australasian (iron & steel) slag association

Australasian (iron and steel) Slag Association Inc.

Material Classification (Iron and Steel Slag) Monitoring Report 2006

Prepared by

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Glossary

Term	*Definition*
AS	Australian Standard
ASA	Australasian (iron & steel) Slag Association
Chain of Custody (COC)	Documentation which accompanies samples to reduce the potential for loss or erroneous labelling or analysis reporting
DEC	Department of Environment and Conservation of New South Wales replaced the Environment Protection Authority (EPA) and National Parks and Wildlife Service (NPWS) and Resource NSW.
EQL	Estimated quantitation limit – the minimum concentration the laboratory can analyse.
ISO	International Standards Organisation
Leachate	The water solution containing the released substance.
mg/kg	Milligrams per kilogram or 1×10^{-6} (i.e. one in one-million)
mg/L	Milligrams per litre or 1×10^{-6} (i.e. one in one-million)
Ug/l	Micrograms per litre or 1×10^{-9} if fluid is assumed to be density of 1mg/mL
NATA	National Association of Testing Authorities
Ng/g	Nanograms per gram or 1×10^{-9} (i.e. one in one-thousand-million)
QA / QC	Quality Assurance. Quality Control
TCLP	Toxicity Characteristic Leaching Procedure – a method of determining the release of a substance via exposure to water solution.
USEPA	United States Environment Protection Agency

Executive Summary

Following the Research and Development Programme of 2004, in particular the published report titled – *"Material Classification of Iron and Steel Slag By-product Waste Classification Investigation Report 2004"*, the Australasian (iron & steel) Slag Association Inc. (ASA) has undertaken to implement one of the key recommendations for the annual monitoring and assessment of iron and steel slags produced and processed by its members.

This report summarises the results of the 2006 monitoring programme which investigated and assessed the chemical nature of iron and steel furnace slags – co-products of three different metallurgical processes, namely, Iron Blast Furnace, Basic Oxygen System Furnace and Electric Arc Furnace respectively.

Iron and steel slags are generated and processed at several sites throughout Australia and New Zealand. Slags assessed in this report derive from sites owned by BlueScope Steel, OneSteel and Smorgon Steel in Australia, and SteelServ, New Zealand.

Each of the co-products were analysed and the results were assessed against the NSW Environment Protection Authority's *Environmental Guidelines*.

In total, 57 samples were initially collected and tested for total metal concentrations. Where sample results for any individual element exceeded the "*Inert*" category for total metals, these samples were subjected to further leachate analysis according to the process contained in the *Environmental Guidelines,* and assessed against the acceptance criteria.

The majority of initial results for total metals were well below the maximum values for total concentration levels. For those elements exceeding these initial acceptance levels (total concentration), investigations were conducted using the TCLP method. Using the 95% UCI, all results were shown to be well below the accepted concentration levels for ***Inert*** classification.

These results are consistent with previous leachate investigations by Golder Associates in the mid 1990's, the published report, *"Material Classification of Iron and Steel Slag By-product Waste Classification Investigation Report 2004",* and *Material Classification (Iron and Steel Slag) Monitoring Report 2005* report findings. Each of these reports confirm the stable and consistent nature of these respective metallurgical processes and resultant products.

This 2006 reports reaffirms iron and steel slag's ***Inert*** nature.

Figure 1 Distribution of Members

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1 Introduction

Further to the Research and Development Programme for 2004, in particular the published report titled – *"Material Classification of Iron and Steel Slag By-product Waste Classification Investigation Report 2004"*, the Australasian (iron & steel) Slag Association Inc. (ASA) resolved to implement one of the key recommendations arsing from the report.

The recommendation specifically called for an ongoing monitoring programme of iron and steel slag available throughout its membership.

> *8.1 Development of a Monitoring Programme*
>
> *The ASA develop and manage an ongoing testing and monitoring programme with the assistance of its members.*

This report represents the first monitoring assessment by Australasian (iron & steel) Slag Association Inc. (ASA) inline with the recommendation for ongoing monitoring of iron and steel slag available from members.

1.1 Iron and Steel Slag Classification System

The *Environmental Guidelines*[1] are a useful aid in both distinguishing concentrations of substances and their mobility behaviour, and in the determination process for classification of a waste. The *Environmental Guidelines* provide the process for determination of the waste classification, including analytical tables, which indicate the acceptable concentrations of contaminants in the waste.

1.2 Objective of Scope of Work

The object of the monitoring system is to collect, analyse, assess and report on the concentration and leachability of iron and steel slags using the NSW EPA *Environmental Guidelines: Assessment, Classification & Management of Liquid & Non-liquid Wastes*[1].

The aim of the monitoring programme is to collate and interpret the analytical results from member products, and confirm the stable and consistent nature of these respective metallurgical processes and resulting products.

The chemical characteristics of several types of metallurgical slags will be examined, these being: Iron Blast Furnace Slag (BFS), Steel Furnace Slag (SFS), Electric Arc Furnace Slag (EAFS), Sinter Slag Fines, Melter Slag and KOBM Slag.

Samples for each of these co-products were selected over a range of inventories, which will assist the ASA in identifying appropriate uses to which iron and steel slag co-products can be used.

[1] NSW EPA - Environmental Guidelines: Assessment, Classification & Management of Liquid & Non-liquid Wastes 1999

1.3 Material Selection & Sample Identification

The following table sets out the sample identification coding system used to sort the specific iron and steel slag products into their various categories:

Product Description	**Sample Identification range**
Granulated Blast Furnace Slag	101 to 103 (n=3)
Blast Furnace Slag – Air cooled aggregates	201 to 206 (n=6)
Blast Furnace Slag – Air cooled fines	301 to 306 (n=6)
Steel Furnace Slag – Air cooled aggregates	401 to 406 (n=6)
Steel Furnace Slag – Air cooled fines	501 to 506 (n=6)
Electric Arc Furnace Slag – Air cooled aggregates	601 to 612 (n=12)
Electric Arc Furnace Slag – Air cooled fines	701 to 709 (n=9)
Sinter Slag Fines	801 to 803 (n=3)
Melter Slag	901 to 903 (n=3)
KOBM Slag	904 to 906 (n=3)

1.4 Material Processes

Slags can be processed into various forms. Molten slag can be poured into pits and allowed to solidify. This solid rock material (air-cooled slag) can then be processed and crushed into aggregates of various sizes.

The manufacturing process for granulated slag will manifest different physical characteristics as compared to air-cooled slag.

Attachment 1 provides an explanation for each of the slag manufacturing processes involved.

1.5 Who is Responsible for Classification?

For both NSW and other state Environment Protection Authorities (EPA's), the responsibility for the determination of classification is the ***Generators'*** responsibility. In other words, the NSW EPA does not classify the waste – that is the responsibility of the generator. The generator determines waste classification according to the EPA's *Environmental Guidelines*.

This places an additional burden for the generator to both prove the reliability, and to demonstrate diligence in monitoring co-product stream quality.

To assess the waste, the *Environmental Guidelines* describe a process which:

- Qualitatively describes the sampling techniques and numbers of samples;
- Analyses contaminant concentration;
- Assesses concentrations in both Total and Available (leachable) forms.

This report is not intended to replace generators' responsibility to determine the classification of their respective co-products. However, should generators choose to rely on this report, they should satisfy themselves with regards to the accuracy and limitations of the study.

2 Sampling and Analysis Procedures

2.1 Site Sampling Procedures

Slag by-product samples were taken in accordance with the following standards:

- AS 1199 Sampling procedures and tables for inspection by attributes
- AS 1399 Guide to AS 1199
- AS 1141.3.1 – Methods for Sampling and Testing Aggregates 1996 (Method 3.1- Sampling Aggregates: Section 6.9 - Sampling from Stockpiles)

A Chain of Custody (COC) form was filled in and despatched with the samples.

2.2 Samples (n) collected

ASA coordinated the collection of 57 samples from member sites throughout Australia and New Zealand.

The geographic distribution of Association members is illustrated in Figure 1 above.

These samples, with COC forms were delivered to LabMark Pty Ltd, a NATA certified laboratory, for analysis.

2.3 Laboratory Procedures

Laboratory procedures for analysis of total metals and TCLP's were conducted by LabMark Pty Ltd, a NATA certified laboratory.

2.4 Quality Control / Quality Assurance Procedures

The full breakdown of the analytical results for the QA/QC for this analyses run can be seen at the end of the NATA laboratory reports. All were satisfactory.

3 Assessment and Classification Procedures

3.1 The Classification Process

The assessment and classification process was in accordance with the *NSW EPA - Environmental Guidelines: Assessment, Classification & Management of Liquid & Non-liquid Wastes 1999*.

4 Comparison of Analytical Results with Environmental Guidelines

4.1 Product Category Assessment Results

Using *Environmental Guidelines* Table A2, each of the samples was assessed with results shown in the following tables.

4.2 Granulated Blast Furnace Slag Assessment

Granulated Blast Furnace Slag

Element	Inert Waste					Solid Waste		Industrial Waste	
	95% UCI TCLP	95% UCI SCC	Maximum Values Without TCLP	Maximum values TCLP	Maximum values SCC	Maximum values TCLP	Maximum values SCC	Maximum values TCLP	Maximum values SCC
	mg/L	mg/kg	mg/kg	mg/L	mg/kg	mg/L	mg/kg	mg/L	mg/kg
Ag				0.5	180	5	180	20	720
As		1.04	10	0.5	500	5	500	20	2000
B		33.38		N/A	N/A	N/A	N/A	N/A	N/A
Ba		335.35		N/A	N/A	N/A	N/A	N/A	N/A
Be	0.005	5.1	2	0.1	100	1	100	4	400
Cd		0.05	2	0.1	100	1	100	4	400
Co		0.5		N/A	N/A	N/A	N/A	N/A	N/A
Cr		8.54	10	0.5	1900	5	1900	20	7600
Cu		6.54		N/A	N/A	N/A	N/A	N/A	N/A
F				15	10000	150	10000	600	40000
Hg		0.25		0.02	50	0.2	50	0.8	200
Mo		0.5	10	0.5	1000	5	1000	20	4000
Ni	0.025	7.48	4	0.2	1050	2	1050	8	4200
Pb		1.6	10	0.5	1500	5	1500	20	6000
Sb		0.5		N/A	N/A	N/A	N/A	N/A	N/A
Se	0.01	2.77	2	0.1	50	1	50	4	200
Sn		0.5		N/A	N/A	N/A	N/A	N/A	N/A
Zn		16.57		N/A	N/A	N/A	N/A	N/A	N/A
Mn		3402.11							

Sample Identification 101 to 103 (n=3)
As can be seen from this assessment the co-product is ***Inert***.

