Environmentally Hazardous Waste, and requires careful handling and disposal in accordance with regulatory requirements. SPL can no longer be disposed of in landfills, and the SPL waste from Tomago Aluminium has historically been shipped overseas for treatment. The SPL is stored on site in a number of sheds prior to disposal.

Since commissioning in 2002, the demonstration plant has built up to its current processing capacity of 12,000 tonnes of SPL per annum. The demonstration plant has the capacity to treat the current SPL generation rates, yet cannot reduce the levels of SPL currently stored on site.

3 PROPOSED DEVELOPMENT

3.1 Plant Description

The SPL processing plant and amenities would be located in two adjacent existing buildings that are currently used for the storage of the SPL, known as SPL Sheds 5 and 6 (see **Figure 2**). SPL Shed 5 is adjacent to the Deline facility, where the SPL is removed from the pots. Each building is 55 m long x 50 m wide (floor area of 2,750 m^2). The buildings are of steel construction with aluminium sheet metal walls and roof cladding. The building sides (north and south) are fitted with louvre type ventilation panels. The floors are constructed from steel reinforced concrete. The steel retaining walls are sealed to the floor excluding the two doorways per building. Each doorway is fitted with a drainage system that is connected to leachate/liquid collection storage tanks.

The proposed plant will include the following components:

- Materials preparation – including pot delining and SPL crushing, sizing, grinding and storage facilities;
- SPL treatment – including a rotary kiln and water reaction mixer; and
- Product plant – including blending, drying and final product crushing and storage facilities.

All of the materials preparation and storage facilities would be located within the SPL sheds, with the thermal treatment plant and the product blending and grinding facilities located between the two buildings. All externally-located plant would be enclosed. The proposed plant would have four air emission points – the SPL Shed 5 and Deline facility air filter (preparation facilities), the thermal treatment plant dust collector, the drying and blending plant dust collector, and the SPL Shed 6 air filter (product storage).

Plant associated with the existing demonstration plant, including conveyors, crushing, grinding and sizing equipment, raw material and product bins, etc., may be retained and utilised in the proposed project.

3.2 SPL Treatment Process

The process developed by Regain to treat SPL material involves preparation of the SPL, heat treatment of the material combined with exposure to air and water, and grinding and blending of the treated material to form the mineral products. These stages are illustrated in **Figure 3**.

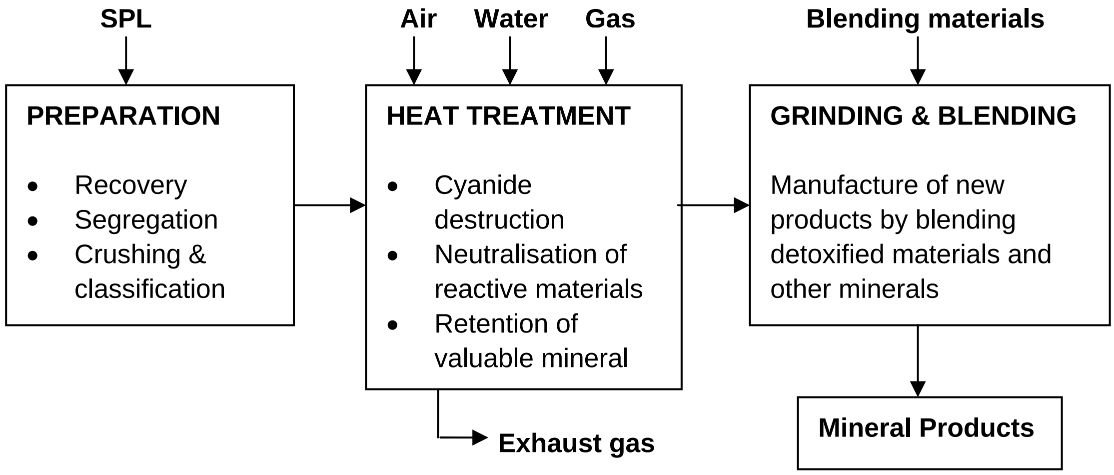


Figure 3: Treatment Process Flow Diagram

The treatment process destroys the cyanide and neutralises the flammable gas hazard associated with the SPL while retaining the valuable materials such as carbon, fluorides, and other inorganic compounds.

Heating of the SPL material destroys most of the cyanide through the process of thermal oxidation, while the reactive compounds are neutralised by the water. Mineral products are made by blending the treated materials with minerals such as coal and sand and previously generated SPL treatment products to achieve the product specifications of the end users of the materials.

3.2.1 Materials Preparation

As currently occurs, pots would be taken to the existing Deline facility for removal of the SPL, with the SPL material transferred to SPL Shed 5 by conveyor. The SPL material would be stored in SPL Shed 5 prior to and during preparation, and moved within the building by front-end loader.

The SPL would be fed to a feeder hopper that directs the SPL onto the sorting station feed conveyor. The sorting station would size the SPL through a number of screens and chutes and remove any large lumps, which would be broken up and re-fed to the plant.

The sorted material would then be fed to the primary crusher, which would be operated on a batch process campaign basis of three to four months per year. The primary crusher would be used to homogenise the material for feeding to the secondary crusher and sizing plant. Once crushed, the SPL would be transferred to the feed stock storage bins in SPL Shed 5 via front-end loader. Prepared feed material would then be transferred to the thermal treatment plant via screw conveyor.

Crushed SPL would be recovered from the feed stockpile and fed to the grinding mill to ensure the material is appropriately sized for the thermal treatment process.

3.2.2 Rotary Kiln and Water Reaction Mixer

The ground SPL would be fed to the rotary kiln using a screw conveyor, located at the base of the kiln feed bin. The rotary kiln would detoxify the SPL through a process of high temperature thermal oxidation. The kiln would be fired by natural gas at temperatures of 750 – 800^{o}C (N.B. temperatures would be maintained below 850 ^{o}C to prevent the liberation of fluoride from the SPL). Air would be drawn into the kiln via an induction fan to facilitate combustion. Combustion products would pass to the baghouse prior to discharge to atmosphere, with collected particulate matter fed back into the product manufacturing plant.

Thermally-treated SPL would then be fed to the water reaction mixer to evolve flammable gases (primarily ammonia, hydrogen, methane and acetylene). The gases produced would be fed back into the kiln as fuel and thermally destroyed.

After passing through the water reaction mixer, the processed SPL would be free of hazardous compounds and no longer classified as a waste material. The detoxified product would be fed to stockpiles in SPL Shed 6 via conveyor.

3.2.3 Product Plant

The product plant would be located between SPL Sheds 5 and 6. Final product preparation includes processes such as blending, drying and final product crushing to achieve the characteristics required by the cement industry.

Blending would be performed manually using a blending hopper, with material fed via front-end loader. Coal, sand, or other SPL treatment products may be added to the treated SPL, which would then be fed to a rotary dryer via a screw conveyor. Up to 5,000 tonnes of inert blending materials could be used in the production process to meet end-user specifications.

The product would then be dried to extract the moisture added during the water reaction process. Air passing through the rotary dryer would be heated using natural gas.

The dried product would be then fed to a product feed bin (4.5 m in diameter and 12 m high) using a bucket elevator, and fed to the product mill (ball mill) where it would be milled to produce a product of homogenous size. Following milling, the product would be passed to the product bin via a dense phase conveyor.

3.2.4 Dust Extraction and Control

As identified in **Section 3.1**, all externally-located plant would be enclosed and all emissions from the proposed project would occur via the four independent dust extraction and collection points identified below.

1. SPL Shed 5 and Deline facility air filter (SPL preparation facilities);
2. Thermal treatment plant dust collector;
3. Drying and blending plant dust collector; and
4. SPL Shed 6 air filter (product storage facilities).

The SPL processing and product storage facilities would be fully sealed, including covered conveyors and sealed atmospheric storage bins. Ductwork would be installed throughout the process plant system and connected to dust generating areas such as mills, crushers, conveyors, storage bins and the kiln/dryer. The dust extraction systems would maintain a negative pressure within the process system and buildings, preventing the escape of fugitive dust.

Dust would be collected via the baghouse dust collectors, which would be fitted with alarm systems to immediately shut down plant operations in the event of baghouse failure. Visual and audible alarms would sound within the plant buildings, with the alarm displaying on the plant control system monitoring display. Collected particulate matter would be fed back through the production cycle.

The dust extraction systems would draw air from within each building at the roof ridgeline, and pass it through dust filter/baghouse facilities. The air discharge from each baghouse would be directed to atmosphere via stacks. The solid discharge from each baghouse would be collected and fed to the products blending hopper.

3.2.5 Transfer to Road Transport

Products would be transferred in powder or granular form from the smelter using road transport. Bulk powder products would be transferred to the road tankers through a transfer spout and delivery nozzle system. The nozzle would be connected to the truck tanks, and an air return pipe would be connected to the truck to facilitate the return of transport air to the product storage bin.

The truck filling cycle would be controlled by the truck driver, who would be in attendance during the whole transfer cycle. The filling spout would be fitted with a high level shut of system, which would shut down the feed when the truck is full. This system would be supplemented by regular driver checks throughout the filling cycle.

Bulk granular products would be loaded into road trucks. Trucks carrying bulk granular products would have covers fitted over loads before leaving the storage shed. Bagged products would be loaded onto road trucks using forklifts.

3.3 Construction

The reprocessing plant is of a modular design, with the majority of the fabrication, assembly and pre-commissioning to be done off-site. The modules would be delivered to site via road vehicles, and would be installed using mobile cranes, elevated work platforms and other construction equipment such as welding machines, grinders and oxy cutters. The construction phase would take an estimated 8 – 10 months to complete. The proposed project would involve extending an existing concrete slab. Additional concrete foundations would be required for six bulk storage bins. The installation of the bulk storage bins would require some minor excavation work for the foundations, the material from which would be used elsewhere on site. Regain wishes to have the plant operational by the end of 2007 or early 2008.

3.4 Operation

The proposed facilities would be designed to operate 24 hours per day, 7 days per week.

4 STATUTORY CONTEXT

4.1 Local Matters

4.1.1 Port Stephens Local Environmental Plan 2000

The site is located within the Port Stephens Local Government Area, and is subject to the provisions of Port Stephens Local Environmental Plan 2000 (LEP 2000). The relevant objectives of the LEP are to:

> *(a) provide for appropriate planning and environmental control over the use and development of land within the area of Port Stephens, in order to uphold and promote the objectives of the Environmental Planning and Assessment Act, 1979, and*
>
> *(f) allow flexibility in the planning framework so as to encourage orderly, economic and equitable development while safeguarding the community's interests, and*
>
> *(g) ensure that development has regard to the principles of ecologically sustainable development.*

The proposed project represents ecologically sustainable development through the full recycling of smelter SPL waste into valuable products for use in other industries, which, when used, reduce greenhouse gas emissions through lower fuel use.
The map to LEP 2000 shows the existing smelter site is located within the 4(a) (Industrial General ‘A’) zone. The proposed project is a permissible use with consent in the 4(a) zone pursuant to the provisions of LEP 2000.

4.1.2 Hunter Water (Special Areas) Regulation 2003

This Regulation restricts intensive agriculture and sewage management facilities in all special areas (i.e. gazetted areas of land located within the catchment areas of the Hunter Region drinking water supply) without the approval of the Director-General of the Department of Planning, development consent or an environment protection licence. The Regulation also prohibits the pollution of waters, where the meaning of pollute is extended from the Protection of the Environment Operations Act 1997 definition to also include “…*disturbing geological or other matter (whether natural or artificial) in such a manner as to change, or to be likely to change, the physical, chemical or biological condition of the waters*”. Extractive industries are restricted in the Tomago Sandbeds Catchment Area.

The proposed project is located just outside the Tomago Sandbeds Catchment Area. It should be noted, however, that the proposed project does not involve agriculture, sewage management, or an extractive industry and will not pollute groundwater (see **Section 5.4**), and would not, therefore, be prohibited under this Regulation.

