ISCOR VANDERBIJLPARK STEEL

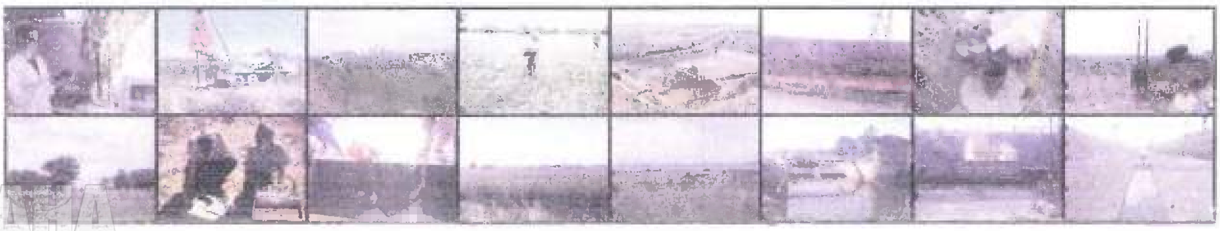
ENVIRONMENTAL MASTER PLAN

SPECIALIST REPORT

SOLID WASTE DISPOSAL QUANTIFICATION AND CLASSIFICATION OF STREAMS WASTE SITE REQUIREMENTS

BY
OCKIE FOURIE TOXICOLOGISTS

SERIES IV
DOCUMENT IVS/SR/029
DECEMBER 2002



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Research for IVS

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Solid Waste Disposal Quantification and Classification of Streams Waste Site Requirements

SERIES IV
SPECIALIST REPORT IVS / SR / 029

DECEMBER 2002

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EXECUTIVE SUMMARY

Classification of current waste streams generated by IVS, future air space requirements and associated potential risk quantification to the environment, was performed and investigated.

ISCOR Vanderbijlpark Steel activities result in approximately 2.2 million tons of solid residue annually, of which approximately 48% has to be disposed of in a residue landfill site. The to be disposed of residue mainly consists of 44% dusts, 53% slags and 3% dusts which according to mobility of contaminants, predominantly classifies as hazardous material to be disposed of in a hazardous waste site.

Results indicate a wide spectrum of inorganic contaminants present in residue to be generally responsible for the classification to be hazardous. However, risk quantification not only indicated manganese to be the contaminant of greatest concern to the environment, but also the compound which would determine air space, needed for disposal practices.

It was demonstrated that present untreated residue would require 1 480 hectare annually to conform with acceptable risk according to minimum requirements. It was also demonstrated that should slags be separately stockpiled for downstream uses and the dusts and sludges be treated for disposal in a General waste site, the air space requirements would drastically reduce to approximately 0.61 hectare annually.

It was strongly recommended to thoroughly investigate appropriate treatment technologies, due to such treatment generally being of a capital intensive nature, in parallel with perusal of alternative uses for stockpiled slags.

1. INTRODUCTION

Generation of waste, and hence waste disposal are anthropogenical activities. As such therefore, it could be argued that such activities should or could be avoided and banned. This kind of reasoning originated *inter alia* from the perception that waste constituents from man made activities must be more hazardous/harmful/toxic than natural constituents, due to the fact (perception) that natural could surely not be harmful! Very little could be more removed from the truth. It is true that many compounds, some being very potent, are being prepared synthetically, such as for example pesticide and pharmaceutical active ingredients, and could these compounds be termed anthropogenical. However, most of the hazardous wastes to contend with in our everyday life, orginates from nature, are ubiquitous in the environment, and are oftenly more hazardous and toxic/harmful to life than those synthetically (anthropogenically) prepared.

Two examples will suffice. It was estimated that only about 28 grams of botulinum toxin would be sufficient to destroy the entire population of the earth. Secondly, polynuclear aromatic hydrocarbons (PAH[s]), some of them known to be potent human carcinogens, occurs naturally, are ubiquitous and very persistent in the environment, and is part and parcel of a daily dietary intake. It is thus a misconception than man-made chemicals must be more harmful than those that occur naturally. Similarly it is also a misconception than the normal, everyday hazardous wastes to contend with, are synthetically derived.

The term anthropogenical should therefore rather be directed to the **activity** in waste disposal, rather than the **origin** (natural *vs* man-made) of the to be disposed of material, considering that such material is generally from a natural nature. It follows therefore to be inevitable that the need to know about the **impact of anthropogenically introduced** chemicals in the environment will always be of paramount interest. Such knowledge is not only vital to those in industry, who carry the responsibility of the cradle-to-grave principle in their management of chemical substances, but also as vital to the Regulatory Authority who has the responsibility as custodian in making decisions involving environmental and human risks. Thus, it also follows that the aim should never be to ban the use of chemicals, but to exert reasonable controls when they are needed – something not possible if impacts cannot be predicted.

The management of hazardous waste remains one of the most important environmental matters throughout the industrial world. In this regard, the RSA has become inseparably linked to international policy through being a signotary of the Basel Convention for the transboundary movements of hazardous waste and their disposal. The Department of Water Affairs and Forestry (DWAF) is responsible for ensuring the correct management and disposal of waste in South Africa by issuing waste disposal site permits in terms of Section 20 of the Environment Conservation Act, 1989 (Act 73 of 1989).

In this regard DWAF produced/published a Waste Management Series in 1994 comprising of three documents, i.e.

- Minimum Requirements for the Handling, Classification and Disposal of Hazardous Waste;
- Minimum Requirements for Waste Disposal by Landfill; and
- Minimum Requirements for the Monitoring of Water Quality at Waste Management Facilities.

The Minimum Requirements (MR) series provide the applicable waste management standards or specifications that must be met in the absence of any valid motivation to the contrary. They also provide a point of departure against which environmentally acceptable waste disposal practices can be distinguished from environmentally unacceptable waste disposal practices.

The objectives of setting Minimum Requirements were to:

- **prevent water pollution and ensure sustained fitness for use of South Africa's water resources;**
- **attain and maintain minimum waste management standards in South Africa, so as to protect human health and the environment from possible harmful effects caused by the handling, treatment, storage and disposal of waste;**
- **effectively administer and provide a systematic and nationally uniform approach to the waste disposal process;**
- **endeavour to make South African waste management practices internationally acceptable.**

Minimum Requirements are implemented through and enforced by a Landfill Site Permit, and includes important principles essential to hazardous waste management. Amongst others does the MR acknowledge that the Generator of waste is responsible for the fate of the generated waste, termed **Duty of Care**, which is in accordance with the cradle-to-grave principle. It also accommodates the precautionary principle by which it assumes that a waste or an identified contaminant of a waste is both highly hazardous until proven otherwise.

Perhaps the most important principle to Industry, is the polluter pays principle. In this regard the MR read as follows:

"The "polluter pays principle" holds that the person or organisation causing pollution is liable for any costs involved in cleaning it up or rehabilitating its effects. It is noted that the polluter will not always necessarily be the generator, as it is possible for responsibility for the safe handling, treatment or disposal of waste to pass from one competent contracting party to another. The polluter may therefore not be the generator, but could be a disposal site operator or a transporter. Through the 'duty of care' principle, however, the generator will always be one of the parties held accountable for the pollution caused by the waste. The generator must be able to prove that the transferal of management of the waste was a responsible action."

In conclusion with regard to standards or minimum requirements, is that of associated costs. The documents state that "*MR makes allowance for the need to control costs in that* *only crucial elements of the waste management process are regulated. The system of graded classification of Hazardous Waste set out in this document is specifically aimed at avoiding unnecessary expenditure without lowering standards. All new, approved or existing projects that generate Hazardous Waste should conform to a minimum standard of BPEO. The best Practicable Environmental Option (BPEO) is the outcome of a systematic consultative and decision-making procedure that emphasises the protection of the environment across land, air and water. It establishes, for a given set of objectives, the option that provides the most benefit or least damage to the environment as a whole at acceptable cost in the long term as well as the short term*"

The Minimum Requirements for waste disposal follows a risk based approach. The aim is to curtail the risks associated with handling and disposal of waste to the point where they are acceptable to man and the environment. Thus, for a waste to be properly managed, its properties and potential risk to man and environment must be fully understood.

Risk implies a possibility. It refers to the possibility of injury, harm or any other adverse effect. It is firstly however important to realize that absolute safety or "no-risk" situations do not exist. Secondly on the other hand, it is of extreme importance to note specifically with regard to contamination and pollution matters, that the mere presence of a substance does not ipso facto imply a detrimental effect. Summation of these two "laws" result in the concept of Acceptable Risk, not only with regard to pharmacokinetics, but also universally recognized and applied in for example, regulatory control of contaminants.

The Minimum Requirements for the Handling, Classification and Disposal of Hazardous Waste sets out a systematic framework for identifying a Hazardous Waste and classifying it in accordance **with the degree of risk that it poses**. From the classification, requirements are set that will ensure hazardous waste is treated and safely disposed of. **These requirements represent the lowest acceptable standard and are therefore termed Minimum Requirements**.

The aim is to ensure the sustained fitness for use of South Africa's water resources and to protect both the public and the environment from harmful effects of incorrect waste management, without impairing essential economic development.

The ISCOR Vanderbijlpark Steel (IVS) Works is a conventional steel plant, which has been extensively modernized and expanded since its establishment in 1940-1945. In summary is fine ore sintered as a feed to blast furnaces, together with coarse ore, coke and minor additives. The blast furnace liquid iron is refined in basic oxygen furnaces to steel, which is cast into continuous slab. A further quantity of fine ore is pre-reduced with coal in rotary kilns as in mini plants. This is melted down in arc furnaces together with scrap steel, refined and cast into slabs. The steel slabs are milled to sheet, cleaned, etched and coated by tinning, painting or electrical hot dip galvanizing. A number of secondary activities, required to support the main steel making and finishing are also conducted on the site.

These activities results annually in approximately 2.2 million tons of solid residue, of which approximately 48% has to be disposed of in a residue landfill site. The approximate 1 million tons to be disposed of consists mainly of dusts (44%), sludges (3%) and slags from the basic oxygen furnaces (53%). The coking and coal also produces tar and other organic products.

2. CLASSIFICATION METHODOLOGY

The Minimum Requirements (MR), as previously referred to, follows a risk based approach in the classification of waste streams to be disposed of, normally by landfill. In effect it is the application of a risk model by which exposure and effects of a contaminant, which may enter the environment, can be quantified according to a risk based approach. The rationale for such a risk evaluation is similar for all contaminants, whether they originate from material (waste) to be disposed of, or from any other source the environment and man is exposed to. A short summary describing the fundamentals of impact and risk assessment (applicable to the Minimum Requirements and good Toxicological Practices) is described elsewhere in the Master Plan Specialist Reports. For convenience to the reader of this Report, part of that discussion, and applicable to disposal of waste generated, will be reproduced as follows:

2.1 Impact and Risk Assessment/Rationale for Risk Evaluation

2.1.1 Introduction

Risk assessment is a complex process. It is a process, which endeavors to evaluate the possibility of harm to receptors caused by exposure to stressors. Very often risk assessment is run down by quoting the relationships "dose/response" and "exposure/effect" as being the end of it all. Although being the basis of pharmacokinetics, which could be described as the fundamentals of life, thorough cognisance has to be taken in risk assessment of other related fundamentals:

- Absolute safety does not exist
- No risk situations do not exist
- There are only choices among risks
- The mere presence of a chemical substance does not *ipso facto* imply a detrimental effect
- When safety to any form of life is the objective, the only rational approach is through the nature of the toxicity in question, and the application of benefits versus potential hazards under the condition of intended use of the compound.

These quotes are very important when risk assessment methodology is to be designed to formulate protection, which amongst others, has to ensure that regulatory actions will be protective of human health and ecosystems. Whilst it is important not to underestimate risk to all forms of life, it is equally important to note that compounded conservatism tends to overestimate risk and thereby not only being overly protective of health, but indeed likely to harm health, for example with regard to essential trace elements such as chromium^{3+}, iron and manganese. Thus, it is important not to muddle the much popular concept "precautionary principle" with over conservatism!

Risk assessment, both with regard to human health and the ecology, is primarily based on three steps. Should any one of these steps be absent, an evaluation of possible harm would not be feasible:

Release of contaminants, exposure conditions, fate and transport of pollutants, and contact between receptors and stressors, could all be termed the **Pathway** for exposure. Pathways determine whether a route of exposure would be direct or indirect, the result of which will provide a quantitative estimate of the risk posed by stressors. Direct pathways would be for example inhalation of atmospheric dispersed contaminants, and the ingestion of surface and ground waters to which contaminants were released. Indirect pathways could involve the total food chain for humans and the ecology alike.

In summary, the sources and pathways for a contaminant must be studied in great detail before biological effects can be related to exposure. Once this is done, the critical dose/response level can be established to ensure that adequate control exist to regulate the stressors in question.

The second step is the determination of potential adverse effects when exposed to contaminants. These evaluations are primarily based on toxicity information from laboratory toxicity studies in animals as well as results from epidemiological studies when available. Although some important pharmacokinetic differences do exist between animals such as rats and mice, and more importantly between animals and humans, is the principle of extrapolating from animal data to humans accepted in the scientific and regulatory community.

It is however very important to realize that generally all models used are simplification of reality. To use rodents as surrogates for humans, to extrapolate from high experimental doses to low environmental relevant doses, introduces uncertainty. To use indicator species such as for example certain fish species in dose/response assessments and extrapolate the results thereof to the aquatic environment, i.e. take in consideration the protection of more than one species, introduces uncertainties. Uncertainty factors, or safety factors are used in mathematical modeling to provide for these uncertainties, which results in health benchmarks used as single-point estimates, which again may have associated variabilities and uncertainties of up to an order of magnitude or more.

The importance of a full understanding of the above, lies in the fact (understandingly so) that risk assessment largely tends to favour conservatism, and is thus very likely to overstate actual risk and therefore being overly protective of human health and the ecology.

The third step in risk assessment is the quantification of exposure. Quantification of exposure could be termed the Estimated Environmental Concentration (EEC) being the magnitude and duration of exposure by the contaminants of concern, to receptors likely to be exposed or impacted on.

Quantification of exposure is normally based on either monitoring a specific situation or by modeling, i.e. predict a specific situation. Both these approaches suffer uncertainties similar to the evaluation of potential adverse effects from animal toxicity studies. One of the major uncertainties in the monitoring approach is the reliance on analytical methods and associated detection limits, which could result in contaminants not being detected. Normally for risk assessment purposes such an event will be indicated by zero exposure, which could be problematic with for example, carcinogenic substances with a genotoxic mode of action (mechanism).

It is believed in some scientific circles that modeling is to be preferred above monitoring. Such a statement has to be questioned, in that exposure quantification and the accuracy thereof would certainly depend on, amongst others, pathway, media and sources. Modeled data depends on data (information) provided, assumptions and relationships chosen for a specific model. These factors are more than often very subjective, do not represent the environmental situation, and could result in large discrepancies in estimating or predicting exposure.

It is therefore to be accepted that both methods describing exposure for risk assessment purposes would contain advantages as well as disadvantages, and that the two methods could differ in resultant ambient contaminant concentrations for a specific pathway. Calculated, modeled or measured exposure may therefore differ from actual exposure, and for this reason the tendency is again to opt for maximum exposure scenarios, also termed Worst Case Scenario.

In summary, the three steps described i.e. ① pathway, ② evaluation of dose/response relationships and ③ quantification of exposure, are the basis for describing potential risk, incorporating assumptions, uncertainties, safety factors etc., in the formulations thereof. Whilst the utmost must be done and considered to ensure the most sound scientific basis possible, care should be taken in the interpretation of results with special reference to conservatism in estimating ecological and human risk.

2.1.2 Ecological Risk Assessment

Some contaminants, when released to the environment, do not have apparent direct effects on living organisms, but do so indirectly by changing the chemical characterization of their habitat or environment. Other contaminants do display a dose/response or exposure/effect relationship to living organisms, and these contaminants are often referred to as being "toxic".

The assessment of the probability that adverse effects will occur in the environment is being complicated by the existence of multiple pathways and thousands of vertebrate and invertebrate species, which ideally have to be considered in risk assessment. This is not possible. The only possible and feasible scenario would be the accomplishment of ambient concentrations of chemicals as ecological benchmarks which will not contribute to significant risk, and which will have to provide for the protection of more than one species. Such a scenario will depend on two cornerstones, one being that indicator species will have to be utilised in toxicity studies from which extrapolation to the total specific environment (i.e. aquatic environment) could be effectuated. Secondly, and most importantly, must the benchmark be an acceptable risk approach representing various species and trophic levels, which is also in line with the philosophy that no risk situations do not exist.

The departure point for a risk assessment of the environment, would be the decision or acceptance of the pathway to be followed. In this regard the aquatic pathway (ground or surface waters) is internationally accepted to be the more applicable due to its associated sensitivity. It could be stated, albeit with caution, that when the three environmental medias (air, land, water) is considered, that the aquatic pathway or route of exposure is the more appropriate to rely on for interpretation to the ecology.

As commonly known and referred to in paragraph 2.1, consists the risk assessment equation, of exposure on the one hand and effect on the other hand.

The exposure side is addressed by either measuring or monitoring of actual concentrations (dose) applicable, or by estimating the environmental concentration (EEC) by for example mass balance equations. Such models are normally "*worst case scenarios*" which on the one hand is conservative (and may be too conservative), but allows upper bound risk estimates. The most negative part of such *worst case scenarios* is the fact that these models do not provide for the fate and transport of the contaminant in the environment. For example do organic contaminants biodegrade (aerobic and anaerobic), or degrade through hydrolysis and photolysis to ultimately mineralize to CO_2, very often by relatively short biological and environmental half-lives and dissipation rates. Factors such as these mentioned may well give rise to over estimation of risk.