4.3 Blast Furnace Slag Aggregate Assessment

Blast Furnace Slag - Air cooled aggregates

Element	Inert Waste					Solid Waste		Industrial Waste	
	95% UCI TCLP	95% UCI SCC	Maximum Values Without TCLP	Maximum values TCLP	Maximum values SCC	Maximum values TCLP	Maximum values SCC	Maximum values TCLP	Maximum values SCC
	mg/L	mg/kg	mg/kg	mg/L	mg/kg	mg/L	mg/kg	mg/L	mg/kg
Ag				0.5	180	5	180	20	720
As		0.5	10	0.5	500	5	500	20	2000
B		47.84		N/A	N/A	N/A	N/A	N/A	N/A
Ba		416.32		N/A	N/A	N/A	N/A	N/A	N/A
Be	0.005	11.46	2	0.1	100	1	100	4	400
Cd		0.05	2	0.1	100	1	100	4	400
Co		1.6		N/A	N/A	N/A	N/A	N/A	N/A
Cr	0.025	12.7	10	0.5	1900	5	1900	20	7600
Cu		1.34		N/A	N/A	N/A	N/A	N/A	N/A
F				15	10000	150	10000	600	40000
Hg		0.25		0.02	50	0.2	50	0.8	200
Mo		0.8	10	0.5	1000	5	1000	20	4000
Ni	0.025	12.52	4	0.2	1050	2	1050	8	4200
Pb		1	10	0.5	1500	5	1500	20	6000
Sb		0.5		N/A	N/A	N/A	N/A	N/A	N/A
Se	0.01	4.42	2	0.1	50	1	50	4	200
Sn		0.5		N/A	N/A	N/A	N/A	N/A	N/A
Zn		9.77		N/A	N/A	N/A	N/A	N/A	N/A
Mn		3785.58							

Sample Identification 201 to 206 (n=6)
As can be seen from this assessment the co-product is ***Inert*.**

4.4 Blast Furnace Slag Fines Assessment

Blast Furnace Slag - Air cooled fines

Element	Inert Waste					Solid Waste		Industrial Waste	
	95% UCI TCLP	95% UCI SCC	Maximum Values Without TCLP	Maximum values TCLP	Maximum values SCC	Maximum values TCLP	Maximum values SCC	Maximum values TCLP	Maximum values SCC
	mg/L	mg/kg	mg/kg	mg/L	mg/kg	mg/L	mg/kg	mg/L	mg/kg
Ag				0.5	180	5	180	20	720
As		0.5	10	0.5	500	5	500	20	2000
B		76.66		N/A	N/A	N/A	N/A	N/A	N/A
Ba		416.73		N/A	N/A	N/A	N/A	N/A	N/A
Be	0.005	16	2	0.1	100	1	100	4	400
Cd		0.05	2	0.1	100	1	100	4	400
Co		1.07		N/A	N/A	N/A	N/A	N/A	N/A
Cr	0.025	77.51	10	0.5	1900	5	1900	20	7600
Cu		15.23		N/A	N/A	N/A	N/A	N/A	N/A
F				15	10000	150	10000	600	40000
Hg		0.25		0.02	50	0.2	50	0.8	200
Mo		0.5	10	0.5	1000	5	1000	20	4000
Ni	0.05	25.11	4	0.2	1050	2	1050	8	4200
Pb		1	10	0.5	1500	5	1500	20	6000
Sb		0.5		N/A	N/A	N/A	N/A	N/A	N/A
Se	0.01	5.56	2	0.1	50	1	50	4	200
Sn		0.5		N/A	N/A	N/A	N/A	N/A	N/A
Zn		32.91		N/A	N/A	N/A	N/A	N/A	N/A
Mn		5339.72							

Sample Identification 301 to 306 (n=6)
As can be seen from this assessment the co-product is ***Inert***.

4.5 Steel Furnace Slag Aggregates Assessment

Steel Furnace Slag - Air cooled aggregates

Element	Inert Waste					Solid Waste		Industrial Waste	
	95% UCI TCLP	95% UCI SCC	Maximum Values Without TCLP	Maximum values TCLP	SCC	Maximum values TCLP	SCC	Maximum values TCLP	SCC
	mg/L	mg/kg	mg/kg	mg/L	mg/kg	mg/L	mg/kg	mg/L	mg/kg
Ag				0.5	180	5	180	20	720
As		0.5	10	0.5	500	5	500	20	2000
B		35.79		N/A	N/A	N/A	N/A	N/A	N/A
Ba		56.66		N/A	N/A	N/A	N/A	N/A	N/A
Be		0.5	2	0.1	100	1	100	4	400
Cd		0.05	2	0.1	100	1	100	4	400
Co		2.6		N/A	N/A	N/A	N/A	N/A	N/A
Cr	0.025	745.77	10	0.5	1900	5	1900	20	7600
Cu		9.66		N/A	N/A	N/A	N/A	N/A	N/A
F				15	10000	150	10000	600	40000
Hg		0.07		0.02	50	0.2	50	0.8	200
Mo	0.02	15.41	10	0.5	1000	5	1000	20	4000
Ni	0.025	19.53	4	0.2	1050	2	1050	8	4200
Pb		1.88	10	0.5	1500	5	1500	20	6000
Sb		0.5		N/A	N/A	N/A	N/A	N/A	N/A
Se		1	2	0.1	50	1	50	4	200
Sn		1.39		N/A	N/A	N/A	N/A	N/A	N/A
Zn		60.22		N/A	N/A	N/A	N/A	N/A	N/A
Mn		26405.39							

Sample Identification 401 to 406 (n=6)
As can be seen from this assessment the co-product is ***Inert*.**

4.6 Steel Furnace Slag Fines Assessment

Steel Furnace Slag - Air cooled fines

Element	Inert Waste					Solid Waste		Industrial Waste	
	95% UCI TCLP	95% UCI SCC	Maximum Values Without TCLP	Maximum values TCLP	SCC	Maximum values TCLP	SCC	Maximum values TCLP	SCC
	mg/L	mg/kg	mg/kg	mg/L	mg/kg	mg/L	mg/kg	mg/L	mg/kg
Ag				0.5	180	5	180	20	720
As		0.94	10	0.5	500	5	500	20	2000
B		42.86		N/A	N/A	N/A	N/A	N/A	N/A
Ba		56.69		N/A	N/A	N/A	N/A	N/A	N/A
Be		0.5	2	0.1	100	1	100	4	400
Cd		0.26	2	0.1	100	1	100	4	400
Co		5.33		N/A	N/A	N/A	N/A	N/A	N/A
Cr	0.025	732.84	10	0.5	1900	5	1900	20	7600
Cu		15.09		N/A	N/A	N/A	N/A	N/A	N/A
F				15	10000	150	10000	600	40000
Hg		0.11		0.02	50	0.2	50	0.8	200
Mo	0.005	15.77	10	0.5	1000	5	1000	20	4000
Ni	0.05	35.19	4	0.2	1050	2	1050	8	4200
Pb		2.52	10	0.5	1500	5	1500	20	6000
Sb		0.5		N/A	N/A	N/A	N/A	N/A	N/A
Se		1	2	0.1	50	1	50	4	200
Sn		0.5		N/A	N/A	N/A	N/A	N/A	N/A
Zn		94.91		N/A	N/A	N/A	N/A	N/A	N/A
Mn		21125.37							

Sample Identification 501 to 506 (n=6)
As can be seen from this assessment the co-product is ***Inert*.**

4.7 Electric Arc Furnace Slag Aggregates Assessment

Electric Arc Furnace Slag - Air cooled aggregates

Element			Inert Waste			Solid Waste		Industrial Waste	
	95% UCI TCLP	95% UCI SCC	Maximum Values Without TCLP	Maximum values TCLP	SCC	Maximum values TCLP	SCC	Maximum values TCLP	SCC
	mg/L	mg/kg	mg/kg	mg/L	mg/kg	mg/L	mg/kg	mg/L	mg/kg
Ag				0.5	180	5	180	20	720
As		3.78	10	0.5	500	5	500	20	2000
B		107.45		N/A	N/A	N/A	N/A	N/A	N/A
Ba		731.75		N/A	N/A	N/A	N/A	N/A	N/A
Be		0.5	2	0.1	100	1	100	4	400
Cd		0.52	2	0.1	100	1	100	4	400
Co		5.49		N/A	N/A	N/A	N/A	N/A	N/A
Cr	0.07	4044.59	10	0.5	1900	5	1900	20	7600
Cu		208.39		N/A	N/A	N/A	N/A	N/A	N/A
F				15	10000	150	10000	600	40000
Hg		0.19		0.02	50	0.2	50	0.8	200
Mo	0.04	27.94	10	0.5	1000	5	1000	20	4000
Ni	0.025	47.74	4	0.2	1050	2	1050	8	4200
Pb		26.03	10	0.5	1500	5	1500	20	6000
Sb		1.21		N/A	N/A	N/A	N/A	N/A	N/A
Se		1.09	2	0.1	50	1	50	4	200
Sn		23.64		N/A	N/A	N/A	N/A	N/A	N/A
Zn		409.14		N/A	N/A	N/A	N/A	N/A	N/A
Mn		38987.07							

Sample Identification 601 to 612 (n=12)
As can be seen from this assessment the co-product is ***Inert*.**

4.8 Electric Arc Furnace Slag Fines Assessment

Electric Arc Furnace Slag - Air cooled fines

Element			Inert Waste			Solid Waste		Industrial Waste	
	95% UCI TCLP	95% UCI SCC	Maximum Values Without TCLP	Maximum values TCLP	SCC	Maximum values TCLP	SCC	Maximum values TCLP	SCC
	mg/L	mg/kg	mg/kg	mg/L	mg/kg	mg/L	mg/kg	mg/L	mg/kg
Ag				0.5	180	5	180	20	720
As		4.65	10	0.5	500	5	500	20	2000
B		66.78		N/A	N/A	N/A	N/A	N/A	N/A
Ba		576.81		N/A	N/A	N/A	N/A	N/A	N/A
Be		0.5	2	0.1	100	1	100	4	400
Cd		0.35	2	0.1	100	1	100	4	400
Co		5.39		N/A	N/A	N/A	N/A	N/A	N/A
Cr	0.17	4608.48	10	0.5	1900	5	1900	20	7600
Cu		413.59		N/A	N/A	N/A	N/A	N/A	N/A
F				15	10000	150	10000	600	40000
Hg		0.1		0.02	50	0.2	50	0.8	200
Mo	0.05	33.4	10	0.5	1000	5	1000	20	4000
Ni	0.025	49.07	4	0.2	1050	2	1050	8	4200
Pb	0.005	28.03	10	0.5	1500	5	1500	20	6000
Sb		1.17		N/A	N/A	N/A	N/A	N/A	N/A
Se		1.72	2	0.1	50	1	50	4	200
Sn		25.35		N/A	N/A	N/A	N/A	N/A	N/A
Zn		401.9		N/A	N/A	N/A	N/A	N/A	N/A
Mn		42005.8							