4.2 Regional Matters

The Regional Environmental Plan (REP) of relevance to the subject site is Hunter REP 1989. The aims of the Hunter REP are:

> *(a) to promote the balanced development of the region, the improvement of its urban and rural environments and the orderly and economic development and optimum use of its land and other resources, consistent with conservation of natural and man made features and so as to meet the needs and aspirations of the community,*
>
> *(b) to co-ordinate activities related to development in the region so there is optimum social and economic benefit to the community, and*
>
> *(c) to continue a regional planning process that will serve as a framework for identifying priorities for further investigations to be carried out by the Department and other agencies.*

The objectives of the Hunter REP in relation to industrial development are:

> *(a) to ensure that sufficient zoned and serviced industrial land is provided in locations appropriate to the needs of industry, while ensuring protection of the environment, and*
>
> *(b) to promote the distribution of employment in secondary industry in a manner compatible with the availability of services and distribution of population.*

The objective of Part 7 (Division 1) of the Hunter REP is to control development such that air, noise and water pollution are minimised.

As the modifications will not significantly increase pollution as discussed in **Section 5**, the proposal is considered to be consistent with the relevant objectives and principles of the Hunter REP.

4.3 State Matters

A number of State Environmental Planning Policies (SEPPs) are relevant to the proposed project. These SEPPs are discussed below.

4.3.1 SEPP 2005 (Major Projects)

SEPP 2005 defines developments that are considered to be Major Projects under Part 3 A of the Environmental Planning and Assessment Act 1979. The approval authority for a Major Project is the Minister for Planning.

Schedule 1 of SEPP 2005 identifies the major development classifications. Under this schedule, the definition of resource recovery or waste facilities includes ‘development for the purpose of hazardous waste facilities that transfer, store or dispose of solid or liquid waste classified in the Australian Dangerous Goods Code or medical, cytotoxic or quarantine waste that handles more than 1,000 tonnes per year of waste’.

The Director-General of the Department of Planning (DOP) has reviewed the information provided to him by Regain regarding the construction and operation of the proposed project, and has determined under delegation that the proposal meets the criteria for consideration as a Major Project under SEPP 2005. The Minister will, therefore, be the approval authority for the proposed project.

4.3.2 SEPP 14 – Coastal Wetlands

SEPP 14 aims to protect coastal wetlands, and requires restricted development activities to be permitted only with the consent of the local Council with the concurrence of the Director-General. The following development is restricted on land affected by the policy:

> 1 *In respect of land to which this policy applies, a person shall not:*
>
> *a) clear that land,*
>
> *b) construct a levee on that land,*
>
> *c) drain that land, or*
>
> *d) fill that land,*
>
> *except with the consent of the council and the concurrence of the Director.*

The proposed project does not involve any of the above activities. Additionally, while there are a number of wetlands on or near the Hunter River that are identified in the policy, there are no wetlands on the land affected by the proposal. The provisions of SEPP 14 do not apply to the project as the proposal does not involve any of the above activities in a designated wetland.

4.3.3 SEPP 33 – Hazardous and Offensive Development

SEPP 33 defines a number of industrial developments as potentially hazardous or potentially offensive. The Department of Urban Affairs and Planning (now Department of Planning) prepared guidelines for assessing whether SEPP 33 applies to a development (Applying SEPP 33 – Hazardous and Offensive Development Application Guidelines, DUAP 1994).

Hazard assessments were conducted for the existing aluminium smelter in 1995 and 2000, and are summarised in the Statement of Environmental Effects – Modification of Development Consent – Proposed Production Capacity Increase – Tomago Aluminium Smelter (HLA, 2001). The existing facility is not considered to be potentially hazardous based on the dangerous goods on site. The risk levels associated with the movement of liquid pitch to the site were considered acceptable. The existing development is, therefore, not considered to be potentially hazardous. As the current proposal will not significantly affect the amount, storage or handling of dangerous goods on site, the proposed project is also not considered to be potentially hazardous. As the existing operations operate under an environment protection licence (EPL), and the proposed additional facilities are controlled under that licence, the proposed project is not considered to be offensive development.

4.3.4 SEPP 44 – Koala Habitat Protection

As the Port Stephens LGA is listed in Schedule 1 of SEPP 44, the consent authority must consider whether the site of the proposed project contains koala habitat as defined in Schedule 2 of the policy. The proposed project is to be located on an existing industrial site, which does not constitute either potential or core koala habitat. The provisions of SEPP 44 do not, therefore, prevent the granting of approval for the proposed project.

4.3.5 SEPP 55 – Remediation of Land

SEPP 55 provides a state-wide planning control for the remediation of contaminated land. Under the policy, contaminated land cannot be developed if it is unsuitable for a proposed use. The proposed project is to be located within and adjacent to existing buildings on the site, and is consistent with the existing development. The site is understood to be in a suitable condition for the proposed project.

4.4 Commonwealth Matters

Actions that may significantly affect matters of national environmental significance (NES) require approval from the Commonwealth under the Environment Protection and Biodiversity Conservation (EPBC) Act 1999 in addition to any state-based approvals. The EPBC Act lists seven matters of NES that must be addressed when assessing the environmental impacts of a proposal. These matters are:

- World heritage properties;
- National heritage places;
- Ramsar wetlands of international significance;
- Threatened species and ecological communities;
- Migratory species;
- Commonwealth marine area; and
- Nuclear actions (including uranium mining).

As the proposed project does not have a significant impact on any of these matters, no approvals are required under the EPBC Act.

4.5 Other Authorisations Required

The site has been previously cleared under existing approvals. The proposed project will not increase the development area or encroach on vegetation. No additional permits or approvals in addition to those described below will be required.

4.5.1 Protection of the Environment Operations Act 1997

The existing smelter on the development site operates under an environment protection licence (EPL 6163) issued under the Protection of the Environment Operations Act 1997. The EPL currently covers the activities of aluminium smelting, waste generation or storage, and waste processing. The licence allows for the treatment, processing or reprocessing of SPL from the Tomago and Kurri Kurri aluminium smelters.

4.5.2 Environmentally Hazardous Chemicals Act 1985

Under the Environmentally Hazardous Chemicals (EHC) Act 1985, aluminium smelter wastes containing fluoride and/or cyanide (including SPL) have been declared as environmentally hazardous chemicals, and a Chemical Control Order (CCO) regulates activities associated with these wastes. Processing, storing, transporting and disposing of SPL is prohibited under the CCO, except when conducted in accordance with a licence issued by the Department of Environment and Conservation (DEC).

The DEC has prepared a draft licence under the EHC Act 1985 for SPL from the Tomago facility, which will be issued to Regain once approval is granted for the proposed project. The licence will impose conditions on the processing and conveying of the SPL, including enabling SPL from the Hydro facility at Kurri Kurri to be transported to the Tomago facility for processing. Conditions relating to incident management, incident reporting, and annual reporting to the DEC will be included, and the licence will also authorise the change from the demonstration plant production scale to commercial production. Until this licence is issued, the operation of the demonstration plant is enabled under the existing EHC licence held by Tomago Aluminium.

5 PHYSICAL AND POLLUTION EFFECTS

5.1 Air Quality

The purpose of the proposed facility is to treat hazardous materials to form valuable end products for other industries. The process was designed to neutralise hazardous gases, which are generated during the process and recycled through the rotary kiln to be destroyed. There are, however, a number of air emissions that may possibly be generated by the proposed facility, which are:

- Particulate matter, including particulate-bound fluoride and metals;
- Products of natural gas combustion, including sulphur dioxide, oxides of nitrogen and carbon dioxide;
- Products of incomplete combustion, including carbon monoxide, volatile organic compounds, polycyclic aromatic hydrocarbons, dioxins and furans; and
- Other gaseous emissions such as fluoride and volatilised metals.

Regain has developed an extensive control system for their facilities to manage air emissions from the demonstration plant and the commercial plant at Hydro Aluminium. These include process control measures and the operation of suitable baghouse dust collectors.

HLA conducted testing of emissions from the kiln stack (the primary source of potential air emissions) on the demonstration plant in August 2005 to determine compliance with air quality goals. Testing was performed during the processing of both carbon (first-cut) and refractory (second-cut) SPL. A summary of the findings is provided in **Table 1**.

Table 1: Summary of Kiln Stack Emission Testing Results - August 2005

Emission Parameter	Carbon Feed 24/8/05 (mg/m^3)	Refractory Feed 23/8/05 (mg/m^3)	Regulatory Limits *1 (mg/m^3)
Fine Particulate (PM_{10})	1.8	2.1	Not Listed
Total Particulate	4.7	4.5	20
Gaseous Fluoride	0.26	0.55	50
Particulate Fluoride	0.002	0.002	50
Cyanide	0.9	<0.01	Not Listed
Hazardous Substances (Metals)	0.058	0.031	1
Cadmium	0.0239	0.0188	0.2
Mercury	<0.00004	<0.00004	0.2
Polycyclic Aromatic Hydrocarbons (PAHs)	0.031	0.028	Not Listed
Sulfur Dioxide (SO_2)	0.2	0.2	Not Listed
Carbon Monoxide (CO)	280.5	77.8	Not Listed
Total Oxides of Nitrogen as Equivalent NO_2	4.5	6.3	350

Emission Parameter	Carbon Feed 24/8/05 (mg/m^3)	Refractory Feed 23/8/05 (mg/m^3)	Regulatory Limits *1 (mg/m^3)
Dioxins and furans*2 (ng/m^3)	0.0015	0.0049	0.1

Notes: Emission concentrations are presented at conditions of 0°C, dry gas and 1 atm.

For comparison with regulatory guidelines, oxides of nitrogen results are expressed as equivalent NO_2.

*1 Applicable to plants built and operating after 1 September 2005 (Clean Air Regulation, 2002)

*2 Stack testing performed by AirLabs Australia Pty Limited, February 2003

As can be seen in **Table 1**, emissions from the existing demonstration plant at Tomago conform to the most stringent Group 6 air emission concentration standards defined in the 2002 Clean Air Regulation. Earlier stack emission testing performed at the demonstration plant in 2002 and 2003 also confirmed that cyanide, dioxin and furan emissions were below regulatory guidelines.

The proposed SPL processing facility would be designed, operated and maintained to ensure the following:

- Mitigation of fugitive emissions by maintaining the processing plant and buildings under negative pressure;
- Destruction of cyanide and hazardous gases by control of the processing stages;
- Minimal formation of incomplete combustion products and liberation of gaseous fluoride and metals by control of the thermal treatment process (i.e. maintaining the temperature below 850 °C);
- Minimal emissions of particulate matter and particulate-bound contaminants such as fluoride and heavy metals by the appropriate operation of baghouse dust collectors; and
- Minimal dust generation from concrete apron areas by the application of appropriate housekeeping practices.

In the context of the Tomago Aluminium smelter, the contribution to air emissions from the proposed SPL processing facility is likely to be low. Based on National Pollutant Inventory data and the results of the stack emission testing performed during 2005 for the demonstration plant, total emissions from the proposed processing facility are conservatively estimated to be less than 0.5 % of the emissions from Tomago Aluminium. An air dispersion modelling assessment would be prepared as part of the environmental assessment of the proposed project to assess predicted cumulative effects. Special attention would be given to particulate matter and fluoride emissions resulting from the processing of both carbon (first-cut) and refractory (second-cut) SPL.

5.2 Hazards

SPL is comprised of a number of constituents, most of which are not toxic or hazardous. Some constituents, however, can be toxic to humans, such as cyanides and fluorides. Other components can produce toxic and/or flammable gases when mixed with water. The main hazards associated with the proposed facility are related to dust and particulate emissions and the uncontrolled mixing of SPL with water. A Material Safety Data Sheet (MSDS) for the Tomago SPL material is provided in **Appendix 1.** This document is currently being revised; the final MSDS should be available at the time of submission of the Environmental Assessment.

A detailed Preliminary Hazard Analysis (PHA) was performed by HLA for the Hydro SPL Plant. The PHA identified a number of potential incidents that could occur as a result of operation of the plant. These were:

- Dust release as a result of loading/unloading SPL and process operations;
- Release of flammable and toxic gas from contact between water and the SPL;
- Release of fluoride and other contaminants as a result of the kiln operating outside the appropriate temperature range;
- Release of flammable and toxic gas caused by equipment failure in the kiln or water mixer area; and
- Explosion in the kiln caused by a flame-out (where the flame fails to burn while gas is being fed to the burner).