By relating known biological and ecological responses of known concentrations (dose) of a contaminant to actual or estimated environmental concentrations, it is possible to quantify possible risk to the environment. Dose/response data is to be obtained from controlled tests with selected indicator species. Indicator species are carefully chosen according to specific criteria such as for example demonstration over years of testing that the species is sensitive to known effects produced, and produces dose-response data to a variety of contaminants. Data must therefore be of a high quality from a significant number of species in the aquatic environment to be able to derive protective criteria extrapolated to "all" species in such an environment.

Sensitive toxicity endpoint data such as those derived from chronic toxicity testing, i.e. no-observed-effect levels, would be the most desired data for benchmark purposes. However, such data only exist for a small percentage of contaminants of concern, and would relatively speaking be more readily available for novel molecules than for those we are so familiar with. Values more readily available in the international literature, are acute LC_{50} values which represents a 50% lethal concentration to a given indicator species. These acute toxicity levels, based on mortality (effect), are therefore to be used to derive acceptable risk levels in an ecological risk assessment, the pathway being the aquatic environment.

In using the available and applicable LC_{50} values published in the open literature, a safety factor has to be adopted or implemented to provide a large margin of safety so as to make provision for inter-species variation and sensitivity, as well as for the fact that effect is based on mortality and not chronic effects. Because the slopes of dose/response curves of the effects of a contaminant on most aquatic species is unknown, a model was used (in this study) to express the quantitative risk for 1/10 the LC_{50}, and to calculate actual risk from the actual concentration measured in specific media (water, waste, sediment, etc.). The acceptable risk of 0,1 x LC_{50} is calculated from a cross section of typical dos/response data, with a typical slope of dose/response curves. From an exposure 10 times lower than the LC_{50}, approximately 0,00034% or one in a population of 300 000 exposed to the contaminant, is likely to die. Actual risk incorporating the concentrations of contaminants exposed to is quantified by the application of a Probit Model from which the severity of risk can be observed.

2.1.3 Human Risk Assessment

The broad philosophy for human risk assessment is very similar to ecological risk assessment. Both these philosophies aim at deriving dose/response information from which a dose could be calculated which would be unlikely to cause adverse health effects. Ecological risk assessment has the distinct advantage that, specifically with reference to site-specific studies, tests could be performed with the actual species of relevance, resulting in high confidence acceptable risk values. The equivalent to acceptable risk values, being Acceptable Daily Intakes (ADI) or Reference doses (Rfd) in human risk assessment, will always be derived from animal toxicity studies, although epidemiology studies in exposed human populations could make important contributions.

Dose/response information from animal studies for extrapolation to humans can only be done with high confidence if a full toxicological dossier has been followed in tests performed. Such a dossier would for example inter alia include physical/chemical properties, acute, sub-acute, sub-chronic oral, dermal and inhalation studies, teratogenic, embryotoxicity and fetotoxicity, two- generation reproduction, mutagenicity, chronic toxicity and carcinogenicity studies, pharmacokinetics, and a very large and comprehensive number of ecotoxicity and environmental fate studies. Such toxicity studies for one molecule could take up to 12 years of research, with associated costs, which could approach one billion American dollars.

Potential for human toxicity is, as mentioned, based on an approach, which assumes that laboratory animals are surrogates for human and other mammalian species. Acceptable daily intakes or References doses are determined from such tests for non-carcinogens, whilst Reference doses as well as oral slope factors and oral unit risk factors are used with administered doses to estimate the probability of increased cancer incidences over a lifetime.

As previously indicated, is the pathway presently chosen by the Minimum Requirements to quantify risk, the aquatic environment, not only being very sensitive, but also the ultimate destiny (ground water) for contaminants mobile in wastes disposed of. Exposure is quantified incorporating a *worst case scenario*. The *worst case scenario* is based on the total load of a contaminant, disposed of per unit time (1 month) and unit area (1 hectare), to leach to a body of receiving water, and is expressed in parts per billion (ppb).

In the Republic of South Africa, disposal of waste has to conform to policies, rules and regulations, as layed down by the Department of Water Affairs and Forestry (DWAF). It is important to note that these "regulations" i.e. Minimum Requirements for the Handling, Classification and Disposal of Hazardous Waste, Minimum Requirements for Waste Disposal by Landfill, and Minimum Requirements for the Monitoring at Waste Management Facilities, has to date not been promulgated by Parliament. However, firstly will they be in the near future, and secondly, can waste only be disposed of in landfill sites permitted by DWAF, who uses the Minimum Requirements in their permitting procedures.

3. ANALYTICAL METHODOLOGY

The analysis, on which the classification methodology is based, is comprehensively prescribed by the minimum Requirement documents. In short it boils down to the total analysis (inorganic and organic if appropriate) of a waste to be discarded or disposed of. The risk analysis, classification and site designated for disposal, is derived from the total analysis, the concentration of a contaminant in the stream, the total volume of a stream and the area on which the waste has to be disposed of. The Minimum Requirements also provides for the delisting of a waste classified as hazardous, to be delisted to general waste quality, should a contaminant be immobile (not leachable). Such analytical tests are performed under worst case scenario by utilizing strong organic and inorganic acids to force leachability over a short period of time, should the contaminant contain mobility characteristics.

4. IDENTIFICATION AND SAMPLING OF WASTE STREAMS

The term solid waste, with reference to waste management and pollution control of the IVS Master Plan Study, refers to a (undesirable) by-product or residue from any process, to be discarded, accumulated or stored for the purpose of discarding or processing/recovering. Solid waste in the Master Plan excludes those wastes termed general wastes, normally represented by for example household and garden refuse, builders rubble and many other different commercial wastes. Solid wastes includes and refers specifically to material which may by circumstance of use, quantity, concentration or inherent toxicological, chemical or physical properties, cause adverse effects to man, fauna and flora, when improperly diposed of, stored or transported. These waste are generally termed hazardous wastes (opposed to general wastes) and must "**general waste**" not be confused with hazardous waste, which could delist for disposal to a "**General waste site**".

Some 34 waste streams at IVS were investigated with regard to disposal by landfill. Most of these waste streams are currently disposed of on the existing dumpsite. However, some streams included in the investigation, such as for example sinter dust, blast furnace slag and basic oxygen furnace grid, are currently either recycled or being used in other industries (cement). They were included with the specific objective of characterization, should such material have to be disposed of for whatever reason.

Most organic material such as tars were not included because, with reference to disposal practices, their composition and hence classification is well known, and secondly due to IVS currently routing these materials to Holfontein for disposal in a H:H Site.

Twenty eight of the 34 waste streams investigated are reported on, the other streams omitted for the reasons mentioned. Only approximately 14% of the materials disposed of are currently weighed for accurate determination of volumes, others are either estimated or calculated. This is a very serious matter, which has to be addressed with urgency. Current classification and risk quantification should therefore be interpreted taking in consideration the lack of quantitative information on volumes. Similarly, must it also be acknowledged that calculations on future air space needed, may change once accurate volumetric quantification is available. Thus, volumes not only influence the hazard rating of a stream, but also determine the disposal area required and hence associated costs.

In conclusion, were all 28 streams reported on also analysed for possible contamination by organics. Contamination by organics assigns the analytical method to be employed in delisting (mobility) procedures, which may negatively impact on disposal practices, air space, risk and costs. Simultaneously were mobility tests also performed on all streams to simulate dedicated disposal practices, i.e. only IVS waste streams not contaminated with organics.

5. DISCUSSION OF RESULTS

Discussion of results will refer to 3 appendixes:

Appendix A: Summarises the classification of the streams, indicating the contaminants of concern, according to mobility, when a hazardous site is indicated. All streams investigated indicate to be hazardous according to their **total** analysis (composition). Contaminants of concern for total analysis is therefore not listed, but is available form Appendix B. Similarly, should a stream classifies not to be of a hazardous (H:H) nature according to its mobility characteristics, and hence disposal in a General (G) site, then it is obvious that no contaminants of concern can be indicated. Results are colour coded. **Red** indicates the concentration as well as exposure (estimated environmental concentration), which necessitates disposal in a **H:H site**, being of an extreme or highly hazardous nature. **Blue** indicates the concentration as well as exposure which necessitates disposal in a

H:H or H:h site, being of a low or moderately nature. **Green** indicates the waste stream to be of an acceptable risk for disposal in a **G Site**.

Results indicate all streams, except the following, to be disposed of in a hazardous waste site.

- Ladle furnace baghouse dust;
- BOF baghouse 1 dust; and
- Foundry cyclone dust.

In addition do another eight streams delist for disposal in a General waste site, should disposal be dedicated, i.e. not interfered with by disposal of waste not generated by IVS, and not disposed together with streams being contaminated with organic contaminants. Appendix A also summarises the contaminants in each stream responsible for classification as hazardous material, and hence disposal in a H:H or H:h site, according to mobility characteristics. The results indicate a wide spectrum of contaminants present to be generally responsible for the classification to be hazardous, specifically slags (BOF and EAF) and sludges (BF and BOF). Some of the dusts, which classifies being hazardous according to the TCLP mobility test, indicate to delist in dedicated disposal practices (AR mobility test), whilst only BF dust (Mn and F) and DR product dust (Mn, Zn,F) remains to be of a hazardous nature.

Thus, the four main observations from the Appendix A summary is that ① when classified under **dedicated disposal conditions** (AR mobility), the slags and sludges as well as BF and DR dust are mainly responsible for a hazardous classification, ② that these streams are also responsible for the larger volume to be disposed of, ③ that quite a number of streams delist under dedicated disposal conditions, and ④ that not one single contaminant is responsible for H classification, but rather a number of contaminants present.

Appendix B: Reproduces the total analysis, mobility tests and classification of each stream. More importantly reproduces this Appendix also the quantitative risk for those potent contaminants analysed for and present in each waste stream. It is to be noted that due to the complexity of waste streams and the resultant methodology used in the **total analysis** of solid waste streams, are the detection limits for all contaminants generally, and comparatively to mobility tests, very high. A *worst case scenario* is thus followed in the classification procedure and risk quantification by accepting the "smaller than" concentration to be the actual concentration of a contaminant present in the waste stream.

The results generally indicate that most of the contaminants present in the waste streams are immobile, indicating acceptable risk to the environment, and hence disposal in a General waste site. For those waste streams which remain to be classified as hazardous due to their mobility characteristics in dedicated disposal practices, risk quantification indicate manganese to be the contaminant of greatest concern, generally recording potential unacceptable risk of 100% mortality in the aquatic environment. This is specifically evident for EAF slag, BOF slag, BF sludge and BF dust. In this regard it is to be noted that the slags to be disposed of, is of a volume approximately 8 times larger than those of BF sludge and dust combined. This should be regarded important to note, specifically regarding the physical nature of slags *versus* sludges and dusts, when treatment of waste streams is to be considered.

Appendix C: Reproduces the results of an attempt to calculate the air space needed for waste streams to be disposed of by IVS, in a dedicated facility according to DWAF Minimum Requirements. The concentration of a contaminant and the total load principle determines the volume of waste which may be disposed of per unit area, conforming to an acceptable risk of one mortality in a population of 300 000 (aquatic route of exposure).

For this exercise, Tables B1, B2, C1 and C2 calculates the accumulative load on an annual basis for H and G classified material, for the contaminants aluminium, barium, cadmium, iron, lead, manganese, zinc and fluorides. These eight contaminants were selected being the compounds of concern according to their abundancy by mobility characteristics of the waste streams. Although dedicated disposal requires only Acid Rain mobility tests (no organics present), was the exercise also conducted for TCLP mobility, for the sake of comparison.

Table B1 indicates that iron is the contaminant in the waste streams, which would be disposed of annually, in the largest quantity according to TCLP mobility. However, manganese is a much more potent contaminant than iron (454g Mn *vs* 13 636g Fe), and would manganese thus be the contaminant which would determine the quantity to be disposed of per hectare per year. According to manganese all the streams disposed of would therefore need air space of 1 480 ha/year, or 29 600 ha/20 years for the disposal of untreated material. This must be regarded not feasible.

Table B2 follows the scenario of mobility as indicated by Acid Rain extractions, the scenario to be followed when organics are not present in the waste streams to be disposed of. Manganese indicate that 41 hectares would be needed annually to dispose of the untreated IVS waste streams, being 820 hectares over a 20 year period. This should also be regarded as not feasible.

Table C1 and **Table C2** follow a scenario when disposal of slags are discontinued. It was indicated in the text that slags (BOF and EAF) account for nearly 50% of the volumes annually to be disposed of. This material may well be of use in for example the manufacture of bricks or as road aggregate. Thus, should slags be for example be stock-piled on approved footprints, incorporating the necessary leachate control measures, would not only the volume of waste to dispose of annually decrease drastically, but also any associated potential risk to man and the environment.

Table C1 indicates the result of TCLP mobility when disposal of slags are discontinued. It indicates that according to manganese present, 295 hectares would be required annually, in comparison with the 1 480 hectare needed when slags are also to be disposed of. This is understandable considering the huge volumes of BOF and EAF slags, as well as the concentrations of manganese leached by the TCLP mobility methodology. However, 295 hectares annually would still result in some 5 900 hectares needed of a period of 20 years, which should also be regarded as not feasible.

Table C2 indicates a much more acceptable result. It indicates that should slags be discontinued from disposal, and mobility tests for dedicated disposal practices applied, that 11.8 hectares (manganese) would be required by IVS annually. Such a result must not be underestimated. This result not only indicates that much less footprint, (and hence costs) would be required but also implies that potential risk to the environment (and man) should decrease noticeably. However, although much more acceptable from a risk and cost point of view, should 11.8 hectares/year, and hence 236 hectares/20 years also regarded to be at least not ideal, even if regarded feasible under specific conditions.

The results of the disposal of untreated material, as depicted and discussed, strongly suggest that appropriate treatment should be considered. Not only would treatment to the point where all streams would classify to G material be much more acceptable from a potential risk point of view, but would much less footprint or air space be needed. Most if not all inorganic contaminants could be treated to leachable concentrations less than approximately 10 ppb and/or less than the detection limits by which they can be identified and/or quantified. This also holds true for manganese, which is the contaminant in the IVS waste streams, dictating the risk as well as air space needed for disposal at IVS.

Such a "treatment scenario" was tested by the calculation of air space needed should all hazardous waste streams according to Acid Rain mobility (Table C2), leach manganese at 0.1 ppm concentrations or less. Experience indicates such a scenario to be realistic, although it would or could be more difficult for some material than others. Should this scenario be applied than the total manganese for all streams of Table C2 would amount to 27 754 grams to be disposed of annually, and hence 0.61 hectares required annually or 12.2 hectare over a period of 20 years.

6. CONCLUSIONS

It is to be concluded from the IVS solid waste disposal quantification and classification study, that disposal of current **untreated waste** in a future approved dedicated disposal facility, is neither from a potential risk to man and environment, nor from an air space and costs point of view, feasible.

7. RECOMMENDATIONS

The following recommendations should be considered:

1. Waste streams which are currently being disposed of, should as a matter of urgency be quantified by utilising the weighbridge. All streams should be weighed separately.

2. Slag material should be considered to be stockpiled on an approved footprint with approved pollution control measures in the CRMF area.

3. Recycling, minimization and perusal of alternative uses for slags should be a high on-going priority.

4. Appropriate treatment technologies to treat and hence delist all hazardous waste streams to General waste, should be investigated in parallel to (3). Normally chemical treatment of hazardous waste is capital intensive, and would it be advisable to regard perusal of alternative uses for slags, and treatment of others (dusts, sludges, etc.), as opportune.