Sample Identification 701 to 709 (n=9)
As can be seen from this assessment the co-product is ***Inert*.**

4.9 Sinter Slag Fines Assessment

Sinter Slag Fines

Element			Inert Waste			Solid Waste		Industrial Waste	
	95% UCI TCLP	95% UCI SCC	Maximum Values Without TCLP	Maximum values TCLP	SCC	Maximum values TCLP	SCC	Maximum values TCLP	SCC
	mg/L	mg/kg	mg/kg	mg/L	mg/kg	mg/L	mg/kg	mg/L	mg/kg
Ag				0.5	180	5	180	20	720
As		2	10	0.5	500	5	500	20	2000
B		50.53		N/A	N/A	N/A	N/A	N/A	N/A
Ba		114.33		N/A	N/A	N/A	N/A	N/A	N/A
Be	0.005	3.15	2	0.1	100	1	100	4	400
Cd		0.36	2	0.1	100	1	100	4	400
Co				N/A	N/A	N/A	N/A	N/A	N/A
Cr	0.025	571.45	10	0.5	1900	5	1900	20	7600
Cu		25.13		N/A	N/A	N/A	N/A	N/A	N/A
F				15	10000	150	10000	600	40000
Hg		0.08		0.02	50	0.2	50	0.8	200
Mo	0.02	22.37	10	0.5	1000	5	1000	20	4000
Ni	0.025	58.74	4	0.2	1050	2	1050	8	4200
Pb		8.2	10	0.5	1500	5	1500	20	6000
Sb		0.5		N/A	N/A	N/A	N/A	N/A	N/A
Se		1	2	0.1	50	1	50	4	200
Sn		5.1		N/A	N/A	N/A	N/A	N/A	N/A
Zn		111.29		N/A	N/A	N/A	N/A	N/A	N/A
Mn		18142.07							

Sample Identification 801 to 803 (n=3)
As can be seen from this assessment the co-product is Inert.

4.10 Melter Slag Assessment

Melter Slag

Element			Inert Waste			Solid Waste		Industrial Waste	
	95% UCI TCLP	95% UCI SCC	Maximum Values Without TCLP	Maximum values TCLP	SCC	Maximum values TCLP	SCC	Maximum values TCLP	SCC
	mg/L	mg/kg	mg/kg	mg/L	mg/kg	mg/L	mg/kg	mg/L	mg/kg
Ag				0.5	180	5	180	20	720
As		0.5	10	0.5	500	5	500	20	2000
B		399.68		N/A	N/A	N/A	N/A	N/A	N/A
Ba		174.84		N/A	N/A	N/A	N/A	N/A	N/A
Be		0.5	2	0.1	100	1	100	4	400
Cd		0.5	2	0.1	100	1	100	4	400
Co		5.48		N/A	N/A	N/A	N/A	N/A	N/A
Cr	0.05	41.54	10	0.5	1900	5	1900	20	7600
Cu		11.48		N/A	N/A	N/A	N/A	N/A	N/A
F				15	10000	150	10000	600	40000
Hg		0.25		0.02	50	0.2	50	0.8	200
Mo		0.5	10	0.5	1000	5	1000	20	4000
Ni		3.77	4	0.2	1050	2	1050	8	4200
Pb		1	10	0.5	1500	5	1500	20	6000
Sb		0.5		N/A	N/A	N/A	N/A	N/A	N/A
Se		1	2	0.1	50	1	50	4	200
Sn		0.5		N/A	N/A	N/A	N/A	N/A	N/A
Zn		40.58		N/A	N/A	N/A	N/A	N/A	N/A
Mn		2627.68							

Sample Identification 901 to 903 (n=3)
As can be seen from this assessment the co-product is ***Inert*.**

4.11 KOBM Slag Assessment

KOBM Slag

Element			Inert Waste			Solid Waste		Industrial Waste	
	95% UCI TCLP	95% UCI SCC	Maximum Values Without TCLP	Maximum values TCLP	SCC	Maximum values TCLP	SCC	Maximum values TCLP	SCC
	mg/L	mg/kg	mg/kg	mg/L	mg/kg	mg/L	mg/kg	mg/L	mg/kg
Ag				0.5	180	5	180	20	720
As		0.5	10	0.5	500	5	500	20	2000
B		110		N/A	N/A	N/A	N/A	N/A	N/A
Ba		39.2		N/A	N/A	N/A	N/A	N/A	N/A
Be		0.5	2	0.1	100	1	100	4	400
Cd		0.5	2	0.1	100	1	100	4	400
Co		14.97		N/A	N/A	N/A	N/A	N/A	N/A
Cr	0.05	1044.61	10	0.5	1900	5	1900	20	7600
Cu		8.77		N/A	N/A	N/A	N/A	N/A	N/A
F				15	10000	150	10000	600	40000
Hg		0.09		0.02	50	0.2	50	0.8	200
Mo		0.5	10	0.5	1000	5	1000	20	4000
Ni	0.13	18.3	4	0.2	1050	2	1050	8	4200
Pb		1	10	0.5	1500	5	1500	20	6000
Sb		0.5		N/A	N/A	N/A	N/A	N/A	N/A
Se		1	2	0.1	50	1	50	4	200
Sn		0.5		N/A	N/A	N/A	N/A	N/A	N/A
Zn		148.52		N/A	N/A	N/A	N/A	N/A	N/A
Mn		13407.15							

Sample Identification 904 to 906 (n=3)
As can be seen from this assessment the co-product is ***Inert*.**

5 Discussion of Results

5.1 Summary

A total of 57 slag samples were analysed for total metals from six separate process locations. The results show that at least one of the “Maximum Values” (MV) requirements without TCLP were exceeded for each of the slag types.

All samples results for TCLP assessment were well below their MV thresholds.

All co-products sampled are accordingly classified as ***Inert***. The results are discussed in more detail below for each of the slag types.

5.2 Granulated Blast Furnace Slag

As demonstrated by the results tabled in 4.2, three (3) elements exceeded the “Maximum Values” (MV) requirements without TCLP for Granulated Blast Furnace Slag, namely Beryllium, Nickel and Selenium. All other elements assessed were well below their MV or “not detected”.

TCLP assessment results for Beryllium, Nickel and Selenium were well below their MV requirements using the 95% Upper Confidence Interval (UCI).

Based on this assessment, the co-product is ***Inert.***

5.3 Blast Furnace Slag Aggregates

As demonstrated by the results tabled in 4.3, four (4) elements exceeded the “Maximum Values” (MV) requirements without TCLP for Blast Furnace Slag Aggregates, namely Beryllium, Chromium, Nickel and Selenium. All other elements assessed were well below their MV or “not detected”.

TCLP assessment results for Beryllium, Chromium, Nickel and Selenium were well below their MV requirements using the 95% Upper Confidence Interval (UCI).

Based on this assessment, the co-product is ***Inert.***

5.4 Blast Furnace Slag Fines

As demonstrated by the results tabled in 4.4, four (4) elements exceeded the “Maximum Values” (MV) requirements without TCLP for Blast Furnace Slag Fines, namely Beryllium, Chromium, Nickel and Selenium. All other elements assessed were well below their MV or “not detected”.

TCLP assessment results for Beryllium, Chromium, Nickel and Selenium were well below their MV requirements using the 95% Upper Confidence Interval (UCI).

Based on this assessment, the co-product is ***Inert.***

5.5 Steel Furnace Slag Aggregates

As demonstrated by the results tabled in 4.5, three (3) elements exceeded the “Maximum Values” (MV) requirements without TCLP for Steel Furnace Slag Aggregates, namely Chromium, Molybdenum and Nickel. All other elements assessed were well below their MV or “not detected”.

TCLP assessment results for Chromium, Molybdenum and Nickel were well below their MV requirements using the 95% Upper Confidence Interval (UCI).

Based on this assessment, the co-product is ***Inert.***

5.6 Steel Furnace Slag Fines

As demonstrated by the results tabled in 4.6, three (3) elements exceeded the "Maximum Values" (MV) requirements without TCLP for Steel Furnace Slag Fines, namely Chromium, Molybdenum and Nickel. All other elements assessed were well below their MV or "not detected".

TCLP assessment results for Chromium, Molybdenum and Nickel were well below their MV requirements using the 95% Upper Confidence Interval (UCI).

Based on this assessment, the co-product is ***Inert.***

5.7 Electric Arc Furnace Slag Aggregates

As demonstrated by the results tabled in 4.7, four (4) elements exceeded the "Maximum Values" (MV) requirements without TCLP for Electric Arc Furnace Aggregates, namely Chromium, Molybdenum, Nickel and Lead. All other elements assessed were well below their MV or "not detected".

TCLP assessment results for Chromium, Molybdenum, Nickel and Lead were well below their MV requirements using the 95% Upper Confidence Interval (UCI).

Based on this assessment, the co-product is ***Inert.***

5.8 Electric Arc Furnace Slag Fines

As demonstrated by the results tabled in 4.8, four (4) elements exceeded the "Maximum Values" (MV) requirements without TCLP for Electric Arc Furnace Slag Fines, namely Chromium, Molybdenum, Nickel and Lead. All other elements assessed were well below their MV or "not detected".

TCLP assessment results for Chromium, Molybdenum, Nickel and Lead were well below their MV requirements using the 95% Upper Confidence Interval (UCI).

5.9 Based on this assessment, the co-product is Inert.

5.9 Sinter Slag Fines

As demonstrated by the results tabled in 4.9, four (4) elements exceeded the "Maximum Values" (MV) requirements without TCLP for Sinter Slag Fines, namely Beryllium, Chromium, Molybdenum and Nickel. All other elements assessed were well below their MV or "not detected".

TCLP assessment results for Beryllium, Chromium, Molybdenum and Nickel were well below their MV requirements using the 95% Upper Confidence Interval (UCI).

Based on this assessment, the co-product is ***Inert.***

5.10 Melter Slag

As demonstrated by the results tabled in 4.10, one (1) element exceeded the "Maximum Values" (MV) requirements without TCLP for Melter Slag, namely Chromium. All other elements assessed were well below their MV or "not detected".