A number of operational safeguards were proposed for the Hydro plant. These safeguards are also proposed for the Tomago facility, and are:

- Locating the processing plant within a building to minimise potential dust release and water contact with the SPL;
- Installation of a dust extraction system to contain any released dust in the SPL building;
- Installation of a dust extraction alarm and shut down system to ensure that operators are notified of any failures in the dust extraction system;
- Utilisation of a fully enclosed process plant design to minimise dust generation during processing of the SPL;
- Fitting dust extractors to silos and equipment to sure any dust generated by the SPL processing is removed from the system;
- Use of fabric filters in the dust extraction system to ensure that any dust generated is contained in a dedicated area for return to the system for processing;
- Use of filter unit alarms to ensure operators are notified of any failures of the dust treatment system;
- Bunding of the materials transfer area to ensure that any minor spills are contained within the plant area and can be returned to the system for processing;
- Temperature control of the rotary kiln to ensure that temperatures are maintained in the appropriate range to minimise the generation of contaminants;
- Installation of explosion doors on the rotary kiln to ensure potential explosive gases are exhausted to a safe place, and the integrity of the kiln is maintained;
- Management of the kiln burner to ensure the kiln is not loaded with unburned gas in the event of a flame out; and
- Monitoring of the baghouse temperature so that the plant can be shut down if temperatures exceed 130^{o}C.

The PHA determined that the risk of incident from the plant was low due to the proposed safety features to be installed on the plant, and the proposed operational and safety management schemes for the facility, which would ensure that the risks would be maintained within recommended criteria and would also be as low as reasonable practicable. As the proposed SPL facility at Tomago is to be operationally similar to the plant at Hydro, the risks are considered to be similar for both plants, and thus the hazards associated with the current proposal are also regarded to be low.

5.3 Noise and Vibration

Noise and vibration may be caused by a number of features of the proposed plant. The most significant sources from the proposed project are the grinding plant, dust collection systems, kiln, and heavy vehicles used for transport of the products and delivery of raw blending materials.

As the proposed project will be operating on an existing site, the cumulative impact of noise and vibration will need to be considered. The environment protection licence for Tomago Aluminium does not list noise or vibration limit criteria or requirements to monitor noise and vibration levels. The noise impacts of the proposed project are likely to be small compared with the existing noise from the smelter. An acoustic assessment would be prepared for the environmental assessment.

5.4 Water

5.4.1 Water Usage

The proposed SPL processing facility would consume 750 – 800 kL of process water per annum, principally through operation of the water reaction mixer. This process water would be resourced from the Tomago Aluminium smelter process water supply. Process waters would be ultimately lost to atmosphere as steam via controlled stack emissions.

The proposed amenities, including a kitchenette, shower and toilet, would be supplied with town water. Up to 100 kL of potable water is expected to be consumed per annum.

5.4.2 Tomago Sandbeds

The Tomago Sandbeds, located in close proximity to the Tomago Aluminium smelter, are an important local potable water resource. The hydraulic gradient beneath the smelter site is towards the Hunter River in the south. The groundwater table is within 2.5 to 5 m of the surface. Operations and activities undertaken at the Tomago Aluminium smelter are managed to control emissions and ensure minimal impact to the environment, including the sandbeds.

Liaison with Hunter Water Corporation, undertaken by HLA for the proposed production capacity increase at the Tomago Aluminium smelter, determined that Hunter Water was generally of the opinion that the smelter has not had an impact on the Tomago Sandbeds water resource (HLA, 2001). This is supported by data generated by Tomago Aluminium's water quality monitoring programs.

The proposed SPL processing facility would be designed and managed within the context of the existing site stormwater system, ensuring that contamination of stormwater does not occur, and hence impacts on surface and groundwater are not likely to occur (refer to **Sections 5.4.3** and **5.4.4**).

5.4.3 Surface Water

Tomago Aluminium manages stormwater in accordance with the conditions of EPL 6163. The existing site is serviced by first-flush systems that capture potentially contaminated waters from the site and hold them in collection ponds, from which the water is discharged to the Hunter River at a controlled rate. Subsequent rainfall is discharged directly to the Hunter River. The stormwater management system was designed to accommodate a combined runoff from a 1 in 50 year storm in the potline areas and a 1 in 10 year storm for the remainder of the site. Tomago Aluminium monitors conductivity, fluoride, total suspended solids and pH of water in the collection ponds daily during discharges.

The proposed facilities would be serviced by the existing stormwater management system, which is considered to have sufficient capacity to service the development. There would be no discharge to water from the SPL treatment process. Process waters would be lost to atmosphere as steam. SPL storage, crushing, sizing and product grinding and storage would take place within covered sheds, and contamination of stormwater impinging on the sheds would not, therefore, occur. The SPL sheds have internal collection drainage system and storage tanks for the containment and management of leachate/liquid. Appropriate housekeeping practices would be implemented to minimise potential contamination. The proposal is not, therefore, expected to affect surface water quality.

5.4.4 Groundwater

There would be no discharge to water from the SPL treatment process. The SPL preparation, treatment and storage operations would occur within sealed sheds and on concrete foundations, hence mitigating any contact with soil and groundwater.

5.5 Traffic

The demonstration plant currently processes 10 000 tonnes of SPL per year. The proposed facility will process 15 000 tonnes of SPL material into value-added mineralised products to be distributed to end users. Regain also wishes to seek approval for the transport of blending materials to the site (approximately 5 000 tonnes per year). These additional movements would be achieved through the use of B-double vehicles. With an average truck capacity of 25 tonnes, 600 truck movements per year, or an additional 12 truck movements per week, would occur should the proposed project proceed.

Existing movements to the smelter primarily consist of raw material transport from storage silos located on Kooragang Island via Cormorant Road, Tourle Street, Industrial Drive, Pacific Highway and Old Punt Road. A private road links the smelter to Old Punt Road.

A small amount of additional traffic would be generated during the construction and operational phases of the project. This additional traffic would make use of the private access road between the smelter and Old Punt Road, which was installed by Tomago Aluminium to reduce the disturbance of nearby residents by heavy vehicle movements to and from the smelter. There is a left hand turning lane on Old Punt Road to enable users to enter the private smelter road. Vehicles leaving the smelter road to turn onto Old Punt Road are faced with a stop sign. Additional traffic during the 8 – 10 month construction/establishment period is expected to include 12 over-dimension and 35 standard semi-trailer deliveries.

The proposed project would not substantially affect existing transportation systems or alter current patterns of circulation or route use. The minimal additional traffic would not significantly degrade any existing infrastructure or significantly increase demand for parking.

5.6 Other Issues

The proposed project would require minimal disturbance to the topography or below-ground features as the site has already been cleared and levelled. Some work for the installation of additional concrete foundation would be required; however, no impacts on natural water bodies or aquifers are expected. No water storage would be required for the proposed project. The proposal would neither affect nor be affected by flooding (the site is above the Tomago floodplain) or tides in the Hunter River estuary.

The proposed facility would not use or generate any pesticides or fertilisers. The process would remove the hazardous materials from the existing SPL waste, which would be achieved through a heat-treatment process. Additives, such as coal and sand and other SPL treatment products, would be blended to meet end user requirements.

The acid sulphate soil policy of the Port Stephens Council on the proposed project site is applicable to works beyond 2 m below natural ground surface, or works by which the water table is likely to be lowered beyond 2 m below natural ground surface. As the proposed works do not meet these criteria, acid sulphate soil issues would not prevent the project from being approved.

6 BIOLOGICAL EFFECTS

The proposed project would not involve the clearing or modification of native vegetation as the facilities are to be contained within the existing smelter site. No disturbance of threatened or indigenous vegetation would occur as a result of the proposal.

Although there area number of threatened and endangered fauna species within 6 km, these species are predominantly found in the Kooragang Nature reserve located to the southeast of the site, and none of the species are known to inhabit the smelter site. The proposal would not displace or disturb terrestrial or aquatic fauna or create a barrier to fauna movement. The proposed facilities would not affect the bushfire risk of the site. No effects on fauna species are expected from the proposed project. Similarly, the proposal would not affect any biologically sensitive areas.

7 RESOURCE IMPLICATIONS

Approximately three to five new staff would be required to operate the proposed facility, with five to ten contractors required during the construction period. These staff would primarily be sourced locally, with some specialised personnel required for specific tasks. The requirement for external resources would be low, and would not significantly affect the use of any community facilities such as social services, education, medical services, or accommodation. The ongoing operations employment is estimated to be three to five personnel on site.

Construction of the proposed facilities would require the following resources:

- 150 – 200 m^3 of concrete;
- 250 – 300 tonnes of steel;
- 400 – 450 metres of piping; and
- 2,700 to 3,000 metres of electrical cable.

The use of these materials is not expected to have a significant impact on the availability of resources in the area.

The proposed project represents a significant resource recycling project. Waste management at the Tomago smelter would be improved by the proposed project, which would reduce the need for storage of SPL on site and remove the need for shipments of SPL overseas for processing. The proposed project represents a full recycling of SPL waste material generated by the existing aluminium smelter, which would result in positive environmental impacts through the reduction of hazardous waste that could otherwise result in negative human and ecosystem impacts. The process does not generate any additional waste products.

Additionally, products produced by the proposed facility can be used in cement and brick manufacturing as a flux to reduce the amount of raw materials needed to generate their end products; fuel savings in the range of 9 – 15 % have been demonstrated from the use of mineral products in these industries, with resultant reductions in greenhouse gas and other combustion product emissions.

The proposed SPL facility would require the use of approximately 750 and 800 kL of water and 80,000 to 90,000 GJ of natural gas per annum. These resources would be sourced from existing supplies to Tomago Aluminium and would utilise existing delivery systems.

The development site is an existing industrial site, and is not, therefore, prime agricultural land. The proposal is not located on a site that could be used for future minerals extraction, and would not affect any areas important for fishing, agriculture, forestry or conservation. While coal resources are located beneath the smelter site, there are no short-term plans to extract the coal, and the installation of the proposed facility would not affect future mining any more than the existing infrastructure. The proposed project would not disrupt any existing or future activities, and would not substantially deplete any natural resources.

The proposed project would make use of existing road and power infrastructure.

8 COMMUNITY

The proposed project would involve small numbers of employees, and would, therefore, not significantly affect the demographics or population of the area. No health or safety risks to the community are associated with the project.

Any potential aesthetic impacts would be minimal, and limited to the site and the immediate surroundings. The proposed structures are consistent with the existing visual landscape and land use of the smelter, and would not reduce the aesthetic value of the area.

The proposed facilities are to primarily be located within two existing buildings, with additional structures to be located between the buildings. As such, the proposal would not affect the amenity or access of any other properties.

No items of heritage or cultural value would be affected by the proposed project. The proposal would not affect the amenity of users of the nearby recreational areas or nature reserves.

9 PRIORITISATION OF POTENTIAL ENVIRONMENTAL ISSUES

9.1 Issues Identification

As identified in **Sections 5 - 8** of this report, the issues associated with the project include:

- Air quality;
- Hazards;
- Noise and vibration;
- Water; and
- Traffic.

9.2 Prioritisation of Issues

9.2.1 Approach

The prioritisation of issues for the proposed project was based on the need to recognise that a higher degree of environmental assessment is required for those environmental issues with the highest potential severity and greatest likely consequences when unmanaged. Where a high potential effect was identified, the attribute or issue was allocated a higher priority for assessment.

Table 2 provides the Issues Prioritisation Matrix used to identify priorities. The potential severity and consequence of the each environmental effect were each given a numerical value between one and three. The numbers were added together to provide a result that was then used to rank the issue as a high, medium or low priority.

Table 2: Issues Prioritisation Matrix

Severity of Effects	Perceived Consequence of Unmanaged Effects		
	3 High	2 Medium	1 Low
1 Low	4 (Medium)	3 (Low)	2 (Low)
2 Medium	5 (High)	4 (Medium)	3 (Low)
3 High	6 (High)	5 (High)	4 (Medium)

9.2.2 Assessment

The prioritisation of environmental issues related to the proposed project is shown in **Table 3**.