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Appendixes

SOLID WASTE DISPOSAL QUANTIFICATION AND CLASSIFICATION OF STREAMS WASTE SITE REQUIREMENTS [Iscor Vanderbijlpark Steel]

APPENDIX A

SUMMARY: WASTE CHARACTERIZATION

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SUMMARY: WASTE CHARACTERIZATION

COM-POUND	Accep-table Risk Value (MR) ppb	DETAILS OF WASTE STREAM: STREAM NUMBER	NAME/ DESCRIPTION	VOLUME PER YEAR Kilogram	VOLUME PER MONTH Kilogram	CHARACTERISTICS OF WASTE STREAM – PHYSICAL: SLUDGE	SOLID	OTHER	CHEMICAL – ORGANIC (PAH's & VOC's) TCLP EXTRACT: Lab Conc. ppm	EEC ppb	INORGANIC (Micro's) TOTAL ANALYSIS: Lab Conc. ppb	TCLP EXTRACTION	Lab Conc. ppm	EEC ppb	A/RAIN EXTRACTION	Lab Conc ppm	EEC ppb
Al	10000	1.	BOF SLAG (FINE)		35,000,000		X		BDL		Ref: Table A-1	Al	3.0	69300	Al	0.52	12012
As	430											Ba	0.42	9702	Fe	0.50	11550
Ba	7800											Fe	0.51	11781	Mn	1.2	27720
Cd	31											Pb	0.03	693	Zn	0.96	22176
Co	6900											Mn	0.10	2310	F-	0.5	11550
Cr^{3+}	4700											Se	0.02	462			
Cu	100											V	0.11	2541			
Fe	9000											F-	2.0	46200			
Pb	100	CLASSIFICATION OVER 1ha H:H / H:h / G									H:H SITE	H:H SITE			H:H SITE		
Mn	300	RISK TO ENVIRONMENT: R / AR									RISK	RISK			RISK		
Hg	22	2.	BOF SLAG (COURSE)		35,000,000		X		BDL		Ref: Table A-2	Al	2.5	57750	Ba	0.42	9702
Ni	1140											Ba	2.4	55440	Fe	0.68	15708
Se	260											Fe	169	3903900	Mn	2.5	57750
Ag	2000											Pb	0.08	1848	V	0.07	1617
Ti	731											Mn	110	2541000	F-	0.3	6930
V	1300											V	0.07	1617			
Zn	700											Zn	0.08	1848			
F-	1500											F-	3.0	69300			
		CLASSIFICATION OVER 1ha H:H / H:h / G									H:H SITE	H:H SITE			H:H SITE		
		RISK TO ENVIRONMENT: R / AR									RISK	RISK			RISK		

SUMMARY: WASTE CHARACTERIZATION

DETAILS OF WASTE STREAM				CHARACTERISTICS OF WASTE STREAM												
				PHYSICAL			CHEMICAL									
		VOLUME PER					ORGANIC (PAH^s & VOC^s)			INORGANIC (Micro's)						
							TCLP EXTRACT			TOTAL ANALYSIS	TCLP EXTRACTION			A/RAIN EXTRACTION		
STREAM NUMBER	NAME/ DESCRIPTION	YEAR Kilogram	MONTH Kilogram	SLUDGE	SOLID	OTHER		Lab Conc. ppm	EEC ppb	Lab Conc. ppb		Lab Conc. ppm	EEC ppb		Lab Conc. ppm	EEC ppb
3.	DESULPHURISATION SLAG		3,600,000		X		BDL			Ref: Table A-3	Mn	0.24	570	F-	1.7	4039
											F-	8.0	19008			
CLASSIFICATION OVER 1ha H:H / H:h / G										H:H SITE	H:H SITE			H:h SITE		
RISK TO ENVIRONMENT: R / AR										RISK	RISK			RISK		
4.	BOF SLAG (UNPROCESSED)		35,000,000		X		BDL			Ref: Table A-4	Al	1.5	34650	Mn	0.37	8547
											Cd	0.08	1848	V	0.07	1617
											Fe	0.40	9240	F-	0.1	2310
											Mn	0.12	2772			
											Se	0.03	693			
											V	0.11	2541			
											F-	1.0	23100			
CLASSIFICATION OVER 1ha H:H / H:h / G										H:H SITE	H:H SITE			H:H SITE		
RISK TO ENVIRONMENT: R / AR										RISK	RISK			RISK		

SUMMARY: WASTE CHARACTERIZATION

DETAILS OF WASTE STREAM				CHARACTERISTICS OF WASTE STREAM											
				PHYSICAL			CHEMICAL								
		VOLUME PER					ORGANIC (PAH's & VOC's)			INORGANIC (Micro's)					
							TCLP EXTRACT			TOTAL ANALYSIS	TCLP EXTRACTION			A/RAIN EXTRACTION	
STREAM NUMBER	NAME/ DESCRIPTION	YEAR Kilogram	MONTH Kilogram	SLUDGE	SOLID	OTHER		Lab Conc. ppm	EEC ppb	Lab Conc. ppb		Lab Conc. ppm	EEC ppb	Lab Conc. ppm	EEC ppb
5.	EAF BAGHOUSE DUST		1,500,000		X	(Dust)	BDL			Ref: Table A-5	Cd	0.11	109	Ref: Table A-5	
											Mn	37	36630		
											Zn	51	50490		
											F-	13	12870		
CLASSIFICATION OVER 1ha H:H / H:h / G										H:H SITE	H:H SITE			G SITE	
RISK TO ENVIRONMENT: R / AR										RISK	RISK			ACCEPTABLE RISK	
6.	LADLE FURNACE 1&2 BAGHOUSE DUST		10,000		X	(Dust)	BDL			Ref: Table A-6	Ref: Table A-6			Ref: Table A-6	
CLASSIFICATION OVER 1ha H:H / H:h / G										H:H SITE	G SITE			G SITE	
RISK TO ENVIRONMENT: R / AR										RISK	ACCEPTABLE RISK			ACCEPTABLE RISK	

SUMMARY: WASTE CHARACTERIZATION

DETAILS OF WASTE STREAM				CHARACTERISTICS OF WASTE STREAM										
				PHYSICAL			CHEMICAL							
		VOLUME PER					ORGANIC (PAH's & VOC's)			INORGANIC (Micro's)				
							TCLP EXTRACT			TOTAL ANALYSIS	TCLP EXTRACTION		A/RAIN EXTRACTION	
STREAM NUMBER	NAME/ DESCRIPTION	YEAR Kilogram	MONTH Kilogram	SLUDGE	SOLID	OTHER		Lab Conc. ppm	EEC ppb	Lab Conc. ppb	Lab Conc. ppm	EEC ppb	Lab Conc. ppm	EEC ppb
7.	BOF BAGHOUSE 2 DUST		200,000		X	(Dust)	BDL			Ref: Table A-1	F- 20	2640	Ref: Table A-7	
CLASSIFICATION OVER 1ha H:H / H:h / G										H:H SITE	H:h SITE		G SITE	
RISK TO ENVIRONMENT: R / AR										RISK	RISK		ACCEPTABLE RISK	
8.	BOF BAGHOUSE 3 DUST		100,000		X	(Dust)	BDL			Ref: Table A-8	Cd 0.15	9.9	Ref: Table A-8	
											Mn 42	2772		
											Zn 126	8316		
CLASSIFICATION OVER 1ha H:H / H:h / G										H:H SITE	H:H SITE		G SITE	
RISK TO ENVIRONMENT: R / AR										RISK	RISK		ACCEPTABLE RISK	

SUMMARY: WASTE CHARACTERIZATION

DETAILS OF WASTE STREAM				CHARACTERISTICS OF WASTE STREAM										
				PHYSICAL			CHEMICAL							
		VOLUME PER					ORGANIC (PAH^s & VOC^s)			INORGANIC (Micro's)				
							TCLP EXTRACT			TOTAL ANALYSIS	TCLP EXTRACTION		A/RAIN EXTRACTION	
STREAM NUMBER	NAME/ DESCRIPTION	YEAR Kilogram	MONTH Kilogram	SLUDGE	SOLID	OTHER		Lab Conc. ppm	EEC ppb	Lab Conc. ppb	Lab Conc. ppm	EEC ppb	Lab Conc. ppm	EEC ppb
9.	BOF BAGHOUSE 1 DUST		100,000		X	(Dust)	BDL			Ref: Table A-9	Ref: Table A-9		Ref: Table A-9	
CLASSIFICATION OVER 1ha H:H / H:h / G										H:H SITE	G SITE		G SITE	
RISK TO ENVIRONMENT: R / AR										RISK	ACCEPTABLE RISK		ACCEPTABLE RISK	
10.	CONTINEOUS CASTER V3 SLUDGE		31,000	X			BDL			Ref: Table A-10	Cd 0.20	4.09	Ref: Table A-10	
											Fe 931	19048		
CLASSIFICATION OVER 1ha H:H / H:h / G										H:H SITE	H:h SITE		G SITE	
RISK TO ENVIRONMENT: R / AR										RISK	RISK		ACCEPTABLE RISK	

SUMMARY: WASTE CHARACTERIZATION

DETAILS OF WASTE STREAM				CHARACTERISTICS OF WASTE STREAM										
				PHYSICAL			CHEMICAL							
		VOLUME PER					ORGANIC (PAH^{s} & VOC^{s})			INORGANIC (Micro's)				
							TCLP EXTRACT			TOTAL ANALYSIS	TCLP EXTRACTION		A/RAIN EXTRACTION	
STREAM NUMBER	NAME/ DESCRIPTION	YEAR Kilogram	MONTH Kilogram	SLUDGE	SOLID	OTHER		Lab Conc. ppm	EEC ppb	Lab Conc. ppb	Lab Conc. ppm	EEC ppb	Lab Conc. ppm	EEC ppb
11.	SINTER AG 100 DUST		20,000		X	(Dust)	BDL			Ref: Table A-11	Ref: Table A-11		Ref: Table A-11	
								NOTE: TOTALLY RECYCLED TO THE SINTER PLANT						
CLASSIFICATION OVER 1ha H:H / H:h / G										H:H SITE	G SITE		G SITE	
RISK TO ENVIRONMENT: R / AR										RISK	ACCEPTABLE RISK		ACCEPTABLE RISK	
12.	SINTER BG 100 DUST		20,000		X	(Dust)	BDL			Ref: Table A-12	Ref: Table A-12		Ref: Table A-12	
								NOTE: TOTALLY RECYCLED TO THE SINTER PLANT						
CLASSIFICATION OVER 1ha H:H / H:h / G										H:H SITE	G SITE		G SITE	
RISK TO ENVIRONMENT: R / AR										RISK	ACCEPTABLE RISK		ACCEPTABLE RISK	

SUMMARY: WASTE CHARACTERIZATION

DETAILS OF WASTE STREAM				CHARACTERISTICS OF WASTE STREAM										
				PHYSICAL			CHEMICAL							
		VOLUME PER					ORGANIC (PAH[a] & VOC[s])			INORGANIC (Micro's)				
							TCLP EXTRACT			TOTAL ANALYSIS	TCLP EXTRACTION		A/RAIN EXTRACTION	
STREAM NUMBER	NAME/ DESCRIPTION	YEAR Kilogram	MONTH Kilogram	SLUDGE	SOLID	OTHER		Lab Conc. ppm	EEC ppb	Lab Conc. ppb	Lab Conc. ppm	EEC ppb	Lab Conc. ppm	EEC ppb
13.	SINTER CG 100 DUST		30,000		X	(Dust)	BDL			Ref: Table A-13	Mn 22	436	Ref: Table A-13	
							NOTE: TOTALLY RECYCLED TO THE SINTER PLANT							
CLASSIFICATION OVER 1ha H:H / H:h / G										H:H SITE	H:H SITE		H:h SITE	
RISK TO ENVIRONMENT: R / AR										RISK	RISK		RISK	
14.	BF C DUST		3,800,000		X	(Dust)	BDL			Ref: Table A-14	Pb 0.06	150	Ref: Table A-14	
CLASSIFICATION OVER 1ha H:H / H:h / G										H:H SITE	H:H SITE		G SITE	
RISK TO ENVIRONMENT: R / AR										RISK	RISK		ACCEPTABLE RISK	

SUMMARY: WASTE CHARACTERIZATION

DETAILS OF WASTE STREAM				CHARACTERISTICS OF WASTE STREAM													
				PHYSICAL			CHEMICAL										
		VOLUME PER					ORGANIC (PAH^{s} & VOC^{s})			INORGANIC (Micro's)							
							TCLP EXTRACT			TOTAL ANALYSIS	TCLP EXTRACTION			A/RAIN EXTRACTION			
STREAM NUMBER	NAME/ DESCRIPTION	YEAR Kilogram	MONTH Kilogram	SLUDGE	SOLID	OTHER		Lab Conc. ppm	EEC ppb	Lab Conc. ppb		Lab Conc. ppm	EEC ppb		Lab Conc. ppm	EEC ppb	
15.	BF D DUST		3,800,000		X	(Dust)	BDL			Ref: Table A-15	Al	7.3	18308	Mn	4.9	12289	
											Pb	0.08	201	F-	3.9	9781	
											Mn	24	60192				
											Zn	5.7	14296				
											F-	2.0	5016				
CLASSIFICATION OVER 1ha H:H / H:h / G										H:H SITE	H:H SITE			H:H SITE			
RISK TO ENVIRONMENT: R / AR										RISK	RISK			RISK			
16.	BF SLUDGE		2,440,000	X			BDL			Ref: Table A-16	Al	45	72468	Mn	10	16104	
											Cd	0.06	97	Zn	3.2	5153	
											Fe	29	46702	F-	7.9	12722	
											Pb	1.5	2416				
											Mn	65	104676				
											Zn	163	262495				
CLASSIFICATION OVER 1ha H:H / H:h / G										H:H SITE	H:H SITE			H:H SITE			
RISK TO ENVIRONMENT: R / AR										RISK	RISK			RISK			

SUMMARY: WASTE CHARACTERIZATION

DETAILS OF WASTE STREAM				CHARACTERISTICS OF WASTE STREAM												
				PHYSICAL			CHEMICAL									
		VOLUME PER					ORGANIC (PAH's & VOC's)			INORGANIC (Micro's)						
							TCLP EXTRACT			TOTAL ANALYSIS	TCLP EXTRACTION			A/RAIN EXTRACTION		
STREAM NUMBER	NAME/ DESCRIPTION	YEAR Kilogram	MONTH Kilogram	SLUDGE	SOLID	OTHER		Lab Conc. ppm	EEC ppb	Lab Conc. ppb		Lab Conc. ppm	EEC ppb		Lab Conc. ppm	EEC ppb
17.	BF PRIME GRANULATED SLAG		21,700,000		X		BDL			Ref: Table A-17	Al	27	386694	Fe	10	143220
											Ba	3.5	50127	Mn	1.4	20051
											Fe	83	1188726	F-	0.9	12890
											Pb	0.05	716			
											Mn	36	515592			
											Ti	0.09	1289			
											Zn	0.23	3294			
											F-	0.2	2864			
CLASSIFICATION OVER 1ha H:H / H:h / G										H:H SITE	H:H SITE			H:H SITE		
RISK TO ENVIRONMENT: R / AR										RISK	RISK			RISK		
18.	BF OFF GRADE GRANULATED SLAG		21,700,000		X		BDL			Ref: Table A-18	Al	22	315084	Fe	2.7	38669
											Ba	1.2	17186	Mn	1.1	15754
											Fe	12	171864	Zn	0.05	716
											Mn	7.8	111712	F-	0.8	11458
											Ti	0.18	2578			
											Zn	0.10	1432			
											F-	0.2	2864			
CLASSIFICATION OVER 1ha H:H / H:h / G										H:H SITE	H:H SITE			H:H SITE		
RISK TO ENVIRONMENT: R / AR										RISK	RISK			RISK		

SUMMARY: WASTE CHARACTERIZATION

DETAILS OF WASTE STREAM				CHARACTERISTICS OF WASTE STREAM												
				PHYSICAL			CHEMICAL									
		VOLUME PER					ORGANIC (PAH's & VOC's)			INORGANIC (Micro's)						
							TCLP EXTRACT			TOTAL ANALYSIS	TCLP EXTRACTION			A/RAIN EXTRACTION		
STREAM NUMBER	NAME/ DESCRIPTION	YEAR Kilogram	MONTH Kilogram	SLUDGE	SOLID	OTHER		Lab Conc. ppm	EEC ppb	Lab Conc. ppb		Lab Conc. ppm	EEC ppb		Lab Conc. ppm	EEC ppb
19.	DR PRODUCT DUST		27,000,000		X	(Dust)	BDL			Ref: Table A-19	Al	2.5	44550	Mn	0.04	713
											Ba	0.49	8732	Zn	0.06	1069
											Mn	23	409860	F-	0.4	7128
											Zn	0.08	1426			
											F-	0.3	5346			
CLASSIFICATION OVER 1ha H:H / H:h / G										H:H SITE	H:H SITE			H:H SITE		
RISK TO ENVIRONMENT: R / AR										RISK	RISK			RISK		
20.	DR WET SCRUBBER MUD		97,000			(Mud)	BDL			Ref: Table A-20	Mn	4.9	314	Ref: Table A-20		
CLASSIFICATION OVER 1ha H:H / H:h / G										H:H SITE	H:H SITE			G SITE		
RISK TO ENVIRONMENT: R / AR										RISK	RISK			ACCEPTABLE RISK		

SUMMARY: WASTE CHARACTERIZATION

DETAILS OF WASTE STREAM				CHARACTERISTICS OF WASTE STREAM												
				PHYSICAL			CHEMICAL									
		VOLUME PER					ORGANIC (PAH's & VOC's)			INORGANIC (Micro's)						
							TCLP EXTRACT			TOTAL ANALYSIS	TCLP EXTRACTION			A/RAIN EXTRACTION		
STREAM NUMBER	NAME/ DESCRIPTION	YEAR Kilogram	MONTH Kilogram	SLUDGE	SOLID	OTHER		Lab Conc. ppm	EEC ppb	Lab Conc. ppb		Lab Conc. ppm	EEC ppb		Lab Conc. ppm	EEC ppb
21.	EAF SLAG		10,500,000		X		BDL			Ref: Table A-21	Al	36	249480	Mn	2.2	15246
											Ba	1.3	9009			
											Fe	16	110880			
											Pb	0.06	416			
											Mn	60	415800			
											Ti	0.12	832			
CLASSIFICATION OVER 1ha H:H / H:h / G										H:H SITE	H:H SITE			H:H SITE		
RISK TO ENVIRONMENT: R / AR										RISK	RISK			RISK		
22.	FOUNDRY CYCLONE DUST		4,000		X	(Dust)	BDL			Ref: Table A-22	Ref: Table A-22			Ref: Table A-22		
CLASSIFICATION OVER 1ha H:H / H:h / G										H:H SITE	G SITE			G SITE		
RISK TO ENVIRONMENT: R / AR										RISK	ACCEPTABLE RISK			ACCEPTABLE RISK		