TCLP assessment results for Chromium were well below their MV requirements using the 95% Upper Confidence Interval (UCI).

Based on this assessment, the co-product is ***Inert.***

5.11 KOBM Slag

As demonstrated by the results tabled in 4.11, two (2) elements exceeded the "Maximum Values" (MV) requirements without TCLP for KOBM Slag, namely Chromium and Nickel. All other elements assessed were well below their MV or "not detected".

TCLP assessment results for Chromium and Nickel were well below their MV requirements using the 95% Upper Confidence Interval (UCI).

Based on this assessment, the co-product is ***Inert.***

5.12 Limitations

This report has been produced by assessing the samples as received, analysed and assessed against the *Environmental Guidelines*. The number of samples taken was considered appropriate:

- For a screening evaluation of the product range to determine the degree of compliance with the accepted standards;
- When coupled with previous investigations, n > 30, and;
- To investigate the consistency of the product.

The 57 samples taken of iron and steel slag co-products have shown to be an indicator of overall product quality, and are very consistent when assessed in conjunction with the previous studies and reports published and provided to the NSW EPA.

- Ecotoxicity & Chemical Characterisation of Experimentally Generated Leachate from Unbond Rock Blast Furnace Slag – 1994
- Ecotoxicity & Chemical Characterisation of Experimentally Generated Leachate from Unbound Basic Oxygen Steel Slag – 1996
- Ecotoxicity & Chemical Characterisation of Experimentally Generated Leachate from Unbond Electric Arc Furnace Steel Slag – 1997
- Material Classification of Iron and Steel Slag Co-product Waste Classification Investigation Report 2004 by Moeyan Management

Despite some sample numbers for selected individual products being low in a statistical sense (n<30), we feel that the consistency exhibited so far will, coupled with ongoing investigations, only confirm the findings of this report.

6 Conclusions

6.1 Compliance with Acceptance Criteria

Based on the acceptance criteria established in the Guidelines, each of the following products, as assessed in this report, are classified as ***Inert***:

- Granulated Blast Furnace Slag
- Blast Furnace Slag – Air-cooled aggregates
- Blast Furnace Slag – Air-cooled fines
- Steel Furnace Slag – Air-cooled aggregates
- Steel Furnace Slag – Air-cooled fines
- Electric Arc Furnace Slag – Air-cooled aggregates
- Electric Arc Furnace Slag – Air-cooled fines
- Sinter Slag Fines
- Melter Slag
- KOBM Slag

7 Related Documents

1. Golder Associates, **Ecotoxicity & Chemical Characterisation of Experimentally Generated Leachate from Unbound Rock Blast Furnace Slag**, May 1993, 92620109(A).

2. Golder Associates, **Ecotoxicity & Chemical Characterisation of Experimentally Generated Leachate from Unbound Basic Oxygen Steel Slag**, April 1996, 95623062.I.

3. Golder Associates, **Ecotoxicity & Chemical Characterisation of Experimentally Generated Leachate from Unbound Electric Arc Furnace Steel Slag**, January 1997, 96623018.P.

4. Moeyan Management, **Material Classification of Iron and Steel Slag By-product Waste Classification Investigation Report 2004**, 2004.

Attachment 1 Slag co-product Manufacturing Process

Blast Furnace Slag - Air Cooled Slag

The first step in the production of steel is to manufacture iron. Iron ore, a mixture of oxides of iron, silica and alumina, together with a fuel consisting of coke, natural gas, oxygen and pulverised coal and also limestone as a fluxing agent, are fed into a blast furnace, which consists of a large vertical chamber through which large volumes of hot air are blasted.

The liquid blast furnace slag flows into pits where it is predominantly air-cooled and sprayed with a small quantity of water. The cooled slag is then transported to a crushing and screening plant where it is further processed into various products including aggregates.

Air-cooled slag is produced when molten blast furnace slag is placed into a slag pit. The slag is allowed to cool for a period of time and water is sprayed over it to increase the rate of solidification among other reasons. This solidified slag can be known as “rock slag” or “air-cooled slag”.

Granulated Blast Furnace Slag

Granulated slag is produced when molten blast furnace slag is introduced to a high-pressure water stream. The effect of this process is to blast the slag stream apart, making small globules of slag that are almost instantaneously solidified. The slag created from this process is typically smaller then 6 mm. On examination, the macro components of granulated blast furnace slag are very consistent.

Both air-cooled and granulated slags are the reclaimed by loader, transported by truck to the BlueScope Steel Recycling area where it is stockpiled in appropriate areas.

Steel Furnace BOS (Basic Oxygen System process) Slag

In the BOS process, molten iron, steel scrap and lime are placed in an open-top vessel. High pressure oxygen is blown into the vessel and a violent chemical reaction takes place. On the completion of the reaction, the steel is drained into one ladle and the slag is poured into another. The molten steel furnace slag is then poured into a slag put where it is allowed to cool.

The steel furnace slag is reclaimed by loader, transported by truck to the BlueScope Steel recycling area where it is reprocessed and stockpiled in appropriate areas for despatch.

BlueScope Steel produces steel furnace slag as a co-product of the steel making process, which is very consistent.

Electric Arc Furnace Slag

In the EAF process, steel scrap and fluxes are added to a refractory lined cup-shaped vessel. This vessel has a lid through which carbon electrodes are passed. An arc is induced between the scrap and electrodes and the resultant heat generated melts scrap and fluxes which react similarly to the BOS process. Steel and slag are also separated similarly.

Melter Slag

Iron is mined using conventional earthmoving equipment before being separated magnetically, by creating a slurry and running it over magnetic drums. This is followed by gravimetric separation through a series of cones and spiral separators, where the heavier iron-bearing materials gravitate towards the centre, while residual clays and silts gravitate outwards. The slurry is then pumped 18 kilometres to the steel mill through an underground pipeline, where it is finally dewatered and stockpiled.

To convert the iron, a direct reduction process is used, adding coal and limestone to the irons before pre-heating them in four multi-hearth furnaces. This drives off the volatile constituents of the coal. The material then enters one of four rotary kilns where the direct reduction takes place over a period of eight hours.

The directly reduced product is then melted in one of two large electric melters. It is from this stage of the process that SteelServ Ltd obtains about 250,000 tonnes per annum of "melter" slag. The chemistry of New Zealand's melter slag differs from other variants of slag. The New Zealand product has a high percentage of titanium and higher concentrations than the industry norm of magnesium oxide and alumina. At the other end of the spectrum, the material is low in silica, calcium oxide and sulphur.

KOBM Slag

New Zealand Steel uses a KOBM Oxygen Steel Converter vessel. The vessel is charged with the molten iron from the melters and a small proportion of scrap before refining begins using a top lance and bottom blown tuyeres to produce. The remaining steel making operation follows conventional practices, apart from the chemistry of the slag, which again differs from international equivalents due to irons and source.

KOBM slag is high in fines and cannot be used as an aggregate for road making or surfacings. KOBM can be used, however, as a lime substitute in stabilising clay sub-bases, as an additive to cement manufacture and as a soil conditioner for horticultural farming.

Attachment 2 Nata Laboratory Reports

Laboratory Report No: E029510
Client Name: Australasian Slag Association
Contact Name: Craig Heidrich
Client Reference Sample

Page: 1 of 4
plus cover page
Date: 18/12/06
This report supercedes reports issued on: N/A

Final
Certificate
of Analysis

Laboratory Identification		58958	58959	58960	58961	58962	58963	58962d	58962r	58958s	crm
Sample Identification		607	608	609	707	708	709	QC	QC	QC	QC
Depth (m)		--	--	--	--	--	--	--	--	--	--
Sampling Date recorded on COC		4/12/06	4/12/06	4/12/06	4/12/06	4/12/06	4/12/06	--	--	--	--
Laboratory Extraction (Preparation) Date		11/12/06	11/12/06	11/12/06	11/12/06	11/12/06	11/12/06	11/12/06	--	14/12/06	11/12/06
Laboratory Analysis Date		11/12/06	11/12/06	11/12/06	11/12/06	11/12/06	11/12/06	11/12/06	--	15/12/06	13/12/06
Method : E026.2											
Acid extractable mercury	**EQL**										
Mercury	0.05	0.06	0.06	0.06	0.05	<0.05	<0.05	<0.05	--	83%	127%

Results expressed in mg/kg dry weight unless otherwise specified

Comments:

E026.2: 0.5g digested with nitric/hydrochloric acid. Analysis by CV-ICP-MS or FIMS.

Laboratory Identification		crm	lcs	lcs	mb	mb					
Sample Identification		QC	QC	QC	QC	QC					
Depth (m)		--	--	--	--	--					
Sampling Date recorded on COC		--	--	--	--	--					
Laboratory Extraction (Preparation) Date		14/12/06	11/12/06	14/12/06	11/12/06	14/12/06					
Laboratory Analysis Date		14/12/06	11/12/06	14/12/06	11/12/06	14/12/06					
Method : E026.2											
Acid extractable mercury	**EQL**										
Mercury	0.05	130%	100%	104%	<0.05	<0.05					

Results expressed in mg/kg dry weight unless otherwise specified

Comments:

E026.2: 0.5g digested with nitric/hydrochloric acid. Analysis by CV-ICP-MS or FIMS.

Laboratory Identification		**58958**	**58959**	**58960**	**58961**	**58962**	**58963**	**58962d**	**58962r**	**58958s**	**crm**
Sample Identification		607	608	609	707	708	709	QC	QC	QC	QC
Depth (m)		--	--	--	--	--	--	--	--	--	--
Sampling Date recorded on COC		4/12/06	4/12/06	4/12/06	4/12/06	4/12/06	4/12/06	--	--	--	--
Laboratory Extraction (Preparation) Date		11/12/06	11/12/06	11/12/06	11/12/06	11/12/06	11/12/06	11/12/06	--	14/12/06	11/12/06
Laboratory Analysis Date		11/12/06	11/12/06	11/12/06	11/12/06	11/12/06	11/12/06	11/12/06	--	14/12/06	11/12/06
Method : E022.2											
Acid extractable metals	**EQL**										
Antimony	1	<1	<1	<1	<1	<1	<1	<1	--	114%	--
Arsenic	1	1	1	2	2	2	2	2	0%	78%	107%
Barium	5	530	630	520	470	470	480	510	8%	#	76%
Beryllium	1	<1	<1	<1	<1	<1	<1	<1	--	64%	103%
Boron	5	45	51	42	41	40	45	44	10%	129%	96%
Cadmium	0.1	0.2	0.2	0.3	0.2	0.4	0.2	0.2	67%	80%	95%
Chromium	1	4660	4560	4050	4860	4960	5390	5270	6%	#	109%
Cobalt	1	2	2	3	3	3	2	3	0%	67%	100%
Copper	2	100	120	150	120	130	110	120	8%	#	103%
Lead	2	12	13	18	13	13	17	11	17%	83%	103%
Manganese	5	39700	41500	34700	45700	43200	46000	45100	4%	#	100%
Molybdenum	1	25	31	31	38	35	29	37	6%	103%	106%
Nickel	1	18	20	24	27	24	21	24	0%	72%	101%
Selenium	2	<2	<2	<2	2	2	2	2	0%	82%	101%
Tin	1	10	10	12	9	11	8	10	10%	59%	76%
Zinc	5	400	410	460	340	340	400	390	14%	#	101%

Results expressed in mg/kg dry weight unless otherwise specified

Comments: - # Percent recovery not available due to significant background levels of analyte in sample.