Table 3: Prioritisation Analysis

Issue	Severity	Consequence	Priority
Emissions to the atmosphere with the potential to result in degradation of air quality in the local area	2	2	4 (Medium)
Hazards due to risk of incidents at plant	2	2	4 (Medium)
Cumulative impact of noise and vibration on sensitive receptors	2	2	4 (Medium)
Water usage during operation	1	1	2 (Low)
Effects on groundwater quality / Tomago Sandbeds	1	2	3 (Low)
Effects on surface water quality	1	1	2 (Low)
Traffic impacts during construction	1	1	2 (Low)
Effects on flora and fauna	1	1	2 (Low)
Demand upon community, natural or transport resources	1	1	2 (Low)
Impacts upon residential amenity such as noise, visual, etc	1	1	2 (Low)

10 FINDINGS

The proposed project involves constructing a full-scale version of the demonstration plant that has successfully operated at the site since 2002, and would be similar in scale and operation to the plant to be installed at the Hydro smelter in Kurri Kurri. The proponent has developed a thorough understanding of the impacts of the facility, and the proposed management strategies have been shown to be effective at both existing sites.

The environmental assessment for the proposed SPL treatment facility would focus on the key impacts of the environmental factors addressed in **Sections 5 – 8**. This EASR has identified that the key environmental issues are:

- Air quality;
- Hazards;
- Noise/vibration; and
- Water quality management.

The details of additional work required to more fully understand the potential impacts of the proposal are provided below.

10.1 Air Quality

The background air quality in the Tomago area is well documented through the monitoring performed by Tomago Aluminium since 1981. The proposed technology has been tested both on site and at another location. Potential air quality impacts of the project can be determined through the use of the Ausplume dispersion model, which is an established and reliable method approved for use by regulatory authorities in NSW.

Dispersion modelling performed for the facility at the Hydro smelter determined that the contribution of the facility to air pollution would be low, with ground level concentrations of pollutants from the facility representing only a fraction of the adopted assessment and guideline criteria. Air quality modelling should be performed for the proposed facility to assess the likely performance of the proposed facility under the meteorological and background pollutant conditions experienced at Tomago.

10.2 Hazards

The main hazards associated with the proposed facility are related to dust and particulate emissions and the uncontrolled mixing of SPL with water, which has the potential to generate potentially explosive gases. A PHA was conducted for the proposed facility to be installed at Hydro Aluminium. When the safety features and management systems proposed for the plant were taken into consideration, the risks associated with the facility were considered to be as low as reasonable practicable.

As the conditions at the Tomago site will vary from those at the Hydro site, a PHA should also be conducted for the proposed project to identify any site-specific hazard issues. As the proposed SPL at Tomago is to be operationally similar to the plant at Hydro, the risks are likely to be similar for both plants, and thus the hazards associated with the current proposal are also regarded to be low.

10.3 Noise and Vibration

An acoustic assessment was performed for the Hydro plant using noise modelling methods. This assessment determined that under the worst case meteorological conditions, no exceedances of adopted noise criteria would occur even when cumulative conditions were taken into account. No adverse sleep disturbance impacts were predicted from this assessment.

Due to the different background and meteorological conditions at the Tomago facility, an acoustic assessment would be required for the proposed project. This assessment should assess both construction and operational noise impacts. Based on the results of the prior investigations, however, noise is considered to be a low risk issue, with no significant adverse impacts expected.

10.4 Water Quality Management

Due to the proximity of the site to surface and groundwater resources, water quality management is a potentially significant issue for the proposed project during the construction and operational phases. This would be addressed through the preparation of an Environmental Management Plan (EMP) for the construction and operation of the facility. This EMP would identify appropriate mitigation measures, including erosion and sedimentation control measures, and housekeeping practices.

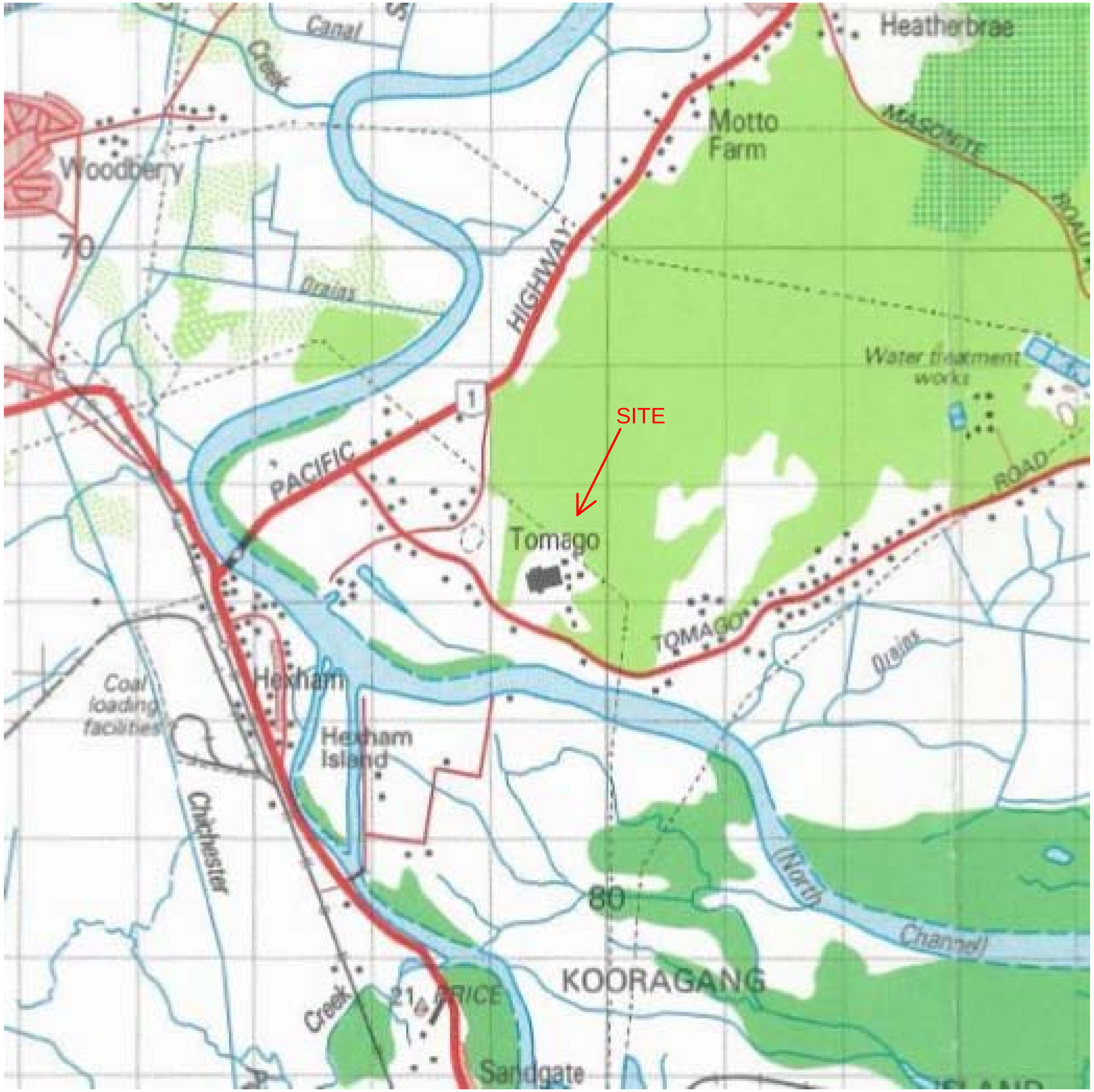
10.5 Other Environmental Issues

Other issues associated with the proposed project, including traffic, flora and fauna, and heritage, are considered to be of low significance in terms of potential environmental impacts. These issues would be discussed in the environmental assessment, with mitigation strategies identified where required. It is suggested that these issues be addressed through desktop studies only.

10.6 Level of Assessment

This EASR has undertaken an initial appraisal of the potential environmental impacts associated with the proposed project, and has identified the key environmental issues to be air quality, hazards and noise. These three issues should be considered through specialist studies in the environmental assessment. Additionally, appropriate water management practices should be developed to mitigate adverse effects on groundwater and surface water resources. Due to the predictability of the potential impacts and the relatively benign nature of the proposed project from an environmental perspective, this report has identified that a high level of environmental assessment is not required for this project.

Figures



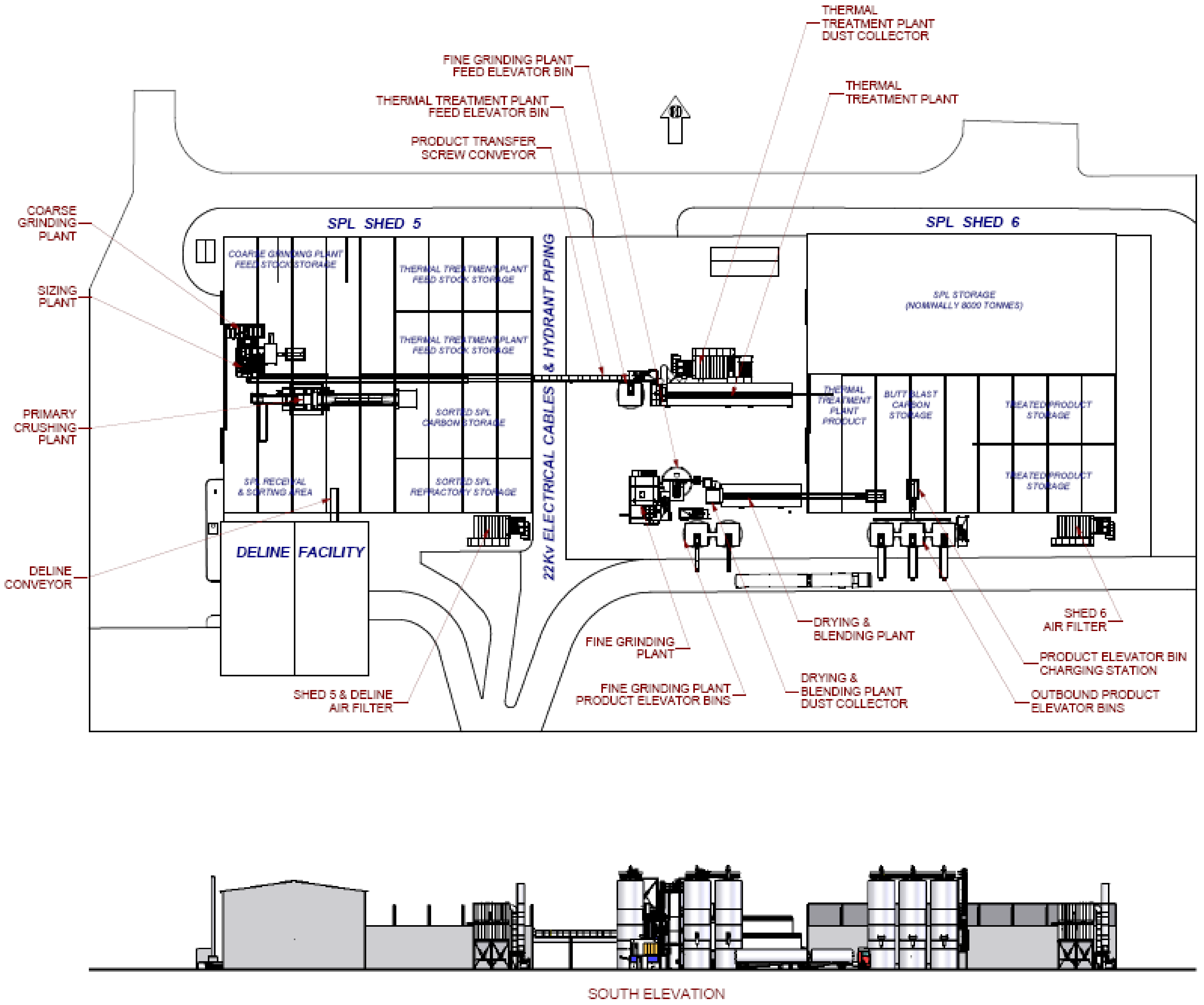
PROJECT	N4047201
DATE	June 2006
SOURCE	Regain
DRAWN BY	EH
APPROVED	HM

Location Map

Preliminary Assessment Report
Spent Potliner Processing Facility at Tomago Aluminium
Regain Services

HLA

FIGURE
1



PROJECT N4047201
DATE June 2006
SOURCE Regain
DRAWN BY EH
APPROVED HM

Proposed Facilities
Floor Plan and Elevations

Preliminary Assessment Report
Spent Potliner Processing Facility
at Tomago Aluminium
Regain Services

HLA

FIGURE
2

Appendices

Appendix 1: Material Safety Data Sheet

TOMAGO CATHODE, ESF TO STORAGE

Hazard Alert Code: HIGH

Chemwatch Material Safety Data Sheet Revision No: 2 Chemwatch 7502-32
Issue Date: 2-May-2002 CD 2006/1

Section 1 - CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

PRODUCT NAME: TOMAGO CATHODE, ESF TO STORAGE

SYNONYMS

"spent pot liner residue", "spent cathodes", "tomago cathode waste", "aluminum pot lining used."