SUMMARY: WASTE CHARACTERIZATION

DETAILS OF WASTE STREAM				CHARACTERISTICS OF WASTE STREAM												
				PHYSICAL			CHEMICAL									
		VOLUME PER					ORGANIC (PAH's & VOC's)			INORGANIC (Micro's)						
							TCLP EXTRACT			TOTAL ANALYSIS	TCLP EXTRACTION			A/RAIN EXTRACTION		
STREAM NUMBER	NAME/ DESCRIPTION	YEAR Kilogram	MONTH Kilogram	SLUDGE	SOLID	OTHER		Lab Conc. ppm	EEC ppb	Lab Conc. ppb		Lab Conc. ppm	EEC ppb		Lab Conc. ppm	EEC ppb
23.	BOF GRID		459,000		X		BDL			Ref: Table A-23	Cd	0.13	39.4	Ref: Table A-23		
											Fe	1210	366557			
											Mn	82	24841			
										NOTE: TOTALLY RECYCLED						
CLASSIFICATION OVER 1ha H:H / H:h / G										H:H SITE	H:H SITE			G SITE		
RISK TO ENVIRONMENT: R / AR										RISK	RISK			ACCEPTABLE RISK		
24.	DR RAW MATERIAL DUST, FURNACE DUST & SEPARTION DUST		26,000,000		X	(Dust)	BDL			Ref: Table A-24	Al	4.0	68640	Mn	1.1	18876
											Ba	1.0	17160	F-	0.1	1716
											Fe	4.0	68640			
											Mn	19	326040			
											Zn	0.30	5148			
CLASSIFICATION OVER 1ha H:H / H:h / G										H:H SITE	H:H SITE			H:H SITE		
RISK TO ENVIRONMENT: R / AR										RISK	RISK			RISK		

SUMMARY: WASTE CHARACTERIZATION

DETAILS OF WASTE STREAM				CHARACTERISTICS OF WASTE STREAM									
				PHYSICAL			CHEMICAL						
		VOLUME PER					ORGANIC (PAH'^{s} & VOC'^{s})		INORGANIC (Micro's)				
							TCLP EXTRACT		TOTAL ANALYSIS	TCLP EXTRACTION		A/RAIN EXTRACTION	
STREAM NUMBER	NAME/ DESCRIPTION	YEAR Kilogram	MONTH Kilogram	SLUDGE	SOLID	OTHER	Lab Conc. ppm	EEC ppb	Lab Conc. ppb	Lab Conc. ppm	EEC ppb	Lab Conc. ppm	EEC ppb
25.	VAALDAM SLUDGE		2,000,000	X			Ref: Analytical Report SGS Lab Not Accredited		Ref: Table A-25	Mn 0.61	805	Ref: Table A-25	
CLASSIFICATION OVER 1ha H:H / H:h / G									H:H SITE	H:H SITE		G SITE	
RISK TO ENVIRONMENT: R / AR									RISK	RISK		ACCEPTABLE RISK	
26.	DOLOCHAR -1mm		1,500,000		X		Ref: Analytical Report SGS Lab Not Accredited		Ref: Table A-26	Fe 39 Mn 15	38610 14850	Ref: Table A-26	
CLASSIFICATION OVER 1ha H:H / H:h / G							H:H SITE		H:H SITE	H:H SITE		G SITE	
RISK TO ENVIRONMENT: R / AR							RISK		RISK	RISK		ACCEPTABLE RISK	

SUMMARY: WASTE CHARACTERIZATION

DETAILS OF WASTE STREAM				CHARACTERISTICS OF WASTE STREAM										
				PHYSICAL			CHEMICAL							
		VOLUME PER					ORGANIC (PAH^s & VOC^s)		INORGANIC (Micro's)					
							TCLP EXTRACT		TOTAL ANALYSIS	TCLP EXTRACTION			A/RAIN EXTRACTION	
STREAM NUMBER	NAME/ DESCRIPTION	YEAR Kilogram	MONTH Kilogram	SLUDGE	SOLID	OTHER	AR Lab Conc. ppm	EEC ppb	Lab Conc. ppb		Lab Conc. ppm	EEC ppb	Lab Conc. ppm	EEC ppb
27.	DOLOCHAR +1mm		9,000,000		X		Ref: Analytical Report SGS Lab Not Accredited		Ref: Table A-27	Al	2.9	17226	Ref: Table A-27	
										Pb	0.02	119		
										Mn	0.12	713		
										Se	0.07	416		
CLASSIFICATION OVER 1ha H:H / H:h / G									H:H SITE	H:H			G SITE	
RISK TO ENVIRONMENT: R / AR									RISK	RISK			ACCEPTABLE RISK	
28.	BOF SLUDGE (MUD)		3,000,000			(MUD)	Ref: Analytical Report SGS Lab Not Accredited		Ref: Table A-28	Cd	0.05	99	F- 3.5	6930
										Fe	629	1245420		
										Mn	54	106920		
										Zn	1.0	1980		
										F-	2.7	5346		
CLASSIFICATION OVER 1ha H:H / H:h / G									H:H SITE	H:H SITE			H:h SITE	
RISK TO ENVIRONMENT: R / AR									RISK	RISK			RISK	

APPENDIX B

WASTE STREAM CLASSIFICATION TABLES (INORGANIC)

TABLES A-1 TO A-28

Table A-1

CLASSIFICATION SUMMARY: WASTE STREAM - BOF SLAG (FINE)

[Source Characterization - Iscor Vanderbijlpark Steel]

INORGANIC COMPOUNDS	[1] Acc. Risk Value (MR) ppb	NAME OF WASTE STREAM: BOF SLAG (FINE)									VOLUME: 35,000,000 KG / MONTH					
		TOTAL ANALYSIS			[5] PROBIT RUN		TCLP EXTRACTION			[5] PROBIT RUN		ACID RAIN EXTRACTION			[5] PROBIT RUN	
		[2] Lab Conc. ppm	[3] EEC ppb	[4] Disposal Site	Risk Quantification %	Risk R / AR	[2] Lab Conc. ppm	[3] EEC ppb	[4] Disposal Site	Risk Quantification %	Risk R / AR	[2] Lab Conc. ppm	[3] EEC ppb	[4] Disposal Site	Risk Quantification %	Risk R / AR
Aluminium as Al	10000	38900	898590000	H:h	1.00E+02	R	3.0	69300	H:h	2.37E+01	R	0.52	12012	H:h	1.73E-03	R
Arsenic as As	430	< 12	277200	H:H	1.00E+02	R	< 0.02	0.00	G	0.00E+00	AR	< 0.02	0.00	G	0.00E+00	AR
Barium as Ba	7800	288	6652800	H:h	1.00E+02	R	0.42	9702	H:h	2.33E-03	R	0.18	4158	G	5.91E-07	AR
Cadmium as Cd	31	< 10	231000	H:H	1.00E+02	R	< 0.03	0.00	G	0.00E+00	AR	< 0.03	0.00	G	0.00E+00	AR
Cobalt as Co	6900	5.0	115500	H:H	8.43E+01	R	< 0.07	0.00	G	0.00E+00	AR	< 0.07	0.00	G	0.00E+00	AR
Chromium^{3+} as Cr^{3+}	4700	1282	29614200	H:h	1.00E+02	R	< 0.07	0.00	G	0.00E+00	AR	< 0.07	0.00	G	0.00E+00	AR
Copper as Cu	100	14	323400	H:H	1.00E+02	R	< 0.05	0.00	G	0.00E+00	AR	< 0.05	0.00	G	0.00E+00	AR
Iron as Fe	9000	160000	3696000000	H:h	1.00E+02	R	0.51	11781	H:h	3.55E-03	R	0.50	11550	H:h	3.02E-03	R
Lead as Pb	100	< 18	415800	H:H	1.00E+02	R	0.03	693	H:H	2.37E+01	R	< 0.02	0.00	G	0.00E+00	AR
Manganese as Mn	300	30400	702240000	H:H	1.00E+02	R	0.10	2310	H:H	3.05E+01	R	1.2	27720	H:H	1.00E+02	R
Mercury as Hg	22	< 5.0	115500	H:H	1.00E+02	R	< 0.02	0.00	G	0.00E+00	AR	< 0.02	0.00	G	0.00E+00	AR
Nickel as Ni	1140	< 66	1524600	H:H	1.00E+02	R	< 0.13	0.00	G	0.00E+00	AR	< 0.13	0.00	G	0.00E+00	AR
Selenium as Se	260	< 5.0	115500	H:H	1.00E+02	R	0.02	462	H:H	3.67E-02	R	< 0.02	0.00	G	0.00E+00	AR
Silver as Ag	2000	22	508200	H:h	1.00E+02	R	< 0.02	0.00	G	0.00E+00	AR	< 0.02	0.00	G	0.00E+00	AR
Titatium as Ti	731	3023	69831300	H:H	1.00E+02	R	< 0.02	0.00	G	0.00E+00	AR	< 0.02	0.00	G	0.00E+00	AR
Vanadium as V	1300	229	5289900	H:h	1.00E+02	R	0.11	2541	H:h	7.11E-02	R	< 0.02	0.00	G	0.00E+00	AR
Zinc as Zn	700	19	438900	H:H	1.00E+02	R	< 0.04	0.00	G	0.00E+00	AR	0.96	22176	H:H	9.88E+01	R
Fluoride as F-	1500	18900	436590000	H:h	1.00E+02	R	2.0	46200	H:h	9.86E+01	R	0.5	11550	H:h	3.05E+01	R
Waste Stream classifies: H:H / H:h / G		Worst Case Scenario		H:H			Worst Case Scenario		H:H			Worst Case Scenario		H:H		
Risk to Environment: R / AR		Risk to Environment		R		R	Risk to Environment		R		R	Risk to Environment		R		R

Table A-2

CLASSIFICATION SUMMARY: WASTE STREAM - BOF SLAG (COURSE)

[Source Characterization - Iscor Vanderbijlpark Steel]

INORGANIC COMPOUNDS	[1] Acc. Risk Value (MR) ppb	NAME OF WASTE STREAM: BOF SLAG (COURSE)										VOLUME: 35,000,000 KG / MONTH				
		TOTAL ANALYSIS			[5] PROBIT RUN		TCLP EXTRACTION			[5] PROBIT RUN		ACID RAIN EXTRACTION			[5] PROBIT RUN	
		[2] Lab Conc. ppm	[3] EEC ppb	[4] Disposal Site	Risk Quantification %	Risk R / AR	[2] Lab Conc. ppm	[3] EEC ppb	[4] Disposal Site	Risk Quantification %	Risk R / AR	[2] Lab Conc. ppm	[3] EEC ppb	[4] Disposal Site	Risk Quantification %	Risk R / AR
Aluminium as Al	10000	26400	609840000	H:h	1.00E+02	R	2.5	57750	H:h	1.42E+01	R	0.25	5775	G	1.42E-06	AR
Arsenic as As	430	<12	277200	H:H	1.00E+02	R	<0.02	0.00	G	0.00E+00	AR	<0.02	0.00	G	0.00E+00	AR
Barium as Ba	7800	453	10464300	H:h	1.00E+02	R	2.4	55440	H:h	2.52E+01	R	0.42	9702	H:h	2.33E-03	R
Cadmium as Cd	31	<10	231000	H:H	1.00E+02	R	<0.03	0.00	G	0.00E+00	AR	<0.03	0.00	G	0.00E+00	AR
Cobalt as Co	6900	7.8	180180	H:H	9.70E+01	R	<0.07	0.00	G	0.00E+00	AR	<0.07	0.00	G	0.00E+00	AR
Chromium[3+] as Cr^{3+}	4700	8121	187595100	H:h	1.00E+02	R	<0.07	0.00	G	0.00E+00	AR	<0.07	0.00	G	0.00E+00	AR
Copper as Cu	100	60	1386000	H:H	1.00E+02	R	<0.05	0.00	G	0.00E+00	AR	<0.05	0.00	G	0.00E+00	AR
Iron as Fe	9000	223000	5151300000	H:h	1.00E+02	R	169	3903900	H:h	1.00E+02	R	0.68	15708	H:h	3.23E-02	R
Lead as Pb	100	<18	415800	H:H	1.00E+02	R	0.08	1848	H:H	8.85E+01	R	<0.02	0.00	G	0.00E+00	AR
Manganese as Mn	300	58500	1351350000	H:H	1.00E+02	R	110	2541000	H:H	1.00E+02	R	2.5	57750	H:H	1.00E+02	R
Mercury as Hg	22	<5.0	115500	H:H	1.00E+02	R	<0.02	0.00	G	0.00E+00	AR	<0.02	0.00	G	0.00E+00	AR
Nickel as Ni	1140	<66	1524600	H:H	1.00E+02	R	<0.13	0.00	G	0.00E+00	AR	<0.13	0.00	G	0.00E+00	AR
Selenium as Se	260	<5.0	115500	H:H	1.00E+02	R	<0.02	0.00	G	0.00E+00	AR	<0.02	0.00	G	0.00E+00	AR
Silver as Ag	2000	<10	231000	H:h	1.00E+02	R	<0.02	0.00	G	0.00E+00	AR	<0.02	0.00	G	0.00E+00	AR
Titatium as Ti	731	4026	93000600	H:H	1.00E+02	R	0.03	693	G	2.11E-04	AR	<0.02	0.00	G	0.00E+00	AR
Vanadium as V	1300	454	10487400	H:h	1.00E+02	R	0.07	1617	H:h	2.33E-03	R	0.07	1617	H:h	2.33E-03	R
Zinc as Zn	700	64	1478400	H:H	1.00E+02	R	0.08	1848	H:H	4.62E-01	R	<0.04	0.00	G	0.00E+00	AR
Fluoride as F-	1500	10700	247170000	H:h	1.00E+02	R	3.0	69300	H:h	9.99E+01	R	0.3	6930	H:h	6.56E+00	R
Waste Stream classifies: H:H / H:h / G		Worst Case Scenario		H:H			Worst Case Scenario		H:H			Worst Case Scenario		H:H		
Risk to Environment: R / AR		Risk to Environment		R		R	Risk to Environment		R		R	Risk to Environment		R		R

Table A-3

CLASSIFICATION SUMMARY: WASTE STREAM - DESULPHURISATION SLAG

(Source Characterization - Iscor Vanderbijlpark Steel)

INORGANIC COMPOUNDS	[1]Acc. Risk Value (MR) ppb	NAME OF WASTE STREAM: DESULPHURISATION SLAG								VOLUME: 3,600,000 KG / MONTH						
		TOTAL ANALYSIS			[5]PROBIT RUN		TCLP EXTRACTION			[5]PROBIT RUN		ACID RAIN EXTRACTION			[5]PROBIT RUN	
		[2]Lab Conc. ppm	[3]EEC ppb	[4]Disposal Site	Risk Quantification %	Risk R / AR	[2]Lab Conc. ppm	[3]EEC ppb	[4]Disposal Site	Risk Quantification %	Risk R / AR	[2]Lab Conc. ppm	[3]EEC ppb	[4]Disposal Site	Risk Quantification %	Risk R / AR
Aluminium as Al	10000	34000	80784000	H:h	1.00E+02	R	2.7	6415	G	4.37E-06	AR	3.3	7841	G	3.40E-05	AR
Arsenic as As	430	<12	28512	H:H	1.00E+02	R	<0.02	48	G	0.00E+00	AR	<0.02	0.00	G	0.00E+00	AR
Barium as Ba	7800	159	377784	H:h	9.99E+01	R	0.45	1069	G	3.33E-14	AR	0.06	143	G	0.00E+00	AR
Cadmium as Cd	31	<10	23760	H:H	1.00E+02	R	<0.03	0.00	G	0.00E+00	AR	<0.03	0.00	G	0.00E+00	AR
Cobalt as Co	6900	5.2	12355	H:H	3.88E-02	R	<0.07	0.00	G	0.00E+00	AR	<0.07	0.00	G	0.00E+00	AR
Chromium^{3+} as Cr^{3+}	4700	1621	3851496	H:h	1.00E+02	R	<0.07	0.00	G	0.00E+00	AR	<0.07	0.00	G	0.00E+00	AR
Copper as Cu	100	24	57024	H:H	1.00E+02	R	<0.05	0.00	G	0.00E+00	AR	<0.05	0.00	G	0.00E+00	AR
Iron as Fe	9000	200000	475200000	H:h	1.00E+02	R	0.31	737	G	0.00E+00	AR	0.50	1188	G	2.22E-14	AR
Lead as Pb	100	<18	42768	H:H	1.00E+02	R	0.03	71	G	1.25E-05	AR	0.02	48	G	1.83E-07	AR
Manganese as Mn	300	29900	71042400	H:H	1.00E+02	R	0.24	570	H:H	5.86E-02	R	0.10	238	G	3.82E-05	AR
Mercury as Hg	22	<5.0	11880	H:H	1.00E+02	R	<0.02	0.00	G	0.00E+00	AR	<0.02	0.00	G	0.00E+00	AR
Nickel as Ni	1140	<66	156816	H:H	1.00E+02	R	<0.13	0.00	G	0.00E+00	AR	<0.13	0.00	G	0.00E+00	AR
Selenium as Se	260	<5.0	11880	H:H	9.99E+01	R	0.03	71	G	2.17E-10	AR	<0.02	0.00	G	0.00E+00	AR
Silver as Ag	2000	98	232848	H:h	1.00E+02	R	<0.02	0.00	G	0.00E+00	AR	<0.02	0.00	G	0.00E+00	AR
Titatium as Ti	731	2706	6429456	H:H	1.00E+02	R	0.03	71	G	0.00E+00	AR	<0.02	0.00	G	0.00E+00	AR
Vanadium as V	1300	212	503712	H:h	1.00E+02	R	0.03	71	G	0.00E+00	AR	<0.02	0.00	G	0.00E+00	AR
Zinc as Zn	700	65	154440	H:H	1.00E+02	R	<0.04	0.00	G	0.00E+00	AR	<0.04	0.00	G	0.00E+00	AR
Fluoride as F-	1500	22600	53697600	H:h	1.00E+02	R	8.0	19008	H:h	6.78E+01	R	1.7	4039	H:h	5.17E-01	R
Waste Stream classifies: H:H / H:h / G		Worst Case Scenario		H:H			Worst Case Scenario		H:H			Worst Case Scenario		H:h		
Risk to Environment: R / AR		Risk to Environment		R		R	Risk to Environment		R		R	Risk to Environment		R		R