E022.2: 0.5g digested in nitric/hydrochloric acid. Analysis by ICP-MS.

Laboratory Identification		**58958**	**58959**	**58960**	**58961**	**58962**	**58963**	**58962d**	**58962r**		
Sample Identification		607	608	609	707	708	709	QC	QC		
Depth (m)		--	--	--	--	--	--	--	--		
Sampling Date recorded on COC		4/12/06	4/12/06	4/12/06	4/12/06	4/12/06	4/12/06	--	--		
Laboratory Extraction (Preparation) Date		7/12/06	7/12/06	7/12/06	7/12/06	7/12/06	7/12/06	7/12/06	--		
Laboratory Analysis Date		8/12/06	8/12/06	8/12/06	8/12/06	8/12/06	8/12/06	8/12/06	--		
Method : E005.2											
Moisture	**EQL**										
Moisture	--	1	1	1	4	3	3	4	29%		

Results expressed in % w/w unless otherwise specified

Comments:

E005.2: Moisture by gravimetric analysis. Results are in % w/w.

Laboratory Report No: E029717
Client Name: Australasian Slag Association
Contact Name: Craig Heidrich
Client Reference Sample

Page: 1 of 4
plus cover page
Date: 03/01/07
This report supercedes reports issued on: N/A

Final
Certificate
of Analysis

Laboratory Identification		61388	61389	61414	61415	61416	61417	61388d	61388r	61389s	crm
Sample Identification		204	205	206	301	302	303	QC	QC	QC	QC
Depth (m)		--	--	--	--	--	--	--	--	--	--
Sampling Date recorded on COC		13/12/06	13/12/06	13/12/06	13/12/06	13/12/06	13/12/06	--	--	--	--
Laboratory Extraction (Preparation) Date		22/12/06	22/12/06	22/12/06	22/12/06	22/12/06	22/12/06	22/12/06	--	22/12/06	22/12/06
Laboratory Analysis Date		27/12/06	27/12/06	27/12/06	27/12/06	27/12/06	27/12/06	27/12/06	--	27/12/06	27/12/06
Method : E026.2											
Acid extractable mercury	**EQL**										
Mercury	0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	--	92%	121%

Results expressed in mg/kg dry weight unless otherwise specified

Comments:

E026.2: 0.5g digested with nitric/hydrochloric acid. Analysis by CV-ICP-MS or FIMS.

Laboratory Identification		lcs	mb								
Sample Identification		QC	QC								
Depth (m)		--	--								
Sampling Date recorded on COC		--	--								
Laboratory Extraction (Preparation) Date		22/12/06	22/12/06								
Laboratory Analysis Date		27/12/06	27/12/06								
Method : E026.2											
Acid extractable mercury	**EQL**										
Mercury	0.05	100%	<0.05								

Results expressed in mg/kg dry weight unless otherwise specified

Comments:

E026.2: 0.5g digested with nitric/hydrochloric acid. Analysis by CV-ICP-MS or FIMS.

Laboratory Identification		**61388**	**61389**	**61414**	**61415**	**61416**	**61417**	**61388d**	**61388r**	**61389s**	**crm**
Sample Identification		204	205	206	301	302	303	QC	QC	QC	QC
Depth (m)		--	--	--	--	--	--	--	--	--	--
Sampling Date recorded on COC		13/12/06	13/12/06	13/12/06	13/12/06	13/12/06	13/12/06	--	--	--	--
Laboratory Extraction (Preparation) Date		22/12/06	22/12/06	22/12/06	22/12/06	22/12/06	22/12/06	22/12/06	--	22/12/06	22/12/06
Laboratory Analysis Date		23/12/06	23/12/06	23/12/06	23/12/06	23/12/06	23/12/06	23/12/06	--	23/12/06	23/12/06
Method : E022.2											
Acid extractable metals	**EQL**										
Antimony	1	<1	<1	<1	<1	<1	<1	<1	--	61%	--
Arsenic	1	<1	<1	<1	1	1	1	<1	--	102%	108%
Barium	5	340	350	330	300	340	290	360	6%	#	82%
Beryllium	1	9	10	13	14	17	15	8	12%	59%	89%
Boron	5	37	37	55	68	80	75	34	8%	68%	94%
Cadmium	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	--	86%	94%
Chromium	1	7	7	13	55	75	84	8	13%	98%	104%
Cobalt	1	1	1	2	4	4	7	1	0%	98%	103%
Copper	2	2	2	3	10	12	19	2	0%	96%	99%
Lead	2	<2	<2	<2	<2	<2	2	<2	--	80%	100%
Manganese	5	4100	3050	3090	4400	5430	5520	4520	10%	#	100%
Molybdenum	1	<1	<1	<1	<1	<1	<1	<1	--	81%	108%
Nickel	1	7	10	15	21	22	28	8	13%	92%	103%
Selenium	2	3	4	5	5	5	6	3	0%	101%	115%
Tin	1	<1	<1	<1	<1	<1	<1	<1	--	86%	84%
Zinc	5	6	7	12	27	31	34	6	0%	100%	93%

Results expressed in mg/kg dry weight unless otherwise specified

Comments: - # Percent recovery not available due to significant background levels of analyte in sample.

E022.2: 0.5g digested in nitric/hydrochloric acid. Analysis by ICP-MS.

Laboratory Report No: E029717
Client Name: Australasian Slag Association
Contact Name: Craig Heidrich
Client Reference Sample

Page: 4 of 4
plus cover page
Date: 03/01/07
This report supercedes reports issued on: N/A

Final
Certificate
of Analysis

Laboratory Identification		**61388**	**61389**	**61414**	**61415**	**61416**	**61417**	**61388d**	**61388r**		
Sample Identification		204	205	206	301	302	303	QC	QC		
Depth (m)		--	--	--	--	--	--	--	--		
Sampling Date recorded on COC		13/12/06	13/12/06	13/12/06	13/12/06	13/12/06	13/12/06	--	--		
Laboratory Extraction (Preparation) Date		21/12/06	21/12/06	21/12/06	21/12/06	21/12/06	21/12/06	21/12/06	--		
Laboratory Analysis Date		22/12/06	22/12/06	22/12/06	22/12/06	22/12/06	22/12/06	22/12/06	--		
Method : E005.2											
Moisture	**EQL**										
Moisture	--	--	--	--	--	--	--	--	--		

Results expressed in % w/w unless otherwise specified

Comments:

E005.2: Moisture by gravimetric analysis. Results are in % w/w.

Laboratory Report No: E029752
Client Name: Australasian Slag Association
Contact Name: Craig Heidrich
Client Reference Sample

Page: 1 of 4
plus cover page
Date: 02/01/07
This report supercedes reports issued on: N/A

Final
Certificate
of Analysis

Laboratory Identification		61757	61758	61759	61760	61761	61762	61757d	61757r	61758s	crm
Sample Identification		601	602	603	701	702	703	QC	QC	QC	QC
Depth (m)		--	--	--	--	--	--	--	--	--	--
Sampling Date recorded on COC		18/12/06	18/12/06	18/12/06	18/12/06	18/12/06	18/12/06	--	--	--	--
Laboratory Extraction (Preparation) Date		27/12/06	27/12/06	27/12/06	27/12/06	27/12/06	27/12/06	27/12/06	--	27/12/06	27/12/06
Laboratory Analysis Date		28/12/06	28/12/06	28/12/06	28/12/06	28/12/06	28/12/06	28/12/06	--	28/12/06	28/12/06
Method : E026.2											
Acid extractable mercury	**EQL**										
Mercury	0.05	0.14	0.07	0.08	0.08	0.14	0.08	0.15	7%	92%	106%

Results expressed in mg/kg dry weight unless otherwise specified

Comments:

E026.2: 0.5g digested with nitric/hydrochloric acid. Analysis by CV-ICP-MS or FIMS.

Laboratory Identification		lcs	mb								
Sample Identification		QC	QC								
Depth (m)		--	--								
Sampling Date recorded on COC		--	--								
Laboratory Extraction (Preparation) Date		27/12/06	27/12/06								
Laboratory Analysis Date		28/12/06	28/12/06								
Method : E026.2											
Acid extractable mercury	**EQL**										
Mercury	0.05	81%	<0.05								

Results expressed in mg/kg dry weight unless otherwise specified

Comments:

E026.2: 0.5g digested with nitric/hydrochloric acid. Analysis by CV-ICP-MS or FIMS.

Laboratory Identification		**61757**	**61758**	**61759**	**61760**	**61761**	**61762**	**61757d**	**61757r**	**61758s**	**crm**
Sample Identification		601	602	603	701	702	703	QC	QC	QC	QC
Depth (m)		--	--	--	--	--	--	--	--	--	--
Sampling Date recorded on COC		18/12/06	18/12/06	18/12/06	18/12/06	18/12/06	18/12/06	--	--	--	--
Laboratory Extraction (Preparation) Date		27/12/06	27/12/06	27/12/06	27/12/06	27/12/06	27/12/06	27/12/06	--	27/12/06	27/12/06
Laboratory Analysis Date		28/12/06	28/12/06	28/12/06	28/12/06	28/12/06	28/12/06	28/12/06	--	28/12/06	27/12/06
Method : E022.2											
Acid extractable metals	**EQL**										
Antimony	1	3	<1	<1	1	2	1	2	40%	117%	--
Arsenic	1	10	3	2	6	6	5	10	0%	81%	123%
Barium	5	410	610	640	490	510	510	490	18%	#	80%
Beryllium	1	<1	<1	<1	<1	<1	<1	<1	--	88%	78%
Boron	5	54	77	83	72	71	71	63	15%	103%	116%
Cadmium	0.1	1.3	0.1	0.1	0.4	0.4	0.3	1.2	8%	101%	93%
Chromium	1	3020	3880	4310	2770	2850	2640	3280	8%	#	124%
Cobalt	1	13	3	3	6	7	6	12	8%	75%	118%
Copper	2	440	140	150	260	750	220	420	5%	#	117%
Lead	2	77	5	7	41	29	30	72	7%	97%	101%
Manganese	5	24500	37300	39100	26800	27600	26300	27100	10%	#	115%
Molybdenum	1	50	18	19	25	28	22	50	0%	91%	104%
Nickel	1	120	25	26	56	64	53	110	9%	83%	120%
Selenium	2	<2	<2	<2	<2	<2	<2	<2	--	82%	127%
Tin	1	52	20	20	31	34	29	50	4%	#	83%
Zinc	5	870	110	100	400	400	430	820	6%	#	110%

Results expressed in mg/kg dry weight unless otherwise specified

Comments: - # Percent recovery not available due to significant background levels of analyte in sample.