PROPER SHIPPING NAME

ALUMINIUM SMELTING BY-PRODUCTS ALUMINIUM REMELTING BY-PRODUCTS ALUMINIUM SMELTING BY-PRODUCTS or ALUMINIUM REMELTING BY-PRODUCTS

PRODUCT USE

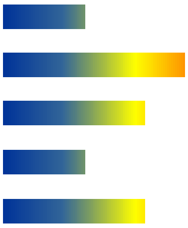
Processing by-product recovered from aluminium refining operations. Stored for recycling.

SUPPLIER

Company: Tomago Aluminium Co. P/L (ACN:001 862 228)	Company: Tomago Aluminium Co. P/L (ACN:001 862 228)
Address:	Address:
PO Box 405	Tomago Road
Raymond Terrace	Tomago
NSW, 2324	NSW, 2322
AUS	AUS
	Telephone: +61 2 4966 9669
	Fax: +61 2 4966 9711

HAZARD RATINGS

		Min Max
Flammability:	1	
Toxicity:	3	
Body Contact:	2	
Reactivity:	1	
Chronic:	2	



Min/Nil=0
Low=1
Moderate=2
High=3
Extreme=4

Section 2 - HAZARDS IDENTIFICATION

STATEMENT OF HAZARDOUS NATURE

> HAZARDOUS SUBSTANCE. DANGEROUS GOODS. According to the Criteria of NOHSC, and the ADG Code.

POISONS SCHEDULE

None

RISK

Contact with water liberates toxic, highly flammable gas.
Harmful by inhalation and in contact with skin.
Toxic if swallowed.
Contact with acids liberates very toxic gas.
Irritating to eyes and skin.
Cumulative effects may result following exposure*.
May produce discomfort of the respiratory system*.
Limited evidence of a carcinogenic effect*.
* (limited evidence).

SAFETY

Never add water to this product.
Keep locked up.

Avoid contact with eyes.
Wear suitable protective clothing.
In case of insufficient ventilation wear suitable respiratory equipment.
Keep container dry.
Use only in well ventilated areas.
Keep container in a well ventilated place.
This material and its container must be disposed of in a safe way.
Keep away from food, drink and animal feeding stuffs.
Take off immediately all contaminated clothing.
In case of contact with eyes, rinse with plenty of water and contact Doctor or Poisons Information Centre.

Section 3 - COMPOSITION / INFORMATION ON INGREDIENTS

NAME	CAS RN	%
thermally reacted mixture of variable composition		
typically		
carbon, non-activated	7440-44-0	10-70
aluminium oxide	1344-28-1.	10-30
aluminium	7429-90-5	10-30
alkali and alkaline earth fluorides as		
sodium fluoride	7681-49-4	9-22
iron	7439-89-6	<3
silicon	7440-21-3	<11
S and P		<1
metal carbides and nitrides as		
cyanide ion	57-12-5	<0.2
Reacts with water or moisture to produce gases of		
ammonia	1336-21-6	
methane	74-82-8	
hydrogen	1333-74-0	
hydrogen cyanide	74-90-8	
Non-reactive as cold, dry solid.		

Section 4 - FIRST AID MEASURES

SWALLOWED

- If swallowed do NOT induce vomiting.
- If vomiting occurs, lean patient forward or place on left side (head-down position, if possible) to maintain open airway and prevent aspiration.
- Observe the patient carefully.
- Never give liquid to a person showing signs of being sleepy or with reduced awareness; i.e. becoming unconscious.

- Give water to rinse out mouth, then provide liquid slowly and as much as casualty can comfortably drink.
- Seek medical advice.

EYE
If this product comes in contact with the eyes:

- Immediately hold eyelids apart and flush the eye continuously with running water.
- Ensure complete irrigation of the eye by keeping eyelids apart and away from eye and moving the eyelids by occasionally lifting the upper and lower lids.
- Continue flushing until advised to stop by the Poisons Information Centre or a doctor, or for at least 15 minutes.
- Transport to hospital or doctor without delay.
- Removal of contact lenses after an eye injury should only be undertaken by skilled personnel.

SKIN
If skin or hair contact occurs:

- Flush skin and hair with running water (and soap if available).
- Seek medical attention in event of irritation.

INHALED

- If fumes or combustion products are inhaled remove from contaminated area.
- Lay patient down. Keep warm and rested.
- Prostheses such as false teeth, which may block airway, should be removed, where possible, prior to initiating first aid procedures.
- Apply artificial respiration if not breathing, preferably with a demand valve resuscitator, bag-valve mask device, or pocket mask as trained. Perform CPR if necessary.
- Transport to hospital, or doctor.

NOTES TO PHYSICIAN
For acute or short term repeated exposures to fluorides:

- Fluoride absorption from gastro-intestinal tract may be retarded by calcium salts, milk or antacids.
- Fluoride particulates or fume may be absorbed through the respiratory tract with 20-30% deposited at alveolar level.
- Peak serum levels are reached 30 mins. post-exposure; 50% appears in the urine within 24 hours.
- For acute poisoning (endotracheal intubation if inadequate tidal volume), monitor breathing and evaluate/monitor blood pressure and pulse frequently since shock may supervene with little warning. Monitor ECG immediately; watch for arrhythmias and evidence of Q-T prolongation or T-wave changes. Maintain monitor. Treat shock vigorously with isotonic saline (in 5% glucose) to restore blood volume and

enhance renal excretion.

- Where evidence of hypocalcaemic or normocalcaemic tetany exists, calcium gluconate (10 ml of a 10% solution) is injected to avoid tachycardia.

BIOLOGICAL EXPOSURE INDEX - BEI
These represent the determinants observed in specimens collected from a healthy worker exposed at the Exposure Standard (ES or TLV):

Determinant	Index	Sampling Time	Comments
Fluorides in urine	3 mg/gm creatinine	Prior to shift	B, NS
	10mg/gm creatinine	End of shift	B, NS

B: Background levels occur in specimens collected from subjects NOT exposed
NS: Non-specific determinant; also observed after exposure to other exposures.

- Signs symptoms of acute cyanide poisoning reflect cellular hypoxia and are often non-specific.
- Cyanosis may be a late finding.
- A bradycardic, hypertensive and tachypneic patient suggests poisoning especially if CNS and cardiovascular depression subsequently occurs.
- Immediate attention should be directed towards assisted ventilation, administration of 100% oxygen, insertion of intravenous lines and institution of cardiac monitoring.
- Obtain an arterial blood gas immediately and correct any severe metabolic acidosis (pH below 7.15).
- Mildly symptomatic patients generally require supportive care alone. Nitrites should not be given indiscriminately - in all cases of moderate to severe poisoning, they should be given in conjunction with thiosulfate. As a temporizing measure supply amyl nitrite perles (0.2ml inhaled 30 seconds every minute) until intravenous lines for sodium nitrite are established. 10 ml of a 3% solution is administered over 4 minutes to produce 20% methaemoglobin in adults. Follow directly with 50 ml of 25% sodium thiosulfate, at the same rate, IV. If symptoms reappear or persist within 1/2-1 hour, repeat nitrite and thiosulfate at 50% of initial dose. As the mode of action involves the metabolic conversion of the thiosulfate to thiocyanate, renal failure may enhance thiocyanate toxicity.
- Methylene blue is not an antidote. [Ellenhorn and Barceloux: Medical Toxicology]

If amyl nitrite intervention is employed then Medical Treatment Kits should contain the following:

- One box containing one dozen amyl nitrite ampoules
- Two sterile ampoules of sodium nitrite solution (10 mL of a 3% solution in each)
- Two sterile ampoules of sodium thiosulfate solution (50 mL of a 25% solution in each)
- One 10 mL sterile syringe. One 50 mL sterile syringe. Two sterile intravenous needles. One tourniquet.
- One dozen gauze pads.
- Latex gloves

- A "Biohazard" bag for disposal of bloody/contaminated equipment.
- A set of cyanide instructions on first aid and medical treatment.

- Notes on the use of amyl nitrite:-

- AN is highly volatile and flammable - do not smoke or use around a source of ignition.
- If treating patient in a windy or draughty area provide some shelter or protection (shirt, wall, drum, cupped hand etc.) to prevent amyl nitrite vapour from being blown away. Keep ampoule upwind from the nose, the objective is to get amyl nitrite into the patients lungs.
- Rescuers should avoid AN inhalation to avoid becoming dizzy and losing competence.
- Lay the patient down. Since AN dilates blood vessels and lowers blood pressure, lying down will help keep patient conscious.
- DO NOT overuse - excessive use might put the patient into shock. Experience at DuPont plants has not shown any serious after-effects from treatment with amyl nitrite.

ADDITIONAL NOTES:

- Major medical treatment procedures may vary e.g. US (FDA method as recommended by DuPont) uses amyl nitrite as a methaemoglobin generator, followed by treatment with sodium nitrite and then sodium thiosulfate.

MODES OF ACTION: Amyl nitrite (AN) reacts with haemoglobin (HB) to form about 5% methaemoglobin (MHB). Sodium nitrite (NaNO2) reacts with haemoglobin to form approximately 20-30% methaemoglobin. Methaemoglobin attracts cyanide ions (CN) from tissue and binds with them to become cyanmethaemoglobin (CNMHB). Sodium thiosulfate (Na2S2O3) converts cyanmethaemoglobin to thiocyanate (HSCN) which is excreted by the kidneys. i.e. AN + HB = MHB NaNO2 + HB = MHB CN + MHB = CNMHB Na2S2O3 + CNMHB + O2 = HSCN

- The administration of the antidote salts is intravenous in normal saline, Ringers lactate or other available IV fluid.
- European practice may use 4-dimethylaminophenol (DMAP) as a methaemoglobin generator. Also hydroxycobalamin (Vitamin B12a) is used. Hydroxycobalamin works by reacting with cyanide to form cyanocobalamin (Vitamin B12) which is excreted in the urine.
- European and Australian NOHSC (Worksafe) propose dicobalt edetate (Kelocyanor) as antidote. This acts by chelating cyanide to form stable cobalticyanide, which is excreted in the urine. In all cases hyperbaric therapy may increase the efficiency of a cyanide antidote kit.

Section 5 - FIRE FIGHTING MEASURES

EXTINGUISHING MEDIA
Dry sand.
Dry chemical powder.
DO NOT use halogenated fire extinguishing agents.
DO NOT use water or halogens on dust fires.
FIRE FIGHTING

Alert Fire Brigade and tell them location and nature of hazard.

- Wear full body protective clothing with breathing apparatus.
- Prevent, by any means available, spillage from entering drains or water courses.

FIRE/EXPLOSION HAZARD

- Non combustible.
- Not considered to be a significant fire risk.
- Heating may cause expansion or decomposition leading to violent rupture of containers.
- May emit corrosive, poisonous fumes.