Table A-4

CLASSIFICATION SUMMARY: WASTE STREAM - BOF SLAG (UNPROCESSED)
[Source Characterization - Iscor Vanderbijlpark Steel]

NAME OF WASTE STREAM: BOF SLAG (UNPROCESSED) — VOLUME: 35,000,000 KG / MONTH

INORGANIC COMPOUNDS	[1] Acc. Risk Value (MR) ppb	TOTAL ANALYSIS			[5] PROBIT RUN		TCLP EXTRACTION			[5] PROBIT RUN		ACID RAIN EXTRACTION			[5] PROBIT RUN	
		[2] Lab Conc. ppm	[3] EEC ppb	[4] Disposal Site	Risk Quantification %	Risk R / AR	[2] Lab Conc. ppm	[3] EEC ppb	[4] Disposal Site	Risk Quantification %	Risk R / AR	[2] Lab Conc. ppm	[3] EEC ppb	[4] Disposal Site	Risk Quantification %	Risk R / AR
Aluminium as Al	10000	26800	619080000	H:h	1.00E+02	R	1.5	34650	H:h	1.92E+00	R	0.34	7854	G	3.46E-05	AR
Arsenic as As	430	<12	277200	H:H	1.00E+02	R	<0.02	0.00	G	0.00E+00	AR	<0.02	0.00	G	0.00E+00	AR
Barium as Ba	7800	52	1201200	H:h	1.00E+02	R	0.19	4389	G	1.07E-06	AR	0.09	2079	G	1.61E-10	AR
Cadmium as Cd	31	<10	231000	H:H	1.00E+02	R	0.08	1848	H:H	1.00E+02	R	<0.03	0.00	G	0.00E+00	AR
Cobalt as Co	6900	3.8	87780	H:H	6.81E+01	R	<0.07	0.00	G	0.00E+00	AR	<0.07	0.00	G	0.00E+00	AR
Chromium[3+] as Cr^{3+}	4700	827	19103700	H:h	1.00E+02	R	<0.07	0.00	G	0.00E+00	AR	<0.07	0.00	G	0.00E+00	AR
Copper as Cu	100	<2.0	46200	H:H	1.00E+02	R	<0.05	0.00	G	0.00E+00	AR	<0.05	0.00	G	0.00E+00	AR
Iron as Fe	9000	209000	4827900000	H:h	1.00E+02	R	0.40	9240	H:h	4.38E-04	R	0.33	7623	G	7.25E-05	AR
Lead as Pb	100	<18	415800	H:H	1.00E+02	R	<0.02	0.00	G	0.00E+00	AR	<0.02	0.00	G	0.00E+00	AR
Manganese as Mn	300	40600	937860000	H:H	1.00E+02	R	0.12	2772	H:H	4.39E+01	R	0.37	8547	H:H	9.80E+01	R
Mercury as Hg	22	<5.0	115500	H:H	1.00E+02	R	<0.02	0.00	G	0.00E+00	AR	<0.02	0.00	G	0.00E+00	AR
Nickel as Ni	1140	<66	1524600	H:H	1.00E+02	R	<0.13	0.00	G	0.00E+00	AR	<0.13	0.00	G	0.00E+00	AR
Selenium as Se	260	<5.0	115500	H:H	1.00E+02	R	0.03	693	H:H	4.88E-01	R	<0.02	0.00	G	0.00E+00	AR
Silver as Ag	2000	<10	231000	H:h	1.00E+02	R	<0.02	0.00	G	0.00E+00	AR	<0.02	0.00	G	0.00E+00	AR
Titatium as Ti	731	2983	68907300	H:H	1.00E+02	R	<0.02	0.00	G	0.00E+00	AR	<0.02	0.00	G	0.00E+00	AR
Vanadium as V	1300	263	6075300	H:h	1.00E+02	R	0.11	2541	H:h	7.11E-02	R	0.07	1617	H:h	2.33E-03	R
Zinc as Zn	700	12	277200	H:H	1.00E+02	R	<0.04	0.00	G	0.00E+00	AR	<0.04	0.00	G	0.00E+00	AR
Fluoride as F-	1500	14200	328020000	H:h	1.00E+02	R	1.0	23100	H:h	8.01E+01	R	0.1	2310	H:h	1.28E-02	R
Waste Stream classifies: H:H / H:h / G		Worst Case Scenario		H:H			Worst Case Scenario		H:H			Worst Case Scenario		H:H		
Risk to Environment: R / AR		Risk to Environment		R		R	Risk to Environment		R		R	Risk to Environment		R		R

Table A-5

CLASSIFICATION SUMMARY: WASTE STREAM - EAF BAGHOUSE DUST
[Source Characterization - Iscor Vanderbijlpark Steel]

INORGANIC COMPOUNDS	[1] Acc. Risk Value (MR) ppb	NAME OF WASTE STREAM: EAF BAGHOUSE DUST											VOLUME: 1,500,000 KG / MONTH				
		TOTAL ANALYSIS			[5] PROBIT RUN		TCLP EXTRACTION			[5] PROBIT RUN		ACID RAIN EXTRACTION			[5] PROBIT RUN	
		[2] Lab Conc. ppm	[3] EEC ppb	[4] Disposal Site	Risk Quantification %	Risk R / AR	[2] Lab Conc. ppm	[3] EEC ppb	[4] Disposal Site	Risk Quantification %	Risk R / AR	[2] Lab Conc. ppm	[3] EEC ppb	[4] Disposal Site	Risk Quantification %	Risk R / AR
Aluminium as Al	10000	5900	5841000	H:h	1.00E+02	R	2.9	2871	G	4.05E-10	AR	<0.15	0.00	G	0.00E+00	AR
Arsenic as As	430	22	21780	H:H	9.99E+01	R	0.02	20	G	0.00E+00	AR	0.09	89	G	6.54E-12	AR
Barium as Ba	7800	106	104940	H:h	7.19E+01	R	0.40	396	G	0.00E+00	AR	0.04	40	G	0.00E+00	AR
Cadmium as Cd	31	<10	9900	H:H	1.00E+02	R	0.11	109	H:H	2.05E+00	R	<0.03	0.00	G	0.00E+00	AR
Cobalt as Co	6900	8.1	8019	H:H	1.31E-03	R	<0.07	0.00	G	0.00E+00	AR	<0.07	0.00	G	0.00E+00	AR
Chromium^{3+} as Cr^{3+}	4700	658	651420	H:h	1.00E+02	R	1.8	1782	G	1.18E-08	AR	2.8	2772	G	1.78E-06	AR
Copper as Cu	100	551	545490	H:H	1.00E+02	R	<0.05	0.00	G	0.00E+00	AR	<0.05	0.00	G	0.00E+00	AR
Iron as Fe	9000	462000	457380000	H:h	1.00E+02	R	<0.05	0.00	G	0.00E+00	AR	0.21	208	G	0.00E+00	AR
Lead as Pb	100	1189	1177110	H:H	1.00E+02	R	0.06	59	G	1.79E-06	AR	<0.02	0.00	G	0.00E+00	AR
Manganese as Mn	300	36700	36333000	H:H	1.00E+02	R	37	36630	H:H	1.00E+02	R	0.02	20	G	0.00E+00	AR
Mercury as Hg	22	<5.0	4950	H:H	1.00E+02	R	<0.02	0.00	G	0.00E+00	AR	<0.02	0.00	G	0.00E+00	AR
Nickel as Ni	1140	<66	65340	H:H	1.00E+02	R	<0.13	0.00	G	0.00E+00	AR	<0.13	0.00	G	0.00E+00	AR
Selenium as Se	260	<5.0	4950	H:H	8.96E+01	R	0.06	59	G	2.12E-11	AR	0.02	20	G	0.00E+00	AR
Silver as Ag	2000	14	13860	H:h	2.37E+01	R	<0.02	0.00	G	0.00E+00	AR	<0.02	0.00	G	0.00E+00	AR
Titatium as Ti	731	552	546480	H:H	1.00E+02	R	<0.02	0.00	G	0.00E+00	AR	<0.02	0.00	G	0.00E+00	AR
Vanadium as V	1300	50	49500	H:h	9.96E+01	R	0.03	30	G	0.00E+00	AR	0.17	168	G	1.11E-14	AR
Zinc as Zn	700	26400	26136000	H:H	1.00E+02	R	51	50490	H:H	1.00E+02	R	<0.04	0.00	G	0.00E+00	AR
Fluoride as F-	1500	22600	22374000	H:h	1.00E+02	R	13	12870	H:h	3.82E+01	R	0.1	99	G	0.00E+00	AR
Waste Stream classifies: H:H / H:h / G		Worst Case Scenario		H:H			Worst Case Scenario		H:H			Worst Case Scenario		G		
Risk to Environment: R / AR		Risk to Environment		R		R	Risk to Environment		R		R	Risk to Environment		AR		AR

Table A-6

CLASSIFICATION SUMMARY: WASTE STREAM • LADLE FURNACE 1&2 BAGHOUSE DUST

[Source Characterization - Iscor Vanderbijlpark Steel]

INORGANIC COMPOUNDS	[1] Acc. Risk Value (MR) ppb	NAME OF WASTE STREAM: LADLE FURNACE 1&2 BAGHOUSE DUST										VOLUME: 10,000 KG / MONTH				
		TOTAL ANALYSIS			[5] PROBIT RUN		TCLP EXTRACTION			[5] PROBIT RUN		ACID RAIN EXTRACTION			[5] PROBIT RUN	
		[2] Lab Conc. ppm	[3] EEC ppb	[4] Disposal Site	Risk Quantification %	Risk R / AR	[2] Lab Conc. ppm	[3] EEC ppb	[4] Disposal Site	Risk Quantification %	Risk R / AR	[2] Lab Conc. ppm	[3] EEC ppb	[4] Disposal Site	Risk Quantification %	Risk R / AR
Aluminium as Al	10000	24400	161040	H:h	8.24E+01	R	3.9	25.7	G	0.00E+00	AR	1.9	12.5	G		AR
Arsenic as As	430	24	158	G	8.15E-09	AR	0.02	0.132	G	0.00E+00	AR	0.04	0.264	G	0.00E+00	AR
Barium as Ba	7800	52	343	G	0.00E+00	AR	0.73	4.82	G	0.00E+00	AR	0.27	1.78	G	0.00E+00	AR
Cadmium as Cd	31	< 10	66	H:H	1.25E-01	R	< 0.03	0.00	G	0.00E+00	AR	< 0.03	0.00	G	0.00E+00	AR
Cobalt as Co	6900	4.0	26	G	0.00E+00	AR	< 0.07	0.00	G	0.00E+00	AR	< 0.07	0.00	G	0.00E+00	AR
Chromium^{3+} as Cr^{3+}	4700	99	653	G	3.33E-14	AR	< 0.07	0.00	G	0.00E+00	AR	< 0.07	0.00	G	0.00E+00	AR
Copper as Cu	100	148	977	H:H	4.82E+01	R	< 0.05	0.00	G	0.00E+00	AR	< 0.05	0.00	G	0.00E+00	AR
Iron as Fe	9000	112000	739200	H:h	1.00E+02	R	< 0.05	0.00	G	0.00E+00	AR	0.09	0.594	G	0.00E+00	AR
Lead as Pb	100	103	680	H:H	2.26E+01	R	0.66	4.40	G	0.00E+00	AR	0.54	3.60	G	0.00E+00	AR
Manganese as Mn	300	19800	130680	H:H	1.00E+02	R	0.05	0.330	G	0.00E+00	AR	0.03	0.198	G	0.00E+00	AR
Mercury as Hg	22	< 5.0	33	H:H	1.05E-02	R	< 0.02	0.00	G	0.00E+00	AR	< 0.02	0.00	G	0.00E+00	AR
Nickel as Ni	1140	< 66	436	G	1.31E-08	AR	< 0.13	0.00	G	0.00E+00	AR	< 0.13	0.00	G	0.00E+00	AR
Selenium as Se	260	< 5.0	33	G	1.11E-14	AR	0.23	1.52	G	0.00E+00	AR	0.10	0.660	G	0.00E+00	AR
Silver as Ag	2000	< 10	66	G	0.00E+00	AR	< 0.02	0.00	G	0.00E+00	AR	< 0.02	0.00	G	0.00E+00	AR
Titatium as Ti	731	117	772	H:H	5.65E-04	R	0.05	0.330	G	0.00E+00	AR	< 0.02	0.00	G	0.00E+00	AR
Vanadium as V	1300	< 41	271	G	7.17E-12	AR	< 0.02	0.00	G	0.00E+00	AR	< 0.02	0.00	G	0.00E+00	AR
Zinc as Zn	700	814	5372	H:H	3.03E+01	R	0.13	0.858	G	0.00E+00	AR	< 0.04	0.00	G	0.00E+00	AR
Fluoride as F-	1500	379300	2503380	H:h	1.00E+02	AR	122	805	G	6.37E-07	AR	8.0	52.8	G	0.00E+00	AR
Waste Stream classifies: H:H / H:h / G		Worst Case Scenario		H:H			Worst Case Scenario		G			Worst Case Scenario		G		
Risk to Environment: R / AR		Risk to Environment		R		R	Risk to Environment		AR		AR	Risk to Environment		AR		AR

Table A-7

CLASSIFICATION SUMMARY: WASTE STREAM • BOF BAGHOUSE 2 DUST

[Source Characterization - Iscor Vanderbijlpark Steel]

NAME OF WASTE STREAM: BOF BAGHOUSE 2 DUST — **VOLUME: 200,000 KG / MONTH**

INORGANIC COMPOUNDS	[1] Acc. Risk Value (MR) ppb	TOTAL ANALYSIS [2] Lab Conc. ppm	[3] EEC ppb	[4] Disposal Site	[5] PROBIT RUN Risk Quantification %	Risk R / AR	TCLP EXTRACTION [2] Lab Conc. ppm	[3] EEC ppb	[4] Disposal Site	[5] PROBIT RUN Risk Quantification %	Risk R / AR	ACID RAIN EXTRACTION [2] Lab Conc. ppm	[3] EEC ppb	[4] Disposal Site	[5] PROBIT RUN Risk Quantification %	Risk R / AR
Aluminium as Al	10000	9900	1306800	H:h	1.00E+02	R	3.7	488	G	0.00E+00	AR	1.7	224	G	0.00E+00	AR
Arsenic as As	430	79	10428	H:H	9.58E+01	R	0.12	15.80	G	0.00E+00	AR	0.04	5.30	G	0.00E+00	AR
Barium as Ba	7800	44	5808	G	2.03E-05	AR	0.65	85.8	G	0.00E+00	AR	0.35	46	G	0.00E+00	AR
Cadmium as Cd	31	<10	1320	H:H	9.98E+01	R	<0.03	0.00	G	0.00E+00	AR	<0.03	0.00	G	0.00E+00	AR
Cobalt as Co	6900	6.9	911	G	2.22E-14	AR	<0.07	0.00	G	0.00E+00	AR	<0.07	0.00	G	0.00E+00	AR
Chromium^{3+} as Cr^{3+}	4700	62	8184	H:h	3.18E-02	R	<0.07	0.00	G	0.00E+00	AR	<0.07	0.00	G	0.00E+00	AR
Copper as Cu	100	15	1980	H:H	9.09E+01	R	<0.05	0.00	G	0.00E+00	AR	<0.05	0.00	G	0.00E+00	AR
Iron as Fe	9000	311000	41052000	H:h	1.00E+02	R	0.48	63.4	G	0.00E+00	AR	0.24	31.7	G	0.00E+00	AR
Lead as Pb	100	<18	2376	H:H	9.55E+01	R	<0.02	0.00	G	0.00E+00	AR	<0.02	0.00	G	0.00E+00	AR
Manganese as Mn	300	3100	409200	H:H	1.00E+02	R	0.02	2.64	G	0.00E+00	AR	<0.01	0.00	G	0.00E+00	AR
Mercury as Hg	22	<5.0	660	H:H	9.84E+01	R	<0.02	0.00	G	0.00E+00	AR	<0.02	0.00	G	0.00E+00	AR
Nickel as Ni	1140	<66	8712	H:H	3.00E+01	R	<0.13	0.00	G	0.00E+00	AR	<0.13	0.00	G	0.00E+00	AR
Selenium as Se	260	<5.0	660	H:H	3.69E-01	R	0.07	9.24	G	0.00E+00	AR	<0.02	0.00	G	0.00E+00	AR
Silver as Ag	2000	13	1716	G	8.21E-05	AR	<0.02	0.00	G	0.00E+00	AR	<0.02	0.00	G	0.00E+00	AR
Titatium as Ti	731	1742	229944	H:H	1.00E+02	R	0.05	6.60	G	0.00E+00	AR	<0.02	0.00	G	0.00E+00	AR
Vanadium as V	1300	<41	5412	H:h	4.34E+00	R	<0.02	0.00	G	0.00E+00	AR	<0.02	0.00	G	0.00E+00	AR
Zinc as Zn	700	1268	167376	H:H	1.00E+02	R	0.32	42.20	G	0.00E+00	AR	<0.04	0.00	G	0.00E+00	AR
Fluoride as F-	1500	59300	7827600	H:h	1.00E+02	R	20	2640	H:h	3.43E-02	R	7.7	1016	G	7.71E-06	AR