E022.2: 0.5g digested in nitric/hydrochloric acid. Analysis by ICP-MS.

Laboratory Report No: E029752
Client Name: Australasian Slag Association
Contact Name: Craig Heidrich
Client Reference Sample

Date: 02/01/07
This report supercedes reports issued on: N/A

Final
Certificate
of Analysis

Laboratory Identification		**61757**	**61758**	**61759**	**61760**	**61761**	**61762**	**61757d**	**61757r**		
Sample Identification		601	602	603	701	702	703	QC	QC		
Depth (m)		--	--	--	--	--	--	--	--		
Sampling Date recorded on COC		18/12/06	18/12/06	18/12/06	18/12/06	18/12/06	18/12/06	--	--		
Laboratory Extraction (Preparation) Date		22/12/06	22/12/06	22/12/06	22/12/06	22/12/06	22/12/06	22/12/06	--		
Laboratory Analysis Date		27/12/06	27/12/06	27/12/06	27/12/06	27/12/06	27/12/06	27/12/06	--		
Method : E005.2											
Moisture	**EQL**										
Moisture	--	--	7	--	1	--	2	--	--		

Results expressed in % w/w unless otherwise specified

Comments:

E005.2: Moisture by gravimetric analysis. Results are in % w/w.

Laboratory Report No: E029579
Client Name: Australasian Slag Association
Contact Name: Craig Heidrich
Client Reference Sample

Date: 14/12/06
This report supercedes reports issued on: N/A

Final
Certificate
of Analysis

Laboratory Identification		58952	58953	58954	58955	58956	58957	58952d	58952r	58953s	crm
Sample Identification		604	605	606	704	705	706	QC	QC	QC	QC
Depth (m)		--	--	--	--	--	--	--	--	--	--
Sampling Date recorded on COC		4/12/06	4/12/06	4/12/06	4/12/06	4/12/06	4/12/06	--	--	--	--
Laboratory Extraction (Preparation) Date		11/12/06	11/12/06	11/12/06	11/12/06	11/12/06	11/12/06	11/12/06	--	11/12/06	11/12/06
Laboratory Analysis Date		11/12/06	11/12/06	11/12/06	11/12/06	11/12/06	11/12/06	11/12/06	--	11/12/06	13/12/06
Method : E026.2											
Acid extractable mercury	**EQL**										
Mercury	0.05	0.08	0.05	0.06	0.06	0.06	0.1	0.06	29%	116%	127%

Results expressed in mg/kg dry weight unless otherwise specified

Comments:

E026.2: 0.5g digested with nitric/hydrochloric acid. Analysis by CV-ICP-MS or FIMS.

Laboratory Identification		lcs	mb								
Sample Identification		QC	QC								
Depth (m)		--	--								
Sampling Date recorded on COC		--	--								
Laboratory Extraction (Preparation) Date		11/12/06	11/12/06								
Laboratory Analysis Date		11/12/06	11/12/06								
Method : E026.2											
Acid extractable mercury	**EQL**										
Mercury	0.05	100%	<0.05								

Results expressed in mg/kg dry weight unless otherwise specified

Comments:

E026.2: 0.5g digested with nitric/hydrochloric acid. Analysis by CV-ICP-MS or FIMS.

Laboratory Identification		**58952**	**58953**	**58954**	**58955**	**58956**	**58957**	**58952d**	**58952r**	**58953s**	**crm**
Sample Identification		604	605	606	704	705	706	QC	QC	QC	QC
Depth (m)		--	--	--	--	--	--	--	--	--	--
Sampling Date recorded on COC		4/12/06	4/12/06	4/12/06	4/12/06	4/12/06	4/12/06	--	--	--	--
Laboratory Extraction (Preparation) Date		11/12/06	11/12/06	11/12/06	11/12/06	11/12/06	11/12/06	11/12/06	--	11/12/06	11/12/06
Laboratory Analysis Date		11/12/06	11/12/06	11/12/06	11/12/06	11/12/06	11/12/06	11/12/06	--	11/12/06	11/12/06
Method : E022.2											
Acid extractable metals	**EQL**										
Antimony	1	<1	1	<1	<1	<1	<1	1	>0%	105%	--
Arsenic	1	2	2	2	2	2	2	3	40%	87%	107%
Barium	5	750	760	690	590	580	650	710	5%	#	76%
Beryllium	1	<1	<1	<1	<1	<1	<1	<1	--	99%	103%
Boron	5	91	94	67	58	54	60	87	4%	#	96%
Cadmium	0.1	<0.1	<0.1	<0.1	0.2	0.1	0.2	<0.1	--	107%	95%
Chromium	1	3430	3390	3240	3610	3520	3780	3150	9%	#	109%
Cobalt	1	3	3	3	3	3	3	4	29%	80%	100%
Copper	2	140	150	120	110	420	120	170	19%	#	103%
Lead	2	3	3	4	10	11	12	4	29%	101%	103%
Manganese	5	39500	38000	36900	38500	35400	33400	33900	15%	#	100%
Molybdenum	1	14	15	13	17	16	17	16	13%	122%	106%
Nickel	1	31	28	22	25	25	25	35	12%	81%	101%
Selenium	2	<2	<2	<2	<2	<2	<2	<2	--	87%	101%
Tin	1	9	9	8	11	10	10	10	11%	65%	76%
Zinc	5	100	110	87	170	150	270	110	10%	#	101%

Results expressed in mg/kg dry weight unless otherwise specified

Comments: - # Percent recovery not available due to significant background levels of analyte in sample.

E022.2: 0.5g digested in nitric/hydrochloric acid. Analysis by ICP-MS.

Laboratory Identification		**58952**	**58953**	**58954**	**58955**	**58956**	**58957**	**58952d**	**58952r**		
Sample Identification		604	605	606	704	705	706	QC	QC		
Depth (m)		--	--	--	--	--	--	--	--		
Sampling Date recorded on COC		4/12/06	4/12/06	4/12/06	4/12/06	4/12/06	4/12/06	--	--		
Laboratory Extraction (Preparation) Date		7/12/06	7/12/06	7/12/06	7/12/06	7/12/06	7/12/06	7/12/06	--		
Laboratory Analysis Date		8/12/06	8/12/06	8/12/06	8/12/06	8/12/06	8/12/06	8/12/06	--		
Method : E005.2											
Moisture	**EQL**										
Moisture	--	3	3	3	2	2	2	3	0%		

Results expressed in % w/w unless otherwise specified

Comments:

E005.2: Moisture by gravimetric analysis. Results are in % w/w.

Laboratory Identification		**64679**	**64680**	**64681**	**64682**	**64683**	**64684**	**64685**	**64686**	**64687**	**64688**
Sample Identification		101	102	103	201	202	203	304	305	306	401
Depth (m)		--	--	--	--	--	--	--	--	--	--
Sampling Date recorded on COC		16/1/07	16/1/07	16/1/07	16/1/07	16/1/07	16/1/07	16/1/07	16/1/07	16/1/07	16/1/07
Laboratory Extraction (Preparation) Date		30/1/07	30/1/07	30/1/07	30/1/07	30/1/07	30/1/07	30/1/07	30/1/07	30/1/07	30/1/07
Laboratory Analysis Date		31/1/07	31/1/07	31/1/07	31/1/07	31/1/07	31/1/07	31/1/07	31/1/07	31/1/07	31/1/07
Method : E026.2											
Acid extractable mercury	**EQL**										
Mercury	0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.06

Results expressed in mg/kg dry weight unless otherwise specified

Comments:

E026.2: 0.5g digested with nitric/hydrochloric acid. Analysis by CV-ICP-MS or FIMS.

Laboratory Identification		**64689**	**64690**	**64691**	**64692**	**64693**	**64694**	**64695**	**64696**	**64679d**	**64679r**
Sample Identification		402	403	501	502	503	801	802	803	QC	QC
Depth (m)		--	--	--	--	--	--	--	--	--	--
Sampling Date recorded on COC		16/1/07	16/1/07	16/1/07	16/1/07	16/1/07	16/1/07	16/1/07	16/1/07	--	--
Laboratory Extraction (Preparation) Date		30/1/07	30/1/07	30/1/07	30/1/07	30/1/07	30/1/07	30/1/07	30/1/07	30/1/07	--
Laboratory Analysis Date		31/1/07	31/1/07	31/1/07	1/2/07	31/1/07	31/1/07	31/1/07	31/1/07	31/1/07	--
Method : E026.2											
Acid extractable mercury	**EQL**										
Mercury	0.05	0.06	0.06	0.05	0.09	0.05	0.05	0.05	<0.05	<0.05	--

Results expressed in mg/kg dry weight unless otherwise specified

Comments:

E026.2: 0.5g digested with nitric/hydrochloric acid. Analysis by CV-ICP-MS or FIMS.