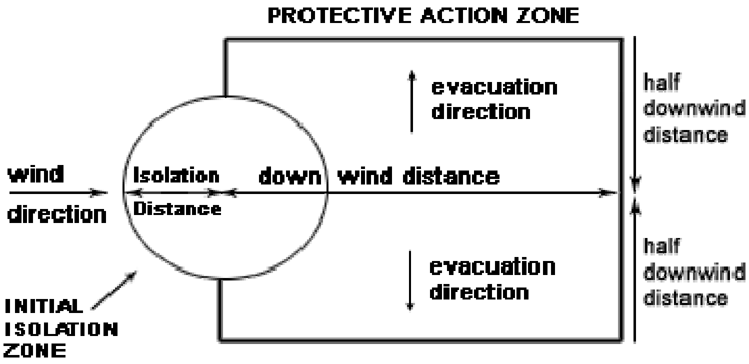
Contact with acids produces toxic fumes.
Keep dry.
HAZCHEM
4W
Personal Protective Equipment
Breathing apparatus.
Gas tight chemical resistant suit.
Limit exposure duration to 1 BA set30 mins.

Section 6 - ACCIDENTAL RELEASE MEASURES

EMERGENCY PROCEDURES
MINOR SPILLS
Refer to major spills.
MAJOR SPILLS

- Clear area of personnel and move upwind.
- If inhalation risk of exposure exists, wear SAA approved dust respirator.
- Collect recoverable product into labelled containers for recycling.

DO NOT use water.
PROTECTIVE ACTIONS FOR SPILL



From IERG (Canada/Australia)	
Isolation Distance	50 metres
Downwind Protection Distance	500 metres
IERG Number	26

FOOTNOTES
1 PROTECTIVE ACTION ZONE is defined as the area in which people are at risk of harmful exposure. This zone assumes that random changes in wind direction confines the vapour plume to an area within 30 degrees on either side of the predominant wind direction, resulting in a crosswind protective action distance equal to the downwind protective action

distance.
2 PROTECTIVE ACTIONS should be initiated to the extent possible, beginning with those closest to the spill and working away from the site in the downwind direction. Within the protective action zone a level of vapour concentration may exist resulting in nearly all unprotected persons becoming incapacitated and unable to take protective action and/or incurring serious or irreversible health effects.
3 INITIAL ISOLATION ZONE is determined as an area, including upwind of the incident, within which a high probability of localised wind reversal may expose nearly all persons without appropriate protection to life-threatening concentrations of the material.
4 SMALL SPILLS involve a leaking package of 200 litres (55 US gallons) or less, such as a drum (jerrican or box with inner containers). Larger packages leaking less than 200 litres and compressed gas leaking from a small cylinder are also considered "small spills". LARGE SPILLS involve many small leaking packages or a leaking package of greater than 200 litres, such as a cargo tank, portable tank or a "one-tonne" compressed gas cylinder.
5 Guide 138 is taken from the US DOT emergency response guide book.
6 IERG information is derived from CANUTEC - Transport Canada.
EMERGENCY RESPONSE PLANNING GUIDELINES (ERPG)
The maximum airborne concentration below which it is believed that nearly all individuals could be exposed for up to one hour WITHOUT experiencing or developing

life-threatening health effects is:

carbon, non-activated	500 mg/m³
aluminium oxide	500 mg/m³
aluminium	250 mg/m³
sodium fluoride	75 mg/m³

irreversible or other serious effects or symptoms which could impair an individual's ability to take protective action is:

carbon, non-activated	10 mg/m³
aluminium oxide	10 mg/m³
aluminium	50 mg/m³
sodium fluoride	5.00 mg/m³

other than mild, transient adverse effects without perceiving a clearly defined odour is:

carbon, non-activated	6 mg/m³
aluminium oxide	6 mg/m³
aluminium	30 mg/m³
sodium fluoride	5 mg/m³

The threshold concentration below which most people. will experience no appreciable risk of health effects:

carbon, non-activated	2 mg/m³
aluminium oxide	2 mg/m³
aluminium	15 mg/m³
sodium fluoride	5 mg/m³

American Industrial Hygiene Association (AIHA)

Ingredients considered according exceed the following cutoffs

Very Toxic (T+)	>= 0.1%	Toxic (T)	>= 3.0%
R50	>= 0.25%	Toxic (T)	>= 3.0%
R51	>= 2.5%	Corrosive (C)	>= 5.0%
else	>= 10%		

where percentage is percentage of ingredient found in the mixture

SAFE HANDLING WITH OTHER CLASSIFIED CHEMICALS

X	X	+	X	X	+

X: Must not be stored together
O: May be stored together with specific preventions
+: May be stored together

Personal Protective Equipment advice is contained in Section 8 of the MSDS.

Section 7 - HANDLING AND STORAGE

PROCEDURE FOR HANDLING

Never add water to this product.

- Avoid generating and breathing dust
- Avoid contact with skin and eyes.
- Wear nominated personal protective equipment when handling.
- Use in a well-ventilated area.
- Use good occupational work practices.
- Observe manufacturer's storing and handling recommendations.

SUITABLE CONTAINER

- Check that containers are clearly labelled

Packaging as recommended by manufacturer.
Delivery may be in bulk by special vehicle.
Ensure that container is waterproof to prevent contact of water with the material. (See "Storage Incompatibility" below).
Do not store directly on the ground.

STORAGE INCOMPATIBILITY

During transportation and storage, cathode waste must be protected to prevent it coming in contact with water. There are a relatively large number of contaminants in spent potlining capable of producing toxic and explosive gases. Those of concern include carbides, nitrides, cyanides, fluorides, sulphides, metallic sodium and aluminium. In contact with water sodium releases hydrogen, carbides release methane and acetylene, nitrides release ammonia. Water and alkalis release hydrogen from aluminium. Leaching with water may extract cyanides and fluorides. Acids and high temperature may release hydrogen fluoride from fluorides, hydrogen cyanide from cyanides, and sulphur oxides from sulphides.
Protect from contact with water including rain.
Store on an impervious pad.
Segregate from strong acids.

STORAGE REQUIREMENTS

- Keep dry.

- Store under cover.
- Store in a well ventilated area.
- Store away from sources of heat or ignition.
- Observe manufacturer's storing and handling recommendations.

Section 8 - EXPOSURE CONTROLS / PERSONAL PROTECTION

EXPOSURE CONTROLS

Source	Material	TWA ppm	TWA mg/m^3	STEL ppm	STEL mg/m^3	Peak ppm	Peak mg/m^3
Australia Exposure Standards	Aluminium oxide (a)		10				
Australia Exposure Standards	Aluminium, pyro powders (as Al)		5				
Australia Exposure Standards	Aluminium (welding fumes) (as Al)		5				
Australia Exposure Standards	Aluminium (metal dust)		10				
Australia Exposure Standards	Inspirable dust (Not specified)		10				
Australia Exposure Standards	Silicon (a)		10				
Australia Exposure Standards	Cyanides (as CN)		5				
Australia Exposure Standards	Ammonia	25	17	35	24		
Australia Exposure Standards	Hydrogen cyanide (h)	10					11
Australia Exposure Standards	Cyanides (as CN)		5				

No data available: carbon, non-activated as (CAS: 7440-44-0) / (CAS: 82600-58-6)
No data available: sodium fluoride as (CAS: 7681-49-4)
No data available: iron as (CAS: 7439-89-6)
No data available: cyanide ion as (CAS: 57-12-5)
No data available: ammonia as (CAS: 1336-21-6)

EMERGENCY EXPOSURE LIMITS

Material	Revised IDLH Value (ppm)	Revised IDLH Value (mg/m3)
Cyanides (as CN)		25

Ammonia	300	
Hydrogen cyanide	50	

NOTES
as CN
These "dusts" have little adverse effect on the lungs and do not produce toxic effects or organic disease. Although there is no dust which does not evoke some cellular response at sufficiently high concentrations, the cellular response caused by P.N.O.C.s has the following characteristics:

- the architecture of the air spaces remain intact,
- scar tissue (collagen) is not synthesised to any degree,
- tissue reaction is potentially reversible.

Extensive concentrations of P.N.O.C.s may:

- seriously reduce visibility,
- cause unpleasant deposits in the eyes, ears and nasal passages,
- contribute to skin or mucous membrane injury by chemical or mechanical action, per se, or by the rigorous skin cleansing procedures necessary for their removal. [ACGIH]

This limit does not apply:

- to brief exposures to higher concentrations
- nor does it apply to those substances that may cause physiological impairment at lower concentrations but for which a TLV has as yet to be determined.

This exposure standard applies to particles which

- are insoluble or poorly soluble* in water or, preferably, in aqueous lung fluid (if data is available) and
- have a low toxicity (i.e.. are not cytotoxic, genotoxic, or otherwise chemically reactive with lung tissue, and do not emit ionizing radiation, cause immune sensitization, or cause toxic effects other than by inflammation or by a mechanism of lung overload)

REPRODUCTIVE HEALTH GUIDELINES
Established occupational exposure limits frequently do not take into consideration reproductive end points that are clearly below the thresholds for other toxic effects. Occupational reproductive guidelines (ORGs) have been suggested as an additional standard. These have been established after a literature search for the reproductive no-observed-adverse effect-level (NOAEL) and the lowest-observed-adverse-effect-level (LOAEL). In addition the US EPA's procedures for risk assessment for hazard identification and dose-response assessment as applied by NIOSH were used in the creation of such limits. Uncertainty factors (UFs) have also been incorporated.

Ingredient	ORG	UF	Endpoint	CR	TLV Adeq
sodium fluoride	2.5 mg/m³	NA	NA	NA	Yes

These exposure guidelines have been derived from a screening level of risk assessment and should not be construed as unequivocally safe limits. ORGS represent an 8-hour time-weighted average unless specified otherwise.
CR = Cancer Risk/10000; UF = Uncertainty factor:
TLV believed to be adequate to protect reproductive health:
LOD: Limit of detection

Toxic endpoints have also been identified as:
D = Developmental; R = Reproductive; TC = Transplacental carcinogen
Jankovic J., Drake F.: A Screening Method for Occupational Reproductive
American Industrial Hygiene Association Journal 57: 641-649 (1996).
INGREDIENT DATA
CARBON, NON-ACTIVATED:
as coal dust (containing <5% crystalline silica): TLV TWA: 2 mg/m³ respirable fraction NOTICE OF INTENDED CHANGE TLV TWA 0.9 mg/m³ (bituminous) respirable fraction A4 TLV TWA 0.4 mg/m³ (anthracite) respirable fraction A4 NOTE: This substance has been classified by the ACGIH as A4 NOT classifiable as causing Cancer in humans. ES TWA: 3 mg/m³ respirable dust The concentration of respirable dust for application of this limit is to be determined from the fraction that penetrates a separator whose size collection efficiency is described by a cumulative lognormal function with a median aerodynamic diameter of 4.0 µm (+-) 0.3 µm and with a geometric standard deviation of 1.5 µm (+-) 0.1 µm, i.e..generally less than 5 µm.
ALUMINIUM OXIDE:
The experimental and clinical data indicate that aluminium oxide acts as an "inert" material when inhaled and seems to have little effect on the lungs nor does it produce significant organic disease or toxic effects when exposures are kept under reasonable control.
[Documentation of the Threshold Limit Values], ACGIH, Sixth Edition
ALUMINIUM:
Twenty seven year experience with aluminium oxide dust (particle size 96% 1,2 um) without adverse effects either systemically or on the lung, and at a calculated concentration equivalent to 2 mg/m³ over an 8-hour shift has lead to the current recommendation of the TLV-TWA. The limit should also apply to aluminium pyro powders whose toxicity is reportedly greater than aluminium dusts and should be protective against lung changes.
SODIUM FLUORIDE:
Based on a study in which the threshold for minimum increase in bone density due to fluoride exposure was 3.38 mg/m³ (as fluoride), the present TLV-TWA has been adopted to prevent irritant effects and disabling bone changes. There is also support for the proposition that occupational exposure below the TLV will have no adverse effect on pregnant women or off-spring. IARC has classified fluorides in drinking water as Group 3 carcinogens; i.e. Not classifiable as to its carcinogenicity to humans. Equivocal evidence of carcinogenic activity (osteosarcoma) has been found in male rats administered sodium fluoride in drinking water. (0-175 ppm) Evidence was not found in female rats or in male or female mice.
IRON:
No exposure limits set by NOHSC or ACGIH. These "dusts" have little adverse effect on the lungs and do not produce toxic effects or organic disease. Although there is no dust which does not evoke some cellular response at sufficiently high concentrations, the cellular response caused by P.N.O.C.s has the following characteristics:

- the architecture of the air spaces remain intact,
- scar tissue (collagen) is not synthesised to any degree,
- tissue reaction is potentially reversible.