Waste Stream classifies: H:H / H:h / G	Worst Case Scenario	H:H			Worst Case Scenario	H:h			Worst Case Scenario	G		
Risk to Environment: R / AR	Risk to Environment	R		R	Risk to Environment	R		R	Risk to Environment	AR		AR

Table A-8

CLASSIFICATION SUMMARY: WASTE STREAM ♦ BOF BAGHOUSE 3 DUST
[Source Characterization - Iscor Vanderbijlpark Steel]

WASTE STREAM NAME: BOF BAGHOUSE 3 DUST — **VOLUME: 100,000 KG / MONTH**

INORGANIC COMPOUNDS	[1] Acc. Risk Value (MR) ppb	TOTAL ANALYSIS [2] Lab Conc. ppm	[3] EEC ppb	[4] Disposal Site	[5] PROBIT RUN Risk Quantification %	Risk R / AR	TCLP EXTRACTION [2] Lab Conc. ppm	[3] EEC ppb	[4] Disposal Site	[5] PROBIT RUN Risk Quantification %	Risk R / AR
Aluminium as Al	10000	5200	343200	H:h	9.92E+01	R	2.3	152	G	0.00E+00	AR
Arsenic as As	430	22	1452	H:H	1.69E+00	R	< 0.02	0.00	G	0.00E+00	AR
Barium as Ba	7800	17	1122	G	5.55E-14	AR	0.33	21.8	G	0.00E+00	AR
Cadmium as Cd	31	< 10	660	H:H	9.30E+01	R	0.15	9.90	H:h	1.50E-09	R
Cobalt as Co	6900	4.4	290	G	0.00E+00	AR	< 0.07	0.00	G	0.00E+00	AR
Chromium^{3+} as Cr^{3+}	4700	90	5940	H:h	2.66E-03	R	< 0.07	0.00	G	0.00E+00	AR
Copper as Cu	100	22	1452	H:H	7.67E+01	R	< 0.05	0.00	G	0.00E+00	AR
Iron as Fe	9000	561000	37026000	H:h	1.00E+02	R	0.19	12.5	G	0.00E+00	AR
Lead as Pb	100	361	23826	H:H	1.00E+02	R	0.02	1.3	G	0.00E+00	AR
Manganese as Mn	300	10200	673200	H:H	1.00E+02	R	42	2772	H:H	4.39E+01	R
Mercury as Hg	22	< 5.0	330	H:H	7.86E+01	R	< 0.02	0.00	G	0.00E+00	AR
Nickel as Ni	1140	< 66	4356	H:H	3.00E+00	R	< 0.13	0.00	G	0.00E+00	AR
Selenium as Se	260	< 5.0	330	H:H	2.75E-03	R	0.04	2.6	G	0.00E+00	AR
Silver as Ag	2000	< 10	660	G	2.23E-09	AR	< 0.02	0.00	G	0.00E+00	AR
Titatium as Ti	731	720	47520	H:H	1.00E+02	R	< 0.02	0.00	G	0.00E+00	AR
Vanadium as V	1300	< 41	2706	H:h	1.08E-01	R	< 0.02	0.00	G	0.00E+00	AR
Zinc as Zn	700	10200	673200	H:H	1.00E+02	R	126	8316	H:H	6.32E+01	R
Fluoride as F-	1500	22300	1471800	H:h	1.00E+02	R	8.0	528	G	4.87E-09	AR
Waste Stream classifies: H:H / H:h / G		Worst Case Scenario		H:H			Worst Case Scenario		H:H		
Risk to Environment: R / AR		Risk to Environment		R		R	Risk to Environment		R		R

INORGANIC COMPOUNDS	ACID RAIN EXTRACTION [2] Lab Conc. ppm	[3] EEC ppb	[4] Disposal Site	[5] PROBIT RUN Risk Quantification %	Risk R / AR
Aluminium as Al	4.2	277	G	0.00E+00	AR
Arsenic as As	< 0.02	0.00	G	0.00E+00	AR
Barium as Ba	0.11	7.3	G	0.00E+00	AR
Cadmium as Cd	< 0.03	0.00	G	0.00E+00	AR
Cobalt as Co	< 0.07	0.00	G	0.00E+00	AR
Chromium^{3+} as Cr^{3+}	< 0.07	0.00	G	0.00E+00	AR
Copper as Cu	< 0.05	0.00	G	0.00E+00	AR
Iron as Fe	0.94	62	G	0.00E+00	AR
Lead as Pb	0.09	5.90	G	0.00E+00	AR
Manganese as Mn	< 0.01	0.00	G	0.00E+00	AR
Mercury as Hg	< 0.02	0.00	G	0.00E+00	AR
Nickel as Ni	< 0.13	0.00	G	0.00E+00	AR
Selenium as Se	< 0.02	0.00	G	0.00E+00	AR
Silver as Ag	< 0.02	0.00	G	0.00E+00	AR
Titatium as Ti	< 0.02	0.00	G	0.00E+00	AR
Vanadium as V	< 0.02	0.00	G	0.00E+00	AR
Zinc as Zn	0.45	30	G	0.00E+00	AR
Fluoride as F-	3.6	238	G	2.11E-13	AR
Waste Stream classifies	Worst Case Scenario		G		
Risk to Environment	Risk to Environment		AR		AR

Table A-9

CLASSIFICATION SUMMARY: WASTE STREAM • BOF BAGHOUSE 1 DUST

[Source Characterization - Iscor Vanderbijlpark Steel]

INORGANIC COMPOUNDS	[1]Acc. Risk Value (MR) ppb	NAME OF WASTE STREAM: BOF BAGHOUSE 1 DUST											VOLUME: 100,000 KG / MONTH				
		TOTAL ANALYSIS			[5]PROBIT RUN		TCLP EXTRACTION			[5]PROBIT RUN		ACID RAIN EXTRACTION			[5]PROBIT RUN	
		[2]Lab Conc. ppm	[3]EEC ppb	[4]Disposal Site	Risk Quantification %	Risk R / AR	[2]Lab Conc. ppm	[3]EEC ppb	[4]Disposal Site	Risk Quantification %	Risk R / AR	[2]Lab Conc. ppm	[3]EEC ppb	[4]Disposal Site	Risk Quantification %	Risk R / AR
Aluminium as Al	10000	12400	818400	H:h	1.00E+02	R	2.5	165	G	0.00E+00	AR	1.3	86	G	0.00E+00	AR
Arsenic as As	430	19	1254	H:H	8.01E-01	R	0.03	2.00	G	0.00E+00	AR	<0.02	0.00	G	0.00E+00	AR
Barium as Ba	7800	26	1716	G	1.43E-11	AR	0.13	8.6	G	0.00E+00	AR	0.07	4.6	G	0.00E+00	AR
Cadmium as Cd	31	<10	660	H:H	9.30E+01	R	<0.03	0.00	G	0.00E+00	AR	<0.03	0.00	G	0.00E+00	AR
Cobalt as Co	6900	11.0	726	G	0.00E+00	AR	0.09	5.90	G	0.00E+00	AR	<0.07	0.00	G	0.00E+00	AR
Chromium^{3+} as Cr^{3+}	4700	10200	673200	H:h	1.00E+02	R	6.9	455	G	0.00E+00	AR	7.3	482	G	0.00E+00	AR
Copper as Cu	100	42	2772	H:H	9.77E+01	R	<0.05	0.00	G	0.00E+00	AR	<0.05	0.00	G	0.00E+00	AR
Iron as Fe	9000	151000	9966000	H:h	1.00E+02	R	0.10	6.6	G	0.00E+00	AR	0.21	14	G	0.00E+00	AR
Lead as Pb	100	62	4092	H:H	9.97E+01	R	0.03	2.0	G	0.00E+00	AR	0.06	4.00	G	0.00E+00	AR
Manganese as Mn	300	127000	8382000	H:H	1.00E+02	R	0.11	7.3	G	0.00E+00	AR	0.32	21	G	0.00E+00	AR
Mercury as Hg	22	<5.0	330	H:H	7.86E+01	R	<0.02	0.00	G	0.00E+00	AR	<0.02	0.00	G	0.00E+00	AR
Nickel as Ni	1140	<66	4356	H:H	3.00E+00	R	<0.13	0.00	G	0.00E+00	AR	<0.13	0.00	G	0.00E+00	AR
Selenium as Se	260	<5.0	330	H:H	2.75E-03	R	0.18	12	G	0.00E+00	AR	<0.02	0.00	G	0.00E+00	AR
Silver as Ag	2000	20	1320	G	5.88E-06	AR	<0.02	0.00	G	0.00E+00	AR	<0.02	0.00	G	0.00E+00	AR
Titatium as Ti	731	551	36366	H:H	9.99E+01	R	0.03	2.00	G	0.00E+00	AR	<0.02	0.00	G	0.00E+00	AR
Vanadium as V	1300	150	9900	H:h	2.97E+01	R	<0.02	0.00	G	0.00E+00	AR	<0.02	0.00	G	0.00E+00	AR
Zinc as Zn	700	406	26796	H:H	9.96E+01	R	0.16	11.0	G	0.00E+00	AR	<0.04	0.00	G	0.00E+00	AR
Fluoride as F-	1500	194400	12830400	H:h	1.00E+02	R	9.0	594	G	1.98E-08	AR	8.3	548	G	7.61E-09	AR
Waste Stream classifies: H:H / H:h / G		Worst Case Scenario		H:H			Worst Case Scenario		G			Worst Case Scenario		G		
Risk to Environment: R / AR		Risk to Environment		R		R	Risk to Environment		AR		AR	Risk to Environment		AR		AR

Table A-10

CLASSIFICATION SUMMARY: WASTE STREAM • CONTINEOUS CASTER V3 SLUDGE

[Source Characterization - Iscor Vanderbijlpark Steel]

NAME OF WASTE STREAM: CONTINEOUS CASTER V3 SLUDGE — VOLUME: 31,000 KG / MONTH

INORGANIC COMPOUNDS	[1]Acc. Risk Value (MR) ppb	TOTAL ANALYSIS			[5]PROBIT RUN		TCLP EXTRACTION			[5]PROBIT RUN		ACID RAIN EXTRACTION			[5]PROBIT RUN	
		[2]Lab Conc. ppm	[3]EEC ppb	[4]Disposal Site	Risk Quantification %	Risk R / AR	[2]Lab Conc. ppm	[3]EEC ppb	[4]Disposal Site	Risk Quantification %	Risk R / AR	[2]Lab Conc. ppm	[3]EEC ppb	[4]Disposal Site	Risk Quantification %	Risk R / AR
Aluminium as Al	10000	<400	8184	G	5.19E-05	AR	<0.15	0.00	G	0.00E+00	AR	<0.15	0.00	G	0.00E+00	AR
Arsenic as As	430	<12	246	G	1.28E-06	AR	<0.02	0.00	G	0.00E+00	AR	<0.02	0.00	G	0.00E+00	AR
Barium as Ba	7800	20	409	G	0.00E+00	AR	0.32	6.55	G	0.00E+00	AR	0.13	2.66	G	0.00E+00	AR
Cadmium as Cd	31	<10	205	H:H	2.10E+01	R	0.20	4.09	H:h	2.22E-14	R	<0.03	0.00	G	0.00E+00	AR
Cobalt as Co	3900	9.6	196	G	0.00E+00	AR	<0.07	0.00	G	0.00E+00	AR	<0.07	0.00	G	0.00E+00	AR
Chromium^{3+} as Cr^{3+}	4700	233	4767	H:h	3.93E-04	R	<0.07	0.00	G	0.00E+00	AR	<0.07	0.00	G	0.00E+00	AR
Copper as Cu	100	36	737	H:H	2.76E+01	R	<0.05	0.00	G	0.00E+00	AR	<0.05	0.00	G	0.00E+00	AR
Iron as Fe	900	731000	14956260	H:h	1.00E+02	R	931	19048	H:h	1.20E-01	R	171	3499	G	1.59E-08	AR
Lead as Pb	100	<18	368	H:H	2.54E+00	R	0.07	1.43	G	0.00E+00	AR	0.04	0.82	G	0.00E+00	AR
Manganese as Mn	300	1400	28644	H:H	1.00E+02	R	2.6	53.2	G	8.99E-13	AR	0.24	4.91	G	0.00E+00	AR
Mercury as Hg	22	<5.0	102	H:H	6.65E+00	R	<0.02	0.00	G	0.00E+00	AR	<0.02	0.00	G	0.00E+00	AR
Nickel as Ni	1140	<66	1350	H:H	1.54E-03	R	<0.13	0.00	G	0.00E+00	AR	<0.13	0.00	G	0.00E+00	AR
Selenium as Se	260	<5.0	102	G	1.77E-08	AR	<0.02	0.00	G	0.00E+00	AR	<0.02	0.00	G	0.00E+00	AR
Silver as Ag	2000	<10	205	G	0.00E+00	AR	<0.02	0.00	G	0.00E+00	AR	<0.02	0.00	G	0.00E+00	AR
Titatium as Ti	731	179	3662	H:H	8.84E+00	R	0.05	1.02	G	0.00E+00	AR	<0.02	0.00	G	0.00E+00	AR
Vanadium as V	1300	<41	839	G	4.65E-06	AR	0.02	0.41	G	0.00E+00	AR	<0.02	0.00	G	0.00E+00	AR
Zinc as Zn	700	14	286	G	2.86E-08	AR	0.14	2.86	G	0.00E+00	AR	<0.04	0.00	G	0.00E+00	AR
Fluoride as F-	1500	9400	192324	H:h	1.00E+02	R	0.2	4.09	G	0.00E+00	AR	<0.1	0.00	G	0.00E+00	AR
Waste Stream classifies: H:H / H:h / G		Worst Case Scenario		H:H			Worst Case Scenario		H:h			Worst Case Scenario		G		
Risk to Environment: R / AR		Risk to Environment		R		R	Risk to Environment		R		R	Risk to Environment		AR		AR

Table A-11

CLASSIFICATION SUMMARY: WASTE STREAM - SINTER AG 100 DUST

[Waste Characterization - Iscor Vanderbijlpark Steel]

INORGANIC COMPOUNDS	[1] Acc. Risk Value (MR) ppb	NAME OF WASTE STREAM: SINTER AG 100 DUST											VOLUME: 20,000 KG / MONTH				
		TOTAL ANALYSIS			[5] PROBIT RUN		TCLP EXTRACTION			[5] PROBIT RUN		ACID RAIN EXTRACTION			[5] PROBIT RUN	
		[2] Lab Conc. ppm	[3] EEC ppb	[4] Disposal Site	Risk Quantification %	Risk R / AR	[2] Lab Conc. ppm	[3] EEC ppb	[4] Disposal Site	Risk Quantification %	Risk R / AR	[2] Lab Conc. ppm	[3] EEC ppb	[4] Disposal Site	Risk Quantification %	Risk R / AR
Aluminium as Al	10000	10700	141240	H:h	7.50E+01	R	2.4	31.7	G	0.00E+00	AR	0.84	11.1	G	0.00E+00	AR
Arsenic as As	430	<12	158	G	8.15E-09	AR	0.03	0.396	G	0.00E+00	AR	<0.02	0.00	G	0.00E+00	AR
Barium as Ba	7800	200	2640	G	3.04E-09	AR	0.73	9.60	G	0.00E+00	AR	0.28	3.7	G	0.00E+00	AR
Cadmium as Cd	31	<10	132	H:H	4.76E+00	R	<0.03	0.396	G	0.00E+00	AR	<0.03	0.00	G	0.00E+00	AR
Cobalt as Co	690	5.9	78	G	0.00E+00	AR	<0.07	0.924	G	0.00E+00	AR	<0.07	0.00	G	0.00E+00	AR
Chromium^{3+} as Cr^{3+}	470	96	1267	G	1.85E-10	AR	<0.07	0.924	G	0.00E+00	AR	<0.07	0.00	G	0.00E+00	AR
Copper as Cu	100	8.2	108	H:H	6.89E-04	R	<0.05	0.660	G	0.00E+00	AR	<0.05	0.00	G	0.00E+00	AR
Iron as Fe	9000	414000	5464800	H:h	1.00E+02	R	0.55	7.26	G	0.00E+00	AR	0.14	1.85	G	0.00E+00	AR
Lead as Pb	100	<18	238	H:H	2.51E-01	R	<0.02	0.264	G	0.00E+00	AR	<0.02	0.00	G	0.00E+00	AR
Manganese as Mn	300	9300	122760	H:H	1.00E+02	R	0.04	0.528	G	0.00E+00	AR	0.03	0.396	G	0.00E+00	AR
Mercury as Hg	22	<5.0	66	H:H	9.31E-01	R	<0.02	0.264	G	0.00E+00	AR	<0.02	0.00	G	0.00E+00	AR
Nickel as Ni	1140	<66	871	G	2.63E-05	AR	<0.13	1.72	G	0.00E+00	AR	<0.13	0.00	G	0.00E+00	AR
Selenium as Se	260	<5.0	66	G	8.72E-11	AR	<0.02	0.264	G	0.00E+00	AR	<0.02	0.00	G	0.00E+00	AR
Silver as Ag	2000	<10	132	G	0.00E+00	AR	<0.02	0.264	G	0.00E+00	AR	<0.02	0.00	G	0.00E+00	AR
Titatium as Ti	731	710	9372	H:H	6.86E+01	R	0.07	0.924	G	0.00E+00	AR	<0.02	0.00	G	0.00E+00	AR
Vanadium as V	1300	<41	541	G	3.54E-08	AR	0.07	0.924	G	0.00E+00	AR	<0.02	0.00	G	0.00E+00	AR
Zinc as Zn	700	36	475	G	7.85E-06	AR	0.06	0.792	G	0.00E+00	AR	<0.04	0.00	G	0.00E+00	AR
Fluoride as F-	1500	9600	126720	H:h	1.00E+02	R	<0.1	1.32	G	0.00E+00	AR	1.9	25.1	G	0.00E+00	AR
Waste Stream classifies: H:H / H:h / G		Worst Case Scenario		H:H			Worst Case Scenario		G			Worst Case Scenario		G		
Risk to Environment: R / AR		Risk to Environment		R		R	Risk to Environment		AR		AR	Risk to Environment		AR		AR