Laboratory Identification		**64679**	**64680**	**64681**	**64682**	**64683**	**64684**	**64685**	**64686**	**64687**	**64688**
Sample Identification		101	102	103	201	202	203	304	305	306	401
Depth (m)		--	--	--	--	--	--	--	--	--	--
Sampling Date recorded on COC		16/1/07	16/1/07	16/1/07	16/1/07	16/1/07	16/1/07	16/1/07	16/1/07	16/1/07	16/1/07
Laboratory Extraction (Preparation) Date		30/1/07	30/1/07	30/1/07	30/1/07	30/1/07	30/1/07	30/1/07	30/1/07	30/1/07	30/1/07
Laboratory Analysis Date		31/1/07	31/1/07	31/1/07	31/1/07	31/1/07	31/1/07	31/1/07	31/1/07	31/1/07	31/1/07
Method : E022.2											
Acid extractable metals	**EQL**										
Antimony	1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Arsenic	1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Barium	5	320	300	300	420	400	410	400	410	410	62
Beryllium	1	4	3	4	6	6	8	8	9	8	<1
Boron	5	23	17	26	29	31	40	50	53	53	33
Cadmium	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Chromium	1	5	5	7	14	6	7	5	6	6	720
Cobalt	1	<1	<1	<1	1	1	1	1	2	2	2
Copper	2	3	3	5	2	<2	2	3	3	4	9
Lead	2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
Manganese	5	3170	3040	3240	3590	3120	3110	3040	3280	3120	21200
Molybdenum	1	<1	<1	<1	<1	<1	1	<1	<1	<1	14
Nickel	1	4	5	6	8	8	9	9	11	10	14
Selenium	2	<2	<2	2	3	2	3	3	3	3	<2
Tin	1	<1	<1	<1	<1	<1	<1	<1	<1	<1	2
Zinc	5	8	9	13	7	5	6	22	13	11	20

Results expressed in mg/kg dry weight unless otherwise specified

Comments: - # Percent recovery not available due to significant background levels of analyte in sample.

E022.2: 0.5g digested in nitric/hydrochloric acid. Analysis by ICP-MS.

Laboratory Identification		**64689**	**64690**	**64691**	**64692**	**64693**	**64694**	**64695**	**64696**	**64679d**	**64679r**
Sample Identification		402	403	501	502	503	801	802	803	QC	QC
Depth (m)		--	--	--	--	--	--	--	--	--	--
Sampling Date recorded on COC		16/1/07	16/1/07	16/1/07	16/1/07	16/1/07	16/1/07	16/1/07	16/1/07	--	--
Laboratory Extraction (Preparation) Date		30/1/07	30/1/07	30/1/07	30/1/07	30/1/07	30/1/07	30/1/07	30/1/07	30/1/07	--
Laboratory Analysis Date		31/1/07	31/1/07	1/2/07	1/2/07	1/2/07	1/2/07	1/2/07	1/2/07	31/1/07	--
Method : E022.2											
Acid extractable metals	**EQL**										
Antimony	1	<1	<1	<1	<1	<1	<1	<1	<1	<1	--
Arsenic	1	<1	<1	<1	<1	<1	2	2	2	<1	--
Barium	5	47	53	53	52	58	56	56	89	320	0%
Beryllium	1	<1	<1	<1	<1	<1	<1	<1	2	4	0%
Boron	5	34	37	35	35	39	39	35	44	20	14%
Cadmium	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.1	0.2	0.2	<0.1	--
Chromium	1	710	690	680	670	750	460	480	380	5	0%
Cobalt	1	2	2	3	3	3	6	6	6	<1	--
Copper	2	9	10	12	13	14	23	20	21	3	0%
Lead	2	<2	<2	<2	<2	<2	4	6	6	<2	--
Manganese	5	21600	22000	19900	20400	21000	15900	15200	13300	3160	0%
Molybdenum	1	16	14	8	8	10	10	17	10	<1	--
Nickel	1	12	13	16	18	20	45	52	51	4	0%
Selenium	2	<2	<2	<2	<2	<2	<2	<2	<2	<2	--
Tin	1	<1	<1	<1	<1	<1	4	3	4	<1	--
Zinc	5	19	20	22	24	21	86	95	100	8	0%

Results expressed in mg/kg dry weight unless otherwise specified

Comments: - # Percent recovery not available due to significant background levels of analyte in sample.

E022.2: 0.5g digested in nitric/hydrochloric acid. Analysis by ICP-MS.

Laboratory Identification		**64679**	**64680**	**64681**	**64682**	**64683**	**64684**	**64685**	**64686**	**64687**	**64688**
Sample Identification		101	102	103	201	202	203	304	305	306	401
Depth (m)		--	--	--	--	--	--	--	--	--	--
Sampling Date recorded on COC		16/1/07	16/1/07	16/1/07	16/1/07	16/1/07	16/1/07	16/1/07	16/1/07	16/1/07	16/1/07
Laboratory Extraction (Preparation) Date		22/1/07	22/1/07	22/1/07	22/1/07	22/1/07	22/1/07	22/1/07	22/1/07	22/1/07	22/1/07
Laboratory Analysis Date		23/1/07	23/1/07	23/1/07	23/1/07	23/1/07	23/1/07	23/1/07	23/1/07	23/1/07	23/1/07
Method : E005.2											
Moisture	**EQL**										
Moisture	--	11	10	11	7	7	7	4	4	4	2

Results expressed in % w/w unless otherwise specified

Comments:

E005.2: Moisture by gravimetric analysis. Results are in % w/w.

Laboratory Identification		**64689**	**64690**	**64691**	**64692**	**64693**	**64694**	**64695**	**64696**	**64679d**	**64679r**
Sample Identification		402	403	501	502	503	801	802	803	QC	QC
Depth (m)		--	--	--	--	--	--	--	--	--	--
Sampling Date recorded on COC		16/1/07	16/1/07	16/1/07	16/1/07	16/1/07	16/1/07	16/1/07	16/1/07	--	--
Laboratory Extraction (Preparation) Date		22/1/07	22/1/07	22/1/07	22/1/07	22/1/07	22/1/07	22/1/07	22/1/07	22/1/07	--
Laboratory Analysis Date		23/1/07	23/1/07	23/1/07	23/1/07	23/1/07	23/1/07	23/1/07	23/1/07	23/1/07	--
Method : E005.2											
Moisture	**EQL**										
Moisture	--	2	2	3	3	2	1	1	1	12	9%

Results expressed in % w/w unless otherwise specified

Comments:

E005.2: Moisture by gravimetric analysis. Results are in % w/w.

Laboratory Report No: E029817
Client Name: Australasian Slag Association
Contact Name: Craig Heidrich
Client Reference Sample

Page: 1 of 4
plus cover page
Date: 09/01/07
This report supercedes reports issued on: N/A

Final
Certificate
of Analysis

Laboratory Identification		62365	62366	62367	62368	62369	62370	62371	62372	62373	62365d
Sample Identification		610	611	612	901	902	903	904	905	906	QC
Depth (m)		--	--	--	--	--	--	--	--	--	--
Sampling Date recorded on COC		21/12/06	21/12/06	21/12/06	21/12/06	21/12/06	21/12/06	21/12/06	21/12/06	21/12/06	--
Laboratory Extraction (Preparation) Date		5/1/07	5/1/07	5/1/07	5/1/07	5/1/07	5/1/07	5/1/07	5/1/07	5/1/07	5/1/07
Laboratory Analysis Date		9/1/07	5/1/07	5/1/07	5/1/07	5/1/07	5/1/07	5/1/07	5/1/07	5/1/07	9/1/07
Method : E026.2											
Acid extractable mercury	**EQL**										
Mercury	0.05	0.37	0.23	0.22	<0.05	<0.05	<0.05	0.05	0.05	0.07	0.26

Results expressed in mg/kg dry weight unless otherwise specified

Comments: -

E026.2: 0.5g digested with nitric/hydrochloric acid. Analysis by CV-ICP-MS or FIMS.

Laboratory Identification		62365r	62366s	crm	lcs	mb					
Sample Identification		QC	QC	QC	QC	QC					
Depth (m)		--	--	--	--	--					
Sampling Date recorded on COC		--	--	--	--	--					
Laboratory Extraction (Preparation) Date		--	5/1/07	5/1/07	5/1/07	5/1/07					
Laboratory Analysis Date		--	5/1/07	5/1/07	5/1/07	5/1/07					
Method : E026.2											
Acid extractable mercury	**EQL**										
Mercury	0.05	35%	108%	106%	93%	<0.05					

Results expressed in mg/kg dry weight unless otherwise specified

Comments: -

E026.2: 0.5g digested with nitric/hydrochloric acid. Analysis by CV-ICP-MS or FIMS.

Laboratory Identification		**62365**	**62366**	**62367**	**62368**	**62369**	**62370**	**62371**	**62372**	**62373**	**62365d**
Sample Identification		610	611	612	901	902	903	904	905	906	QC
Depth (m)		--	--	--	--	--	--	--	--	--	--
Sampling Date recorded on COC		21/12/06	21/12/06	21/12/06	21/12/06	21/12/06	21/12/06	21/12/06	21/12/06	21/12/06	--
Laboratory Extraction (Preparation) Date		5/1/07	5/1/07	5/1/07	5/1/07	5/1/07	5/1/07	5/1/07	5/1/07	5/1/07	5/1/07
Laboratory Analysis Date		5/1/07	5/1/07	5/1/07	5/1/07	5/1/07	5/1/07	5/1/07	5/1/07	5/1/07	5/1/07
Method : E022.2											
Acid extractable metals	**EQL**										
Antimony	1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Arsenic	1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Barium	5	770	760	790	160	150	140	35	37	37	770
Beryllium	1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Boron	5	130	130	150	370	350	330	110	110	110	130
Cadmium	0.1	<0.1	<0.1	0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Chromium	1	3360	2720	3040	40	38	38	990	1020	1010	3050
Cobalt	1	3	2	3	3	2	4	10	8	12	3
Copper	2	89	80	92	10	8	9	7	7	8	100
Lead	2	4	5	3	<2	<2	<2	<2	<2	<2	4
Manganese	5	34700	32100	35500	2610	2610	2620	12300	12900	12200	30700
Molybdenum	1	9	7	8	<1	<1	<1	<1	<1	<1	8
Nickel	1	12	11	14	2	2	3	13	13	16	13
Selenium	2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
Tin	1	15	13	14	<1	<1	<1	<1	<1	<1	14
Zinc	5	170	140	150	22	<5	19	35	99	34	150

Results expressed in mg/kg dry weight unless otherwise specified

Comments: - # Percent recovery not available due to significant background levels of analyte in sample.

E022.2: 0.5g digested in nitric/hydrochloric acid. Analysis by ICP-MS.

Laboratory Identification		**62365**	**62366**	**62367**	**62368**	**62369**	**62370**	**62371**	**62372**	**62373**	**62365d**
Sample Identification		610	611	612	901	902	903	904	905	906	QC
Depth (m)		--	--	--	--	--	--	--	--	--	--
Sampling Date recorded on COC		21/12/06	21/12/06	21/12/06	21/12/06	21/12/06	21/12/06	21/12/06	21/12/06	21/12/06	--
Laboratory Extraction (Preparation) Date		4/1/07	4/1/07	4/1/07	4/1/07	4/1/07	4/1/07	4/1/07	4/1/07	4/1/07	4/1/07
Laboratory Analysis Date		5/1/07	5/1/07	5/1/07	5/1/07	5/1/07	5/1/07	5/1/07	5/1/07	5/1/07	5/1/07
Method : E005.2											
Moisture	**EQL**										
Moisture	--	--	--	--	--	1	--	--	3	4	3	--

Results expressed in % w/w unless otherwise specified

Comments:

E005.2: Moisture by gravimetric analysis. Results are in % w/w.

Laboratory Identification		**62365r**									
Sample Identification		QC									
Depth (m)		--									
Sampling Date recorded on COC		--									
Laboratory Extraction (Preparation) Date		--									
Laboratory Analysis Date		--									
Method : E005.2											
Moisture	**EQL**										
Moisture	--	--									

Results expressed in % w/w unless otherwise specified

Comments:

E005.2: Moisture by gravimetric analysis. Results are in % w/w.

Laboratory Report No: E029858
Client Name: Australasian Slag Association
Contact Name: Craig Heidrich
Client Reference

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Laboratory Identification		62743	62744	62745	62746	62747	62748	62743d	62743r	62745s	crm
Sample Identification		404	405	406	504	505	506	QC	QC	QC	QC
Depth (m)		--	--	--	--	--	--	--	--	--	--
Sampling Date recorded on COC		3/1/07	3/1/07	3/1/07	3/1/07	3/1/07	3/1/07	--	--	--	--
Laboratory Extraction (Preparation) Date		5/1/07	10/1/07	5/1/07	5/1/07	5/1/07	5/1/07	5/1/07	--	5/1/07	5/1/07
Laboratory Analysis Date		8/1/07	11/1/07	8/1/07	8/1/07	8/1/07	8/1/07	8/1/07	--	8/1/07	5/1/07
Method : E026.2											
Acid extractable mercury	**EQL**										
Mercury	0.05	0.05	0.06	<0.05	0.14	0.06	0.06	<0.05	>0%	104%	106%

Results expressed in mg/kg dry weight unless otherwise specified

Comments:

E026.2: 0.5g digested with nitric/hydrochloric acid. Analysis by CV-ICP-MS or FIMS.

Laboratory Identification		crm	lcs	lcs	mb	mb					
Sample Identification		QC	QC	QC	QC	QC					
Depth (m)		--	--	--	--	--					
Sampling Date recorded on COC		--	--	--	--	--					
Laboratory Extraction (Preparation) Date		10/1/07	5/1/07	10/1/07	5/1/07	10/1/07					
Laboratory Analysis Date		10/1/07	5/1/07	10/1/07	5/1/07	10/1/07					
Method : E026.2											
Acid extractable mercury	**EQL**										
Mercury	0.05	106%	93%	87%	<0.05	<0.05					

Results expressed in mg/kg dry weight unless otherwise specified

Comments:

E026.2: 0.5g digested with nitric/hydrochloric acid. Analysis by CV-ICP-MS or FIMS.

Laboratory Report No: E029858
Client Name: Australasian Slag Association
Contact Name: Craig Heidrich
Client Reference

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This report supercedes reports issued on: N/A

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Laboratory Identification		62743	62744	62745	62746	62747	62748	62743d	62743r	62745s	crm
Sample Identification		404	405	406	504	505	506	QC	QC	QC	QC
Depth (m)		--	--	--	--	--	--	--	--	--	--
Sampling Date recorded on COC		3/1/07	3/1/07	3/1/07	3/1/07	3/1/07	3/1/07	--	--	--	--
Laboratory Extraction (Preparation) Date		5/1/07	10/1/07	5/1/07	5/1/07	5/1/07	5/1/07	5/1/07	--	5/1/07	5/1/07
Laboratory Analysis Date		5/1/07	11/1/07	5/1/07	5/1/07	5/1/07	5/1/07	5/1/07	--	5/1/07	5/1/07
Method : E022.2											
Acid extractable metals	**EQL**										
Antimony	1	<1	<1	<1	<1	<1	<1	<1	--	62%	--
Arsenic	1	<1	<1	<1	1	<1	1	<1	--	83%	110%
Barium	5	34	30	33	24	25	25	38	11%	58%	85%
Beryllium	1	<1	<1	<1	<1	<1	<1	<1	--	77%	83%
Boron	5	29	24	25	22	<5	36	31	7%	78%	81%
Cadmium	0.1	<0.1	<0.1	<0.1	0.4	<0.1	<0.1	<0.1	--	85%	87%
Chromium	1	400	600	390	380	410	280	400	0%	#	101%
Cobalt	1	3	2	2	5	4	6	3	0%	71%	99%
Copper	2	9	8	9	14	12	16	25	94%	74%	97%
Lead	2	2	<2	2	3	2	2	2	0%	82%	91%
Manganese	5	16400	29800	19300	15300	16700	12800	17200	5%	#	96%
Molybdenum	1	7	5	7	6	5	21	5	33%	94%	104%
Nickel	1	24	12	13	14	23	46	24	0%	87%	99%
Selenium	2	<2	<2	<2	<2	<2	<2	<2	--	89%	106%
Tin	1	<1	<1	<1	<1	<1	<1	3	>100%	98%	80%
Zinc	5	64	18	68	83	93	83	72	12%	95%	92%

Results expressed in mg/kg dry weight unless otherwise specified

Comments: - # Percent recovery not available due to significant background levels of analyte in sample.

E022.2: 0.5g digested in nitric/hydrochloric acid. Analysis by ICP-MS.

Laboratory Report No: E029858
Client Name: Australasian Slag Association
Contact Name: Craig Heidrich
Client Reference

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Laboratory Identification		62743	62744	62745	62746	62747	62748	62743d	62743r		
Sample Identification		404	405	406	504	505	506	QC	QC		
Depth (m)		--	--	--	--	--	--	--	--		
Sampling Date recorded on COC		3/1/07	3/1/07	3/1/07	3/1/07	3/1/07	3/1/07	--	--		
Laboratory Extraction (Preparation) Date		10/1/07	10/1/07	10/1/07	10/1/07	10/1/07	10/1/07	10/1/07	--		
Laboratory Analysis Date		11/1/07	11/1/07	11/1/07	11/1/07	11/1/07	11/1/07	11/1/07	--		
Method : E005.2											
Moisture	**EQL**										
Moisture	--	2	1	1	3	3	4	2	0%		

Results expressed in % w/w unless otherwise specified

Comments:

E005.2: Moisture by gravimetric analysis. Results are in % w/w.

Laboratory Report No: E030492
Client Name: Australasian Iron and Steel Slag Assoc.
Contact Name: Craig Heidrich
Client Reference MCDS/06 - Additonal Request

Date: 27/02/07
This report supercedes reports issued on: N/A

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Laboratory Identification		**71471**	**71472**	**71473**	**71474**	**71475**	**71476**	**71477**	**71478**	**71479**	**71480**
Sample Identification		103	206	303	401	503	609	707	802	901	905
Depth (m)		--	--	--	--	--	--	--	--	--	--
Sampling Date recorded on COC		16/1/07	13/12/06	13/12/06	16/1/07	16/1/07	4/12/06	4/12/06	16/1/07	21/12/06	21/12/06
Laboratory Extraction (Preparation) Date		23/2/07	23/2/07	23/2/07	23/2/07	23/2/07	23/2/07	23/2/07	23/2/07	23/2/07	23/2/07
Laboratory Analysis Date		--	--	--	--	--	--	--	--	--	--
Method : E019.2											
TCLP Preparation	**EQL**										
TCLP Fluid No.	--	1	1	1	1	1	1	1	1	1	2
Initial pH (pH units)	--	10.3	10.0	9.5	11.5	11.3	11.0	10.7	9.9	8.8	12.1
pH after HCl (pH units)	--	1.7	3.3	2.3	2.6	2.1	2.1	1.8	1.9	1.7	11.8
Final pH (pH units)	--	6.0	5.9	6.9	11.8	11.9	10.8	10.8	8.0	7.1	12.1

Results expressed in pH units unless otherwise specified

Comments:

E019.2: Soil leached for 18 hours with fluid as specified above . Refer to relevant water method for results.

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Laboratory Identification		**71471**	**71472**	**71473**	**71474**	**71475**	**71476**	**71477**	**71478**	**71479**	**71480**
Sample Identification		103	206	303	401	503	609	707	802	901	905
Depth (m)		--	--	--	--	--	--	--	--	--	--
Sampling Date recorded on COC		16/1/07	13/12/06	13/12/06	16/1/07	16/1/07	4/12/06	4/12/06	16/1/07	21/12/06	21/12/06
Laboratory Extraction (Preparation) Date		26/2/07	26/2/07	26/2/07	26/2/07	26/2/07	26/2/07	26/2/07	26/2/07	26/2/07	26/2/07
Laboratory Analysis Date		26/2/07	26/2/07	26/2/07	26/2/07	26/2/07	26/2/07	26/2/07	26/2/07	26/2/07	26/2/07
Method : E022.1											
TCLP metals	**EQL**										
Beryllium	10	<10	<10	<10	--	--	--	--	<10	--	--
Chromium	50	--	<50	<50	<50	<50	70	170	<50	50	<50
Lead	10	--	--	--	--	--	--	<10	--	--	--
Molybdenum	10	--	--	--	20	<10	40	50	20	--	--
Nickel	50	<50	<50	50	<50	50	<50	<50	<50	--	130
Selenium	20	<20	<20	<20	--	--	--	--	--	--	--

Results expressed in ug/l unless otherwise specified

Comments:

E022.1: Filtered TCLP leachate acidifed with nitric/hydrochloric acid. Analysis by ICP/MS. Results are expressed as in the leachate.

Laboratory Identification		**71474d**	**71474r**	**71475s**	**lcs**	**mb**					
Sample Identification		QC	QC	QC	QC	QC					
Depth (m)		--	--	--	--	--					
Sampling Date recorded on COC		--	--	--	--	--					
Laboratory Extraction (Preparation) Date		26/2/07	--	26/2/07	26/2/07	26/2/07					
Laboratory Analysis Date		26/2/07	--	26/2/07	26/2/07	26/2/07					
Method : E022.1											
TCLP metals	**EQL**										
Beryllium	10	--	--	--	90%	<10					
Chromium	50	<50	--	88%	90%	<50					
Lead	10	--	--	--	100%	<10					
Molybdenum	10	20	0%	96%	97%	<10					
Nickel	50	50	>0%	92%	100%	<50					
Selenium	20	--	--	--	107%	<20					

Results expressed in ug/l unless otherwise specified

Comments:

E022.1: Filtered TCLP leachate acidifed with nitric/hydrochloric acid. Analysis by ICP/MS. Results are expressed as in the leachate.