Extensive concentrations of P.N.O.C.s may:

- seriously reduce visibility,
- cause unpleasant deposits in the eyes, ears and nasal passages,
- contribute to skin or mucous membrane injury by chemical or mechanical action, per se, or by the rigorous skin cleansing procedures necessary for their removal. [ACGIH]

This limit does not apply:

- to brief exposures to higher concentrations
- nor does it apply to those substances that may cause physiological impairment at lower concentrations but for which a TLV has as yet to be determined.

This exposure standard applies to particles which

- are insoluble or poorly soluble* in water or, preferably, in aqueous lung fluid (if data is available) and
- have a low toxicity (i.e.. are not cytotoxic, genotoxic, or otherwise chemically reactive with lung tissue, and do not emit ionizing radiation, cause immune sensitization, or cause toxic effects other than by inflammation or by a mechanism of lung overload)

SILICON:
CEL TWA: 5 mg/m³ NOTE: The CEL TWA is consistent with the value recommended in the Norwegian ferro-alloy industry (furnace room dust/mixed dust). Silicon dust appears to have little adverse effect on the lungs and is not implicated in the genesis of organic disease or in the production of toxic effects. The TLV-TWA is thought to be protective against physical irritation and possible chronic respiratory effects encountered at higher levels.
CYANIDE ION:
cyanides as CN (A.Wt: 26.00) ES TWA: 5 mg/m³ SKIN TLV C: 5 mg/m³ SKIN (calcium cyanide, potassium cyanide, sodium cyanide) OES TWA: 5 mg/m³ SKIN IDLH Level: 25 mg/m³ NOTE: Detector tubes for cyanides, measuring CN in excess of 2mg are commercially available. Exposure limits with "skin" notation indicate that vapour and liquid may be absorbed through intact skin. Absorption by skin may readily exceed vapour inhalation exposure. Symptoms for skin absorption are the same as for inhalation. Contact with eyes and mucous membranes may also contribute to overall exposure and may also invalidate the exposure standard.
AMMONIA:
Odour Threshold Value: Variously reported as 0.019 ppm and 55 ppm; AIHA Value 16.7 ppm (detection) NOTE: Detector tubes for ammonia, measuring in excess of 1 ppm, are commercially available. The TLV-TWA is thought to be protective against irritation of the eyes and respiratory tract and minimise discomfort among workers that are not inured to its effects and systemic damage. Acclimatised persons are able to tolerate prolonged exposures of up to 100 ppm without symptoms. Marked irritation has been seen in persons exposed to ammonia concentrations between 50 and 100 ppm only when the exposures involved sudden concentration peaks which do not permit short-term acclimatisation. The detoxification capacity of the liver is significant since the amount of ammonia formed endogenously in the intestines markedly exceeds that from external sources. Human exposure effects, at vapour concentrations of about:
--- -------------------- ppm Possible Effects --------------- --------------------------------- --------------------- 5 minimal irritation 9-50 nasal dryness, olfactory fatigue and moderate irritation 125-137 definite nose, throat and chest irritation 140 slight eye irritation 150 laryngeal spasm 500 30 minute exposures may produce cyclic hypernea, increased blood pressure and pulse rate, and upper respiratory tract irritation which may persist for 24 hours 700 immediate eye irritation 1500-10000 dyspnea, convulsive coughing, chest pain, respiratory spasm, pink frothy sputum, rapid asphyxia and delayed pulmonary oedema which may be fatal. Other effects include runny nose, swelling of the lips, restlessness, headache, salivation, nausea, vomiting, glottal oedema, pharyngitis, tracheitis, and speech difficulties. Bronchopneumonia, asphyxiation due to spasms, inflammation, and oedema of the larynx, may be fatal. Residual effects include hoarseness, productive cough, and decreased respiratory function >2500 severe eye irritation, with swelling of the eyelids, lachrymation, blepharospasm, palpebral oedema, increased intraocular pressure, oval semi-dilated, fixed pupils, corneal ulceration (often severe) and temporary blindness. Depending

on duration of exposure, there may be destruction of the epithelium, corneal and lenticular opacification, and iritis accompanied by hypopyon or haemorrhage and possible loss of pigment from the posterior layer of the iris. Less severe damage is often resolved. In the case of severe damage, symptoms may be delayed; late complications including persistent oedema, vascularisation and corneal scarring, permanent opacity, acute angle glaucoma, staphyloma, cataract, and atrophy of the retina, iris, and symblepharon. Long-term exposure to sub-acute concentrations or single exposures to high concentrations may produce chronic airway dysfunction, alveolar disease, bronchiolitis, bronchiectasis, emphysema and anxiety neuroses

METHANE:

ES TWA: simple asphyxiant TLV TWA: simple asphyxiant Simple asphyxiants are gases which, when present in high concentrations, reduce the oxygen content in air below that required to support breathing, consciousness and life; loss of consciousness, with death by suffocation may rapidly occur in an oxygen deficient atmosphere. CARE: Most simple asphyxiants are odourless and there is no warning on entry into an oxygen deficient atmosphere. If there is any doubt, oxygen content can be checked simply and quickly. It may not be appropriate to only recommend an exposure standard for simple asphyxiants rather it is essential that sufficient oxygen be maintained. Air normally has 21 percent oxygen by volume, with 18 percent regarded as minimum under normal atmospheric pressure to maintain consciousness / life. At pressures significantly higher or lower than normal atmospheric pressure, expert guidance should be sought. NOTICE OF INTENDED CHANGE TLV TWA 1000 ppm

HYDROGEN:

ES TWA: simple asphyxiant TLV TWA: simple asphyxiant Simple asphyxiants are gases which, when present in high concentrations, reduce the oxygen content in air below that required to support breathing, consciousness and life; loss of consciousness, with death by suffocation may rapidly occur in an oxygen deficient atmosphere. CARE: Most simple asphyxiants are odourless and there is no warning on entry into an oxygen deficient atmosphere. If there is any doubt, oxygen content can be checked simply and quickly. It may not be appropriate to only recommend an exposure standard for simple asphyxiants rather it is essential that sufficient oxygen be maintained. Air normally has 21 percent oxygen by volume, with 18 percent regarded as minimum under normal atmospheric pressure to maintain consciousness / life. At pressures significantly higher or lower than normal atmospheric pressure, expert guidance should be sought.

HYDROGEN CYANIDE:

Odour threshold: 0.2 - 5.0 ppm., recognition 2.0 - 5.0 ppm. NOTE: Detector tubes for hydrocyanic acid, measuring in excess of 2 ppm, are commercially available. Long-term (8 hrs) measurements may be conducted to detect concentrations exceeding 1.3 ppm. The recommended TLV-C is thought to provide protection against the significant risk of headache, fatigue, colic and nervousness observed in individuals exposed at 10 ppm in a full working shift. There are no rigorous studies which demonstrate objective signs of cyanide induced adverse health effects from long-term exposure to HCN in the workplace at concentrations equal to or less than 10 ppm. Although reports do exist which describe diverse and non-specific symptoms attributed to chronic exposures, other chemicals and stressors may also be implicated.

PERSONAL PROTECTION




EYE

- Safety glasses with side shields.

- Chemical goggles.
- Full face shield may be required for supplementary but never for primary protection of eyes
- Contact lenses may pose a special hazard; soft contact lenses may absorb and concentrate irritants. A written policy document, describing the wearing of lens or restrictions on use, should be created for each workplace or task. This should include a review of lens absorption and adsorption for the class of chemicals in use and an account of injury experience. Medical and first-aid personnel should be trained in their removal and suitable equipment should be readily available. In the event of chemical exposure, begin eye irrigation immediately and remove contact lens as soon as practicable. Lens should be removed at the first signs of eye redness or irritation - lens should be removed in a clean environment only after workers have washed hands thoroughly. [CDC NIOSH Current Intelligence Bulletin 59]

HANDS/FEET
Wear chemical protective gloves, eg. PVC.
Wear safety footwear.
OTHER

- Overalls.
- Eyewash unit.

GLOVE SELECTION INDEX

Glove selection is based on a modified presentation of the:
"Forsberg Clothing Performance Index".

The effect(s) of the following substance(s) are taken into account in the computer-generated selection: sodium fluoride

Protective Material	CPI *.
NATURAL RUBBER	A
NEOPRENE	A
NITRILE	A
PVC	A

* CPI - Chemwatch Performance Index
A: Best Selection
B: Satisfactory; may degrade after 4 hours continuous immersion
C: Poor to Dangerous Choice for other than short term immersion

NOTE: As a series of factors will influence the actual performance of the glove, a final selection must be based on detailed observation. -

* Where the glove is to be used on a short term, casual or infrequent basis, factors such as "feel" or convenience (e.g. disposability), may dictate a choice of gloves which might otherwise be unsuitable following long-term or frequent use. A qualified practitioner should be consulted.

RESPIRATOR

Protection Factor	Half-Face Respirator	Full-Face Respirator	Powered Air Respirator
10 x ES	ABK P1 Air-line*	- -	ABK PAPR-P1 -
50 x ES	Air-line**	ABK P2	ABK PAPR-P2
100 x ES	-	ABK P3	-
		Air-line*	-
100+ x ES	-	Air-line**	ABK PAPR-P3

* - Negative pressure demand ** - Continuous flow.
The local concentration of material, quantity and conditions of use determine the type of personal protective equipment required.
For further information consult site specific CHEMWATCH data (if available), or your Occupational Health and Safety Advisor.

ENGINEERING CONTROLS

General exhaust is adequate under normal operating conditions. Local exhaust ventilation may be required in specific circumstances. If risk of overexposure exists, wear approved respirator. Correct fit is essential to obtain adequate protection. Provide adequate ventilation in warehouse or closed storage areas. Air contaminants generated in the workplace possess varying "escape" velocities which, in turn, determine the "capture velocities" of fresh circulating air required to effectively remove the contaminant.

Type of Contaminant:	Air Speed:
solvent, vapours, degreasing etc., evaporating from tank (in still air).	0.25-0.5 m/s (50-100 f/min)
aerosols, fumes from pouring operations, intermittent container filling, low speed conveyer transfers, welding, spray drift, plating acid fumes, pickling (released at low velocity into zone of active generation)	0.5-1 m/s (100-200 f/min.)
direct spray, spray painting in shallow booths, drum filling, conveyer loading, crusher dusts, gas discharge (active generation into zone of rapid air motion)	1-2.5 m/s (200-500 f/min.)
grinding, abrasive blasting, tumbling, high speed wheel generated dusts (released at high initial velocity into zone of very high rapid air motion).	2.5-10 m/s (500-2000 f/min.)

Within each range the appropriate value depends on:

Lower end of the range	Upper end of the range
1: Room air currents minimal or favourable to capture	1: Disturbing room air currents
2: Contaminants of low toxicity or of nuisance value only.	2: Contaminants of high toxicity
3: Intermittent, low production.	3: High production, heavy use
4: Large hood or large air mass in motion	4: Small hood-local control only

Simple theory shows that air velocity falls rapidly with distance away from the opening of a simple extraction pipe. Velocity generally decreases with the square of distance from the extraction point (in simple cases). Therefore the air speed at the extraction point should be adjusted, accordingly, after reference to distance from the contaminating source. The air velocity at the extraction fan, for example, should be a minimum of 1-2 m/s (200-400 f/min) for extraction of solvents generated in a tank 2 meters distant from the extraction point. Other mechanical considerations, producing performance deficits within the extraction apparatus, make it essential that theoretical air velocities are multiplied by factors of 10 or more when extraction systems are installed or used.