Table A-12

CLASSIFICATION SUMMARY: WASTE STREAM - SINTER BG 100 DUST

[Waste Characterization - Iscor Vanderbijlpark Steel]

INORGANIC COMPOUNDS	[1]Acc. Risk Value (MR) ppb	NAME OF WASTE STREAM: SINTER BG 100 DUST									VOLUME: 20,000 KG / MONTH					
		TOTAL ANALYSIS			[5]PROBIT RUN		TCLP EXTRACTION			[5]PROBIT RUN		ACID RAIN EXTRACTION			[5]PROBIT RUN	
		[2]Lab Conc. ppm	[3]EEC ppb	[4]Disposal Site	Risk Quantification %	Risk R / AR	[2]Lab Conc. ppm	[3]EEC ppb	[4]Disposal Site	Risk Quantification %	Risk R / AR	[2]Lab Conc. ppm	[3]EEC ppb	[4]Disposal Site	Risk Quantification %	Risk R / AR
Aluminium as Al	10000	13400	176880	H:h	8.68E+01	R	2.5	33	G	0.00E+00	AR	1.0	13.2	G	0.00E+00	AR
Arsenic as As	430	< 12	158	G	8.15E-09	AR	0.02	0.264	G	0.00E+00	AR	< 0.02	0.264	G	0.00E+00	AR
Barium as Ba	7800	234	3089	G	1.98E-08	AR	0.82	11	G	0.00E+00	AR	0.60	7.92	G	0.00E+00	AR
Cadmium as Cd	31	< 10	132	H:H	4.76E+00	R	< 0.03	0.00	G	0.00E+00	AR	< 0.03	0.396	G	0.00E+00	AR
Cobalt as Co	6900	7.0	92	G	0.00E+00	AR	< 0.07	0.00	G	0.00E+00	AR	< 0.07	0.924	G	0.00E+00	AR
Chromium^{3+} as Cr^{3+}	4700	93	1228	G	1.25E-10	AR	< 0.07	0.00	G	0.00E+00	AR	< 0.07	0.924	G	0.00E+00	AR
Copper as Cu	100	10	132	H:H	3.80E-03	R	< 0.05	0.00	G	0.00E+00	AR	< 0.05	0.660	G	0.00E+00	AR
Iron as Fe	9000	386000	5095200	H:h	1.00E+02	R	< 0.05	0.00	G	0.00E+00	AR	0.11	1.45	G	0.00E+00	AR
Lead as Pb	100	< 18	238	H:H	2.51E-01	R	< 0.02	0.00	G	0.00E+00	AR	< 0.02	0.264	G	0.00E+00	AR
Manganese as Mn	300	8700	114840	H:H	1.00E+02	R	0.01	0.132	G	0.00E+00	AR	< 0.01	0.132	G	0.00E+00	AR
Mercury as Hg	22	< 5.0	66	H:H	9.31E-01	R	< 0.02	0.00	G	0.00E+00	AR	< 0.02	0.264	G	0.00E+00	AR
Nickel as Ni	1140	< 66	871	G	2.63E-05	AR	< 0.13	0.00	G	0.00E+00	AR	< 0.13	1.72	G	0.00E+00	AR
Selenium as Se	260	< 5.0	66	G	8.72E-11	AR	0.03	0.396	G	0.00E+00	AR	< 0.02	0.264	G	0.00E+00	AR
Silver as Ag	2000	< 10	132	G	0.00E+00	AR	< 0.02	0.00	G	0.00E+00	AR	< 0.02	0.264	G	0.00E+00	AR
Titatium as Ti	731	865	11418	H:H	8.08E+01	R	0.03	0.396	G	0.00E+00	AR	< 0.02	0.264	G	0.00E+00	AR
Vanadium as V	1300	< 41	541	G	3.54E-08	AR	0.05	0.660	G	0.00E+00	AR	< 0.02	0.264	G	0.00E+00	AR
Zinc as Zn	700	48	634	G	1.38E-04	AR	< 0.04	0.00	G	0.00E+00	AR	< 0.04	0.528	G	0.00E+00	AR
Fluoride as F-	1500	10500	138600	H:h	1.00E+02	R	0.3	4.0	G	0.00E+00	AR	2.6	34.3	G	0.00E+00	AR
Waste Stream classifies: H:H / H:h / G		Worst Case Scenario		H:H			Worst Case Scenario		G			Worst Case Scenario		G		
Risk to Environment: R / AR		Risk to Environment		R		R	Risk to Environment		AR		AR	Risk to Environment		AR		AR

Table A-13

CLASSIFICATION SUMMARY: WASTE STREAM - SINTER CG 100 DUST
[Waste Characterization - Iscor Vanderbijlpark Steel]

INORGANIC COMPOUNDS	[1] Acc. Risk Value (MR) ppb	NAME OF WASTE STREAM: SINTER CG 100 DUST										VOLUME: 30,000 KG / MONTH				
		TOTAL ANALYSIS			[5] PROBIT RUN		TCLP EXTRACTION			[5] PROBIT RUN		ACID RAIN EXTRACTION			[5] PROBIT RUN	
		[2] Lab Conc. ppm	[3] EEC ppb	[4] Disposal Site	Risk Quantification %	Risk R / AR	[2] Lab Conc. ppm	[3] EEC ppb	[4] Disposal Site	Risk Quantification %	Risk R / AR	[2] Lab Conc. ppm	[3] EEC ppb	[4] Disposal Site	Risk Quantification %	Risk R / AR
Aluminium as Al	10000	<400	7920	G	3.76E-05	AR	2.6	51.5	G	0.00E+00	AR	0.18	3.6	G	0.00E+00	AR
Arsenic as As	430	<12	238	G	8.94E-07	AR	<0.02	0.00	G	0.00E+00	AR	<0.02	0.00	G	0.00E+00	AR
Barium as Ba	7800	7.8	154	G	0.00E+00	AR	0.41	8.12	G	0.00E+00	AR	0.20	4.0	G	0.00E+00	AR
Cadmium as Cd	31	<10	198	H:H	1.91E+01	R	<0.03	0.00	G	0.00E+00	AR	<0.03	0.00	G	0.00E+00	AR
Cobalt as Co	6900	3.5	69	G	0.00E+00	AR	<0.07	0.00	G	0.00E+00	AR	<0.07	0.00	G	0.00E+00	AR
Chromium^{3+} as Cr^{3+}	4700	10	198	G	0.00E+00	AR	<0.07	0.00	G	0.00E+00	AR	<0.07	0.00	G	0.00E+00	AR
Copper as Cu	100	<2.0	40	G	2.23E-08	AR	<0.05	0.00	G	0.00E+00	AR	<0.05	0.00	G	0.00E+00	AR
Iron as Fe	9000	3200	63360	H:h	2.46E+01	R	0.17	3.37	G	0.00E+00	AR	<0.05	0.00	G	0.00E+00	AR
Lead as Pb	100	<18	356	H:H	2.18E+00	R	<0.02	0.00	G	0.00E+00	AR	<0.02	0.00	G	0.00E+00	AR
Manganese as Mn	300	4800	95040	H:H	1.00E+02	R	22	436	H:H	8.20E-03	R	0.91	18	G	0.00E+00	AR
Mercury as Hg	22	<5.0	99	H:H	5.93E+00	R	<0.02	0.00	G	0.00E+00	AR	<0.02	0.00	G	0.00E+00	AR
Nickel as Ni	1140	<66	1307	H:H	1.16E-03	R	<0.13	0.00	G	0.00E+00	AR	<0.13	0.00	G	0.00E+00	AR
Selenium as Se	260	39	772	H:H	8.82E-01	R	<0.02	0.00	G	0.00E+00	AR	<0.02	0.00	G	0.00E+00	AR
Silver as Ag	2000	<10	198	G	0.00E+00	AR	<0.02	0.00	G	0.00E+00	AR	<0.02	0.00	G	0.00E+00	AR
Titatium as Ti	731	36	713	G	2.75E-04	AR	0.03	0.59	G	0.00E+00	AR	<0.02	0.00	G	0.00E+00	AR
Vanadium as V	1300	<41	812	G	3.29E-06	AR	<0.02	0.00	G	0.00E+00	AR	<0.02	0.00	G	0.00E+00	AR
Zinc as Zn	700	48	950	H:H	4.76E-03	R	0.11	2.18	G	0.00E+00	AR	<0.04	0.00	G	0.00E+00	AR
Fluuride as F-	1500	10500	207900	H:h	1.00E+02	R	0.2	4.0	G	0.00E+00	AR	<0.1	0.00	G	0.00E+00	AR
Waste Stream classifies: H:H / H:h / G		Worst Case Scenario		H:H			Worst Case Scenario		H:H			Worst Case Scenario		G		
Risk to Environment: R / AR		Risk to Environment		R		R	Risk to Environment		R		R	Risk to Environment		AR		AR

Table A-14

CLASSIFICATION SUMMARY: WASTE STREAM - BF C DUST
[Waste Characterization - Iscor Vanderbijlpark Steel]

INORGANIC COMPOUNDS	[1]Acc. Risk Value (MR) ppb	NAME OF WASTE STREAM: BF C DUST										VOLUME: 3,800,000 KG / MONTH				
		TOTAL ANALYSIS			[5]PROBIT RUN		TCLP EXTRACTION			[5]PROBIT RUN		ACID RAIN EXTRACTION			[5]PROBIT RUN	
		[2]Lab Conc. ppm	[3]EEC ppb	[4]Disposal Site	Risk Quanti-fication %	Risk R / AR	[2]Lab Conc. ppm	[3]EEC ppb	[4]Disposal Site	Risk Quanti-fication %	Risk R / AR	[2]Lab Conc. ppm	[3]EEC ppb	[4]Disposal Site	Risk Quanti-fication %	Risk R / AR
Aluminium as Al	10000	11600	29092800	H:h	1.00E+02	R	2.1	5267	G	5.17E-07	AR	<0.15	0.00	G	0.00E+00	AR
Arsenic as As	430	<12	30096	H:H	1.00E+02	R	<0.02	0.00	G	0.00E+00	AR	<0.02	0.00	G	0.00E+00	AR
Barium as Ba	7800	281	704748	H:h	1.00E+02	R	1.0	2508	G	1.63E-09	AR	0.12	301	G	0.00E+00	AR
Cadmium as Cd	31	<10	25080	H:H	1.00E+02	R	<0.03	0.00	G	0.00E+00	AR	<0.03	0.00	G	0.00E+00	AR
Cobalt as Co	6900	5.3	13292	H:H	6.44E-02	R	<0.07	0.00	G	0.00E+00	AR	<0.07	0.00	G	0.00E+00	AR
Chromium^{3+} as Cr^{3+}	4700	100	250800	H:h	1.00E+02	R	<0.07	0.00	G	0.00E+00	AR	<0.07	0.00	G	0.00E+00	AR
Copper as Cu	100	8.2	20566	H:H	1.00E+02	R	<0.05	0.00	G	0.00E+00	AR	<0.05	0.00	G	0.00E+00	AR
Iron as Fe	9000	415000	1040820000	H:h	1.00E+02	R	<0.05	0.00	G	0.00E+00	AR	0.06	150	G	0.00E+00	AR
Lead as Pb	100	<18	45144	H:H	1.00E+02	R	0.06	150	H:H	1.05E-02	R	<0.02	0.00	G	0.00E+00	AR
Manganese as Mn	300	10500	26334000	H:H	1.00E+02	R	0.09	226	G	2.28E-05	AR	<0.15	0.00	G	0.00E+00	AR
Mercury as Hg	22	<5.0	12540	H:H	1.00E+02	R	<0.02	0.00	G	0.00E+00	AR	<0.02	0.00	G	0.00E+00	AR
Nickel as Ni	1140	<66	165528	H:H	1.00E+02	R	<0.13	0.00	G	0.00E+00	AR	<0.13	0.00	G	0.00E+00	AR
Selenium as Se	260	<5.0	12540	H:H	9.99E+01	R	<0.02	0.00	G	0.00E+00	AR	<0.02	0.00	G	0.00E+00	AR
Silver as Ag	2000	<10	25080	H:h	6.71E+01	R	<0.02	0.00	G	0.00E+00	AR	<0.02	0.00	G	0.00E+00	AR
Titatium as Ti	731	1142	2864136	H:H	1.00E+02	R	<0.02	0.00	G	0.00E+00	AR	<0.02	0.00	G	0.00E+00	AR
Vanadium as V	1300	<41	102828	H:h	1.00E+02	R	0.11	276	G	9.06E-12	AR	0.10	251	G	2.68E-12	AR
Zinc as Zn	700	45	112860	H:H	1.00E+02	R	0.12	301	G	5.18E-08	AR	<0.04	0.00	G	0.00E+00	AR
Fluoride as F-	1500	11800	29594400	H:h	1.00E+02	R	0.3	752	G	2.98E-07	AR	<0.1	0.00	G	0.00E+00	AR
Waste Stream classifies: H:H / H:h / G		Worst Case Scenario		H:H			Worst Case Scenario		H:H			Worst Case Scenario		G		
Risk to Environment: R / AR		Risk to Environment		R		R	Risk to Environment		R		R	Risk to Environment		AR		AR

Table A-15

CLASSIFICATION SUMMARY: WASTE STREAM - BF D DUST

[Waste Characterization - Iscor Vanderbijlpark Steel]

INORGANIC COMPOUNDS	[1]Acc. Risk Value (MR) ppb	NAME OF WASTE STREAM: BF D DUST												VOLUME: 3,800,000 KG / MONTH			
		TOTAL ANALYSIS			[5] PROBIT RUN		TCLP EXTRACTION			[5] PROBIT RUN		ACID RAIN EXTRACTION			[5] PROBIT RUN	
		[2]Lab Conc. ppm	[3]EEC ppb	[4]Disposal Site	Risk Quantification %	Risk R / AR	[2]Lab Conc. ppm	[3]EEC ppb	[4]Disposal Site	Risk Quantification %	Risk R / AR	[2]Lab Conc. ppm	[3]EEC ppb	[4]Disposal Site	Risk Quantification %	Risk R / AR
Aluminium as Al	10000	13800	34610400	H:h	1.00E+02	R	7.3	18308	H:h	4.53E-02	R	0.34	853	G	0.00E+00	AR
Arsenic as As	430	<12	30096	H:H	1.00E+02	R	<0.02	0.00	G	0.00E+00	AR	<0.02	0.00	G	0.00E+00	AR
Barium as Ba	7800	182	456456	H:h	1.00E+02	R	0.92	2307	G	5.85E-10	AR	0.25	627	G	0.00E+00	AR
Cadmium as Cd	31	<10	25080	H:H	1.00E+02	R	<0.03	0.00	G	0.00E+00	AR	<0.03	0.00	G	0.00E+00	AR
Cobalt as Co	5900	8.9	22321	H:H	1.37E+00	R	<0.07	0.00	G	0.00E+00	AR	<0.07	0.00	G	0.00E+00	AR
Chromium^{3+} as Cr^{3+}	4700	108	270864	H:h	1.00E+02	R	<0.07	0.00	G	0.00E+00	AR	<0.07	0.00	G	0.00E+00	AR
Copper as Cu	100	8.2	20566	H:H	1.00E+02	R	<0.05	0.00	G	0.00E+00	AR	<0.05	0.00	G	0.00E+00	AR
Iron as Fe	9000	282000	707256000	H:h	1.00E+02	R	3.0	7524	G	6.39E-05	AR	0.90	2257	G	7.48E-11	AR
Lead as Pb	100	138	346104	H:H	1.00E+02	R	0.08	201	H:H	8.57E-02	R	0.02	50	G	2.90E-07	AR
Manganese as Mn	300	5500	13794000	H:H	1.00E+02	R	24	60192	H:H	1.00E+02	R	4.9	12289	H:H	9.97E+01	R
Mercury as Hg	22	<5.0	12540	H:H	1.00E+02	R	<0.02	0.00	G	0.00E+00	AR	<0.02	0.00	G	0.00E+00	AR
Nickel as Ni	1140	<66	165528	H:H	1.00E+02	R	<0.13	0.00	G	0.00E+00	AR	<0.13	0.00	G	0.00E+00	AR
Selenium as Se	250	<5.0	12540	H:H	9.99E+01	R	<0.02	0.00	G	0.00E+00	AR	<0.02	0.00	G	0.00E+00	AR
Silver as Ag	2000	<10	25080	H:h	6.71E+01	R	<0.02	0.00	G	0.00E+00	AR	<0.02	0.00	G	0.00E+00	AR
Titatium as Ti	731	3475	8715300	H:H	1.00E+02	R	<0.02	0.00	G	0.00E+00	AR	<0.02	0.00	G	0.00E+00	AR
Vanadium as V	1600	<41	102828	H:h	1.00E+02	R	<0.02	0.00	G	0.00E+00	AR	<0.02	0.00	G	0.00E+00	AR
Zinc as Zn	700	402	1008216	H:H	1.00E+02	R	5.7	14296	H:H	9.19E+01	R	0.20	502	G	1.39E-05	AR
Fluoride as F-	1500	13500	33858000	H:h	1.00E+02	R	2.0	5016	H:h	1.62E+00	R	3.9	9781	H:h	2.02E+01	R
Waste Stream classifies: H:H / H:h / G		Worst Case Scenario		H:H			Worst Case Scenario		H:H			Worst Case Scenario		H:H		
Risk to Environment: R / AR		Risk to Environment		R		R	Risk to Environment		R		R	Risk to Environment		R		R

Table A-16

CLASSIFICATION SUMMARY: WASTE STREAM - BF SLUDGE
[Waste Characterization - Iscor Vanderbijlpark Steel]

INORGANIC COMPOUNDS	[1] Acc. Risk Value (MR) ppb	NAME OF WASTE STREAM: BF SLUDGE								VOLUME: 2,440,000 KG / MONTH						
		TOTAL ANALYSIS			[5] PROBIT RUN		TCLP EXTRACTION			[5] PROBIT RUN		ACID RAIN EXTRACTION			[5] PROBIT RUN	
		[2] Lab Conc. ppm	[3] EEC ppb	[4] Disposal Site	Risk Quantification %	Risk R / AR	[2] Lab Conc. ppm	[3] EEC ppb	[4] Disposal Site	Risk Quantification %	Risk R / AR	[2] Lab Conc. ppm	[3] EEC ppb	[4] Disposal Site	Risk Quantification %	Risk R / AR
Aluminium as Al	40000	16000	25766400	H:h	1.00E+02	R	45	72468	H:h	2.65E+01	R	<0.15	0.00	G	0.00E+00	AR
Arsenic as As	430	32	51533	H:H	1.00E+02	R	<0.02	0.00	G	0.00E+00	AR	<0.02	0.00	G	0.00E+00	AR
Barium as Ba	7800	282	454133	H:h	1.00E+02	R	0.99	1594	G	5.55E-12	AR	0.30	483	G	0.00E+00	AR
Cadmium as Cd	31	<10	16104	H:H	1.00E+02	R	0.06	97.0	H:H	1.16E+00	R	<0.03	0.00	G	0.00E+00	AR
Cobalt as Co	6900	7.0	11273	H:H	2.00E-02	R	<0.07	0.00	G	0.00E+00	AR	<0.07	0.00	G	0.00E+00	AR
Chromium^{3+} as Cr^{3+}	4700	55	88572	H:h	8.92E+01	R	<0.07	0.00	G	0.00E+00	AR	<0.07	0.00	G	0.00E+00	AR
Copper as Cu	100	27	43481	H:H	1.00E+02	R	<0.05	0.00	G	0.00E+00	AR	<0.05	0.00	G	0.00E+00	AR
Iron as Fe	9000	323000	520159200	H:h	1.00E+02	R	29	46702	H:h	9.99E+00	R	0.08	129	G	0.00E+00	AR
Lead as Pb	100	1352	2177261	H:H	1.00E+02	R	1.5	2416	H:H	9.58E+01	R	<0.02	0.00	G	0.00E+00	AR
Manganese as Mn	300	4000	6441600	H:H	1.00E+02	R	65	104676	H:H	1.00E+02	R	10	16104	H:H	1.00E+02	R
Mercury as Hg	22	<5.0	8052	H:H	1.00E+02	R	<0.02	0.00	G	0.00E+00	AR	<0.02	0.00	G	0.00E+00	AR
Nickel as Ni	1140	<66	106286	H:H	1.00E+02	R	<0.13	0.00	G	0.00E+00	AR	<0.13	0.00	G	0.00E+00	AR
Selenium as Se	260	<5.0	8052	H:H	9.86E+01	R	<0.02	0.00	G	0.00E+00	AR	<0.02	0.00	G	0.00E+00	AR
Silver as Ag	2000	<10	16104	H:h	3.36E+01	R	<0.02	0.00	G	0.00E+00	AR	<0.02	0.00	G	0.00E+00	AR
Titatium as Ti	731	940	1513776	H:H	1.00E+02	R	<0.02	0.00	G	0.00E+00	AR	<0.02	0.00	G	0.00E+00	AR
Vanadium as V	1300	<41	66026	H:h	9.99E+01	R	<0.02	0.00	G	0.00E+00	AR	<0.02	0.00	G	0.00E+00	AR
Zinc as Zn	700	7017	11300177	H:H	1.00E+02	R	163	262495	H:H	1.00E+02	R	3.2	5153	H:H	2.75E+01	R
Fluoride as F-	1500	15100	24317040	H:h	1.00E+02	R	0.8	1288	G	8.27E-05	AR	7.9	12722	H:h	3.74E+01	R
Waste Stream classifies: H:H / H:h / G		Worst Case Scenario		H:H			Worst Case Scenario		H:H			Worst Case Scenario		H:H		
Risk to Environment: R / AR		Risk to Environment		R		R	Risk to Environment		R		R	Risk to Environment		R		R

Table A-17

CLASSIFICATION SUMMARY: WASTE STREAM - BF PRIME GRANULATED SLAG

[Waste Characterization - Iscor Vanderbijlpark Steel]

INORGANIC COMPOUNDS	[1]Acc. Risk Value (MR) ppb	NAME OF WASTE STREAM: BF PRIME GRANULATED SLAG									VOLUME: 21,700,000 KG / MONTH								
		TOTAL ANALYSIS			[5]PROBIT RUN		TCLP EXTRACTION			[5]PROBIT RUN		ACID RAIN EXTRACTION			[5]PROBIT RUN	
		[2]Lab Conc. ppm	[3]EEC ppb	[4]Disposal Site	Risk Quantification %	Risk R / AR	[2]Lab Conc. ppm	[3]EEC ppb	[4]Disposal Site	Risk Quantification %	Risk R / AR	[2]Lab Conc. ppm	[3]EEC ppb	[4]Disposal Site	Risk Quantification %	Risk R / AR
Aluminium as Al	10000	69800	999675600	H:h	1.00E+02	R	27	386694	H:h	9.96E+01	R	<0.15	0.00	G	0.00E+00	AR
Arsenic as As	430	23	329406	H:H	1.00E+02	R	<0.02	0.00	G	0.00E+00	AR	<0.02	0.00	G	0.00E+00	AR
Barium as Ba	7800	1004	14379288	H:h	1.00E+02	R	3.5	50127	H:h	1.94E+01	R	0.22	3151	G	2.50E-08	AR
Cadmium as Cd	31	<10	143220	H:H	1.00E+02	R	<0.03	0.00	G	0.00E+00	AR	<0.03	0.00	G	0.00E+00	AR
Cobalt as Co	6900	5.2	74474	H:H	5.59E+01	R	<0.07	0.00	G	0.00E+00	AR	<0.07	0.00	G	0.00E+00	AR
Chromium^{3+} as Cr^{3+}	4700	28	401016	H:h	1.00E+02	R	<0.07	0.00	G	0.00E+00	AR	<0.07	0.00	G	0.00E+00	AR
Copper as Cu	100	10	143220	H:H	1.00E+02	R	<0.05	0.00	G	0.00E+00	AR	<0.05	0.00	G	0.00E+00	AR
Iron as Fe	3000	5700	81635400	H:h	1.00E+02	R	83	1188726	H:h	1.00E+02	R	10	143220	H:h	8.18E+01	R
Lead as Pb	100	67	959574	H:H	1.00E+02	R	0.05	716	H:H	2.57E+01	R	<0.02	0.00	G	0.00E+00	AR
Manganese as Mn	300	7200	103118400	H:H	1.00E+02	R	36	515592	H:H	1.00E+02	R	1.4	20051	H:H	1.00E+02	R
Mercury as Hg	22	<5.0	71610	H:H	1.00E+02	R	<0.02	0.00	G	0.00E+00	AR	<0.02	0.00	G	0.00E+00	AR
Nickel as Ni	1140	<66	945252	H:H	1.00E+02	R	<0.13	0.00	G	0.00E+00	AR	<0.13	0.00	G	0.00E+00	AR
Selenium as Se	260	18	257796	H:H	1.00E+02	R	<0.02	0.00	G	0.00E+00	AR	<0.02	0.00	G	0.00E+00	AR
Silver as Ag	2000	<10	143220	H:h	1.00E+02	R	<0.02	0.00	G	0.00E+00	AR	<0.02	0.00	G	0.00E+00	AR
Titatium as Ti	731	3467	49654374	H:H	1.00E+02	R	0.09	1289	H:H	3.48E-02	R	<0.02	0.00	G	0.00E+00	AR
Vanadium as V	1300	<41	587202	H:h	1.00E+02	R	0.04	573	G	6.90E-08	AR	<0.02	0.00	G	0.00E+00	AR
Zinc as Zn	700	31	443982	H:H	1.00E+02	R	0.23	3294	H:H	7.04E+00	R	0.04	573	G	5.20E-05	AR
Fluoride as F-	1500	15100	216262200	H:h	1.00E+02	R	0.2	2864	H:h	6.06E-02	R	0.9	12890	H:h	3.84E+01	R
Waste Stream classifies: H:H / H:h / G		Worst Case Scenario		H:H			Worst Case Scenario		H:H			Worst Case Scenario		H:H		
Risk to Environment: R / AR		Risk to Environment		R		R	Risk to Environment		R		R	Risk to Environment		R		R

Table A-18

CLASSIFICATION SUMMARY: WASTE STREAM - BF OFF GRADE GRANULATED SLAG

[Waste Characterization - Iscor Vanderbijlpark Steel]

WASTE STREAM NAME: BF OFF GRADE GRANULATED SLAG — VOLUME: 21,700,000 KG / MONTH

INORGANIC COMPOUNDS	[1]Acc. Risk Value (MR) ppb	TOTAL ANALYSIS [2]Lab Conc. ppm	[3]EEC ppb	[4]Disposal Site	[5]PROBIT RUN Risk Quantification %	Risk R / AR	TCLP EXTRACTION [2]Lab Conc. ppm	[3]EEC ppb	[4]Disposal Site	[5]PROBIT RUN Risk Quantification %	Risk R / AR	ACID RAIN EXTRACTION [2]Lab Conc. ppm	[3]EEC ppb	[4]Disposal Site	[5]PROBIT RUN Risk Quantification %	Risk R / AR
Aluminium as Al	10000	82800	1185861600	H:h	1.00E+02	R	22	315084	H:h	9.88E+01	R	0.29	4153	G	3.46E-08	AR
Arsenic as As	430	18	257796	H:H	1.00E+02	R	<0.02	0.00	G	0.00E+00	AR	<0.02	0.00	G	0.00E+00	AR
Barium as Ba	7800	1197	17143434	H:h	1.00E+02	R	1.2	17186	H:h	1.56E-01	R	0.27	3867	G	2.63E-07	AR
Cadmium as Cd	31	<10	143220	H:H	1.00E+02	R	<0.03	0.00	G	0.00E+00	AR	<0.03	0.00	G	0.00E+00	AR
Cobalt as Co	6900	7.0	100254	H:H	7.67E+01	R	<0.07	0.00	G	0.00E+00	AR	<0.07	0.00	G	0.00E+00	AR
Chromium[3+] as Cr[3+]	4700	45	644490	H:h	1.00E+02	R	<0.07	0.00	G	0.00E+00	AR	<0.07	0.00	G	0.00E+00	AR
Copper as Cu	100	<2.0	28644	H:H	1.00E+02	R	<0.05	0.00	G	0.00E+00	AR	<0.05	0.00	G	0.00E+00	AR
Iron as Fe	8000	5500	78771000	H:h	1.00E+02	R	12	171864	H:h	8.97E+01	R	2.7	38669	H:h	4.94E+00	R
Lead as Pb	100	57	816354	H:H	1.00E+02	R	<0.02	0.00	G	0.00E+00	AR	<0.02	0.00	G	0.00E+00	AR
Manganese as Mn	300	11200	160406400	H:H	1.00E+02	R	7.8	111712	H:H	1.00E+02	R	1.1	15754	H:H	9.99E+01	R
Mercury as Hg	22	<5.0	71610	H:H	1.00E+02	R	<0.02	0.00	G	0.00E+00	AR	<0.02	0.00	G	0.00E+00	AR
Nickel as Ni	140	<66	945252	H:H	1.00E+02	R	<0.13	0.00	G	0.00E+00	AR	<0.13	0.00	G	0.00E+00	AR
Selenium as Se	260	8.7	124601	H:H	1.00E+02	R	<0.02	0.00	G	0.00E+00	AR	<0.02	0.00	G	0.00E+00	AR
Silver as Ag	2000	<10	143220	H:h	1.00E+02	R	<0.02	0.00	G	0.00E+00	AR	<0.02	0.00	G	0.00E+00	AR
Titatium as Ti	731	4218	60410196	H:H	1.00E+02	R	0.18	2578	H:H	2.08E+00	R	<0.02	0.00	G	0.00E+00	AR
Vanadium as V	1300	<41	587202	H:h	1.00E+02	R	0.02	286	G	1.43E-11	AR	<0.02	0.00	G	0.00E+00	AR
Zinc as Zn	700	25	358050	H:H	1.00E+02	R	0.10	1432	H:H	9.64E-02	R	0.05	716	H:H	4.24E-04	R
Fluoride as F-	1500	16600	237745200	H:h	1.00E+02	R	0.2	2864	H:h	6.06E-02	R	0.8	11458	H:h	2.99E+01	R
Waste Stream classifies: H:H / H:h / G		Worst Case Scenario		H:H			Worst Case Scenario		H:H			Worst Case Scenario		H:H		
Risk to Environment: R / AR		Risk to Environment		R		R	Risk to Environment		R		R	Risk to Environment		R		R

Table A-19

CLASSIFICATION SUMMARY: WASTE STREAM - DR PRODUCT DUST

[Waste Characterization - Iscor Vanderbijlpark Steel]

INORGANIC COMPOUNDS	[1] Ac. Risk Value (MRL) ppb	NAME OF WASTE STREAM: DR PRODUCT DUST										VOLUME: 27,000,000 KG / MONTH					
		TOTAL ANALYSIS			[5] PROBIT RUN		TCLP EXTRACTION			[5] PROBIT RUN		ACID RAIN EXTRACTION			[5] PROBIT RUN	
		[2] Lab Conc. ppm	[3] EEC ppb	[4] Disposal Site	Risk Quantification %	Risk R / AR	[2] Lab Conc. ppm	[3] EEC ppb	[4] Disposal Site	Risk Quantification %	Risk R / AR	[2] Lab Conc. ppm	[3] EEC ppb	[4] Disposal Site	Risk Quantification %	Risk R / AR
Aluminium as Al	10000	75200	1340064000	H:h	1.00E+02	R	2.5	44550	H:h	5.70E+00	R	0.28	4990	G	2.83E-07	AR
Arsenic as As	430	18	320760	H:H	1.00E+02	R	<0.02	0.00	G	0.00E+00	AR	<0.02	0.00	G	0.00E+00	AR
Barium as Ba	7300	616	10977120	H:h	1.00E+02	R	0.49	8732	H:h	9.45E-04	R	0.18	3208	G	3.09E-08	AR
Cadmium as Cd	31	<10	178200	H:H	1.00E+02	R	<0.03	0.00	G	0.00E+00	AR	<0.03	0.00	G	0.00E+00	AR
Cobalt as Co	6900	10	178200	H:H	9.68E+01	R	<0.07	0.00	G	0.00E+00	AR	<0.07	0.00	G	0.00E+00	AR
Chromium^{3+} as Cr^{3+}	4700	54	962280	H:h	1.00E+02	R	<0.07	0.00	G	0.00E+00	AR	<0.07	0.00	G	0.00E+00	AR
Copper as Cu	100	<2.0	35640	H:H	1.00E+02	R	<0.05	0.00	G	0.00E+00	AR	<0.05	0.00	G	0.00E+00	AR
Iron as Fe	9000	36600	652212000	H:h	1.00E+02	R	<0.05	0.00	G	0.00E+00	AR	0.09	1604	G	9.55E-13	AR
Lead as Pb	100	38	677160	H:H	1.00E+02	R	<0.02	0.00	G	0.00E+00	AR	<0.02	0.00	G	0.00E+00	AR
Manganese as Mn	300	800	14256000	H:H	1.00E+02	R	23	409860	H:H	1.00E+02	R	0.04	713	H:H	2.49E-01	R
Mercury as Hg	22	<5.0	89100	H:H	1.00E+02	R	<0.02	0.00	G	0.00E+00	AR	<0.02	0.00	G	0.00E+00	AR
Nickel as Ni	1140	<66	1176120	H:H	1.00E+02	R	<0.13	0.00	G	0.00E+00	AR	<0.13	0.00	G	0.00E+00	AR
Selenium as Se	260	<5.0	89100	H:H	1.00E+02	R	<0.02	0.00	G	0.00E+00	AR	<0.02	0.00	G	0.00E+00	AR
Silver as Ag	2000	<10	178200	H:h	1.00E+02	R	<0.02	0.00	G	0.00E+00	AR	<0.02	0.00	G	0.00E+00	AR
Titatium as Ti	731	3890	51499800	H:H	1.00E+02	R	<0.02	0.00	G	0.00E+00	AR	<0.02	0.00	G	0.00E+00	AR
Vanadium as V	1300	<41	730620	H:h	1.00E+02	R	<0.02	0.00	G	0.00E+00	AR	<0.02	0.00	G	0.00E+00	AR
Zinc as Zn	700	9.8	174636	H:H	