Section 9 - PHYSICAL AND CHEMICAL PROPERTIES

APPEARANCE

Dark grey to black coloured subdivided solid. Characteristic ammonia-like odour in moist air. (Care!). Part of material is water soluble giving an alkaline solution.. Warning: The addition of water can release methane, ammonia, hydrogen and hydrogen cyanide.

PHYSICAL PROPERTIES

Solid.
Does not mix with water.
Sinks in water.
Contact with acids liberates very toxic gas.

Molecular Weight: Not applicable.	Boiling Range (C): Not available
Melting Range (C): Not available	Specific Gravity (water=1): 2-2.5
Solubility in water (g/L): Partly miscible	pH (as supplied): Not applicable
pH (1% solution): 8.5-12	Vapour Pressure (kPa): Not applicable.
Volatile Component (%vol): Nil.	Evaporation Rate: Not applicable
Relative Vapour Density (air=1): Not applicable.	Flash Point (C): Not applicable
Lower Explosive Limit (%): Not applicable	Upper Explosive Limit (%): Not applicable
Autoignition Temp (C): Not available	Decomposition Temp (°C): Not available
State: Divided solid	

Section 10 - CHEMICAL STABILITY AND REACTIVITY INFORMATION

CONDITIONS CONTRIBUTING TO INSTABILITY
Contact with water liberates toxic gases.
Contact with acids liberates very toxic gases.
Presence of incompatible materials.
Hazardous polymerisation will not occur.

Section 11 - TOXICOLOGICAL INFORMATION

POTENTIAL HEALTH EFFECTS
ACUTE HEALTH EFFECTS
SWALLOWED
The material is corrosive to the gastro-intestinal tract and harmful if swallowed.
Considered an unlikely route of entry in commercial/industrial environments.
EYE
The material is highly discomforting to the eyes and capable of causing pain and severe conjunctivitis. Corneal injury may develop, with possible permanent impairment of vision, if not promptly and adequately treated.
The material may produce moderate eye irritation leading to inflammation. Repeated or prolonged exposure to irritants may produce conjunctivitis.
SKIN
The material is moderately discomforting and corrosive to the skin and is capable of causing skin reactions which may lead to dermatitis.
INHALED
Particulate/dust is discomforting to the upper respiratory tract.
CHRONIC HEALTH EFFECTS
Principal routes of exposure are usually by skin contact / eye contact and inhalation of vapour given off by material that has become wet or damp.
Extended exposure to inorganic fluorides causes fluorosis, which includes signs of joint pain and stiffness, tooth discolouration, nausea and vomiting, loss of appetite, diarrhoea or constipation, weight loss, anaemia, weakness and general unwellness. There may also be frequent urination and thirst. Redness, itchiness and allergy-like inflammation of the skin and mouth cavity can occur. The central nervous system may be involved.
Long term exposure to high dust concentrations may cause changes in lung function i.e. pneumoconiosis; caused by particles less than 0.5 micron penetrating and remaining in the lung. Prime symptom is breathlessness; lung shadows show on X-ray.
TOXICITY AND IRRITATION
Not available. Refer to individual constituents.
unless otherwise specified data extracted from RTECS - Register of Toxic Effects of Chemical Substances

TOXICITY	IRRITATION
CARBON, NON-ACTIVATED:	
TDLo: 167mg/kg	Nil Reported
Substance has been investigated as a reproductive effector.	
ALUMINIUM OXIDE:	
No significant acute toxicological data identified in literature search.	
ALUMINIUM:	
Not available. Refer to individual constituents.	
SODIUM FLUORIDE:	
Oral (human) LDLo: 71 mg/kg	Eye (rabbit): 20 mg/24h-Moderate
Oral (woman) LDLo: 90 mg/kg	
Oral (human) TDLo: 0.21 mg/kg	
Oral (woman) TDLo: 7 mg/kg	
Oral (man) TDLo: 1662 mg/kg	
Oral (rat) LD50: 52 mg/kg	
The substance is classified by IARC as Group 3:	
NOT classifiable as to its carcinogenicity to humans.	
Evidence of carcinogenicity may be inadequate or limited in animal testing.	
IRON:	
Oral (rat) LD50: 98600 mg/kg	[Pa
[	Nil Reported [
[Patty]	
SILICON:	
Oral (rat) LD50: 3160 mg/kg	Nil Reported
CYANIDE ION:	
Intraperitoneal (mouse) LD50: 3 mg/kg	Nil Reported
AMMONIA:	
Oral (rat) LD50: 350 mg/kg	Eye (rabbit): 0.25 mg SEVERE
Oral (human) LDLo: 43 mg/kg	Eye (rabbit): 1 mg/30s SEVERE
Inhalation (human) LCLo: 5000 ppm/5m	
Inhalation (human) TCLo: 20 ppm	
Inhalation (rat) LC50: 2000 ppm/4h	
Unreported (man) LDLo: 132 mg/kg	
METHANE:	
No significant acute toxicological data identified in literature search.	
HYDROGEN:	
No significant acute toxicological data identified in literature search.	
HYDROGEN CYANIDE:	
Oral (human) TDLo: 0.57 mg/kg	Nil Reported
Inhalation (man) LCLo: 400 mg/m^3/2m	
Inhalation (human) TCLo: 500 mg/m^3/3m	
Inhalation (human) TCLo: 200 mg/m^3/10m	
Inhalation (human) TCLo: 120 mg/m^3/1h	
Inhalation (rat) LC50: 484 ppm/5m	

Section 12 - ECOLOGICAL INFORMATION

During transportation and storage cathode waste must be protected to prevent it coming into contact with water. It should never be placed directly on the ground nor allowed to come into contact with water or acids.

Refer to data for ingredients, which follows:
SODIUM FLUORIDE:
Toxicity invertebrate: LC50 (48h) 1987 ppm
AMMONIA:
Fish LC50 (96hr.) (mg/l): 0.45-0.8
Toxicity Fish: LC50(96)0.25-8.2mg/L
Toxicity invertebrate: LC50(96)1.1-1.53mg/L
Bioaccumulation: some
Nitrif. inhib.: some
processes Abiotic: oxid
In air ammonia is persistent whilst, in water, it biodegrades rapidly to nitrate, producing a high oxygen demand. Ammonia is strongly adsorbed to soil. Ammonia is non-persistent in water (half-life 2 days) and is moderately toxic to fish under normal temperature and pH conditions. Ammonia is harmful to aquatic life at low concentrations but does not concentrate in the food chain.
Drinking Water Standards:
0.5 mg/l (UK max.)
1.5 mg/l (WHO Levels)
Soil Guidelines: none available.
Air Quality Standards: none available.
METHANE:
log Kow (Sangster 1997): 1.09
BOD20: 3.04
ThOD: 3.99
log Kow : 1.09
Koc: 753
Half-life (hr) air: 21600
Half-life (hr) H_2O surface water: 1.17-14
Half-life (hr) soil: 1680
ThOD: 3.99
Toxicity Fish: LD50(24)14mg/L
HYDROGEN:
ThOD: 3.73
HYDROGEN CYANIDE:
Hazardous Air Pollutant: Yes
Fish LC50 (96hr.) (mg/l): 5.3E-06 -
Algae IC50 (72hr.) (mg/l): 1.8
log Pow (Verschueren 1983): 0.35/1.07
The material is classified as an ecotoxin* because the Fish LC50 (96 hours) is less than or equal to 0.1 mg/l
* Classification of Substances as Ecotoxic (Dangerous to the Environment)
Appendix 8, Table 1
Compiler's Guide for the Preparation of International Chemical Safety Cards: 1993
Commission of the European Communities.
Marine Pollutant
log Kow: 0.35-1.07
Toxicity invertebrate: cell mult. inhib. prtz 0.24mg/L

Section 13 - DISPOSAL CONSIDERATIONS

Recycle wherever possible.
Hold in designated solid waste storage area until approved for disposal.

Section 14 - TRANSPORTATION INFORMATION

Labels Required
dangerous when wet
HAZCHEM
4W
Land Transport UNDG:

Dangerous Goods Class:	4.3	Subrisk:	None
UN Number:	3170	Packing Group:	III

Shipping Name:ALUMINIUM SMELTING BY-PRODUCTS
ALUMINIUM REMELTING BY-PRODUCTS
ALUMINIUM SMELTING BY-PRODUCTS or ALUMINIUM REMELTING BY-PRODUCTS
Air Transport IATA:

ICAO/IATA Class:	4.3	ICAO/IATA Subrisk:	None
UN/ID Number:	3170	Packing Group:	III
ERG Code:	4W		

Shipping Name: Aluminium remelting by-products +
Maritime Transport IMDG:

IMDG Class:	4.3	IMDG Subrisk:	None
UN Number:	3170	Packing Group:	III
EMS Number:	F-G,S-P		

Shipping Name: ALUMINIUM SMELTING BY-PRODUCTS or ALUMINIUM REMELTING BY-PRODUCTS

Section 15 - REGULATORY INFORMATION

POISONS SCHEDULE
None
REGULATIONS
carbon, non-activated (CAS: 7440-44-0) is found on the following regulatory lists;
Australia High Volume Industrial Chemical List (HVICL)
Australia Inventory of Chemical Substances (AICS)
OECD Representative List of High Production Volume (HPV) Chemicals
aluminium oxide (CAS: 1344-28-1) is found on the following regulatory lists;
Australia High Volume Industrial Chemical List (HVICL)
Australia Inventory of Chemical Substances (AICS)
International Council of Chemical Associations (ICCA) - High Production Volume List
OECD Representative List of High Production Volume (HPV) Chemicals
aluminium (CAS: 7429-90-5) is found on the following regulatory lists;
Australia High Volume Industrial Chemical List (HVICL)
Australia Inventory of Chemical Substances (AICS)
OECD Representative List of High Production Volume (HPV) Chemicals
sodium fluoride (CAS: 7681-49-4) is found on the following regulatory lists;
Australia High Volume Industrial Chemical List (HVICL)
Australia Inventory of Chemical Substances (AICS)
Australia Poisons Schedule
International Council of Chemical Associations (ICCA) - High Production Volume List
OECD Representative List of High Production Volume (HPV) Chemicals
iron (CAS: 7439-89-6) is found on the following regulatory lists;

Australia High Volume Industrial Chemical List (HVICL)
Australia Inventory of Chemical Substances (AICS)
OECD Representative List of High Production Volume (HPV) Chemicals
silicon (CAS: 7440-21-3) is found on the following regulatory lists;
Australia High Volume Industrial Chemical List (HVICL)
Australia Inventory of Chemical Substances (AICS)
OECD Representative List of High Production Volume (HPV) Chemicals
cyanide ion (CAS: 57-12-5) is found on the following regulatory lists;
Australia Poisons Schedule
ammonia (CAS: 1336-21-6) is found on the following regulatory lists;
Australia High Volume Industrial Chemical List (HVICL)
Australia Inventory of Chemical Substances (AICS)
Australia Poisons Schedule
International Council of Chemical Associations (ICCA) - High Production Volume List
OECD Representative List of High Production Volume (HPV) Chemicals
methane (CAS: 74-82-8) is found on the following regulatory lists;
Australia Inventory of Chemical Substances (AICS)
International Council of Chemical Associations (ICCA) - High Production Volume List
OECD Representative List of High Production Volume (HPV) Chemicals
hydrogen (CAS: 1333-74-0) is found on the following regulatory lists;
Australia High Volume Industrial Chemical List (HVICL)
Australia Inventory of Chemical Substances (AICS)
International Council of Chemical Associations (ICCA) - High Production Volume List
OECD Representative List of High Production Volume (HPV) Chemicals
hydrogen cyanide (CAS: 74-90-8) is found on the following regulatory lists;
Australia Inventory of Chemical Substances (AICS)
Australia Poisons Schedule
International Council of Chemical Associations (ICCA) - High Production Volume List
OECD Representative List of High Production Volume (HPV) Chemicals
No data available for carbon, non-activated as CAS: 82600-58-6.

Section 16 - OTHER INFORMATION

Ingredients with multiple CAS Nos

Ingredient Name	Cas Nos
carbon, non-activated	7440-44-0, 82600-58-6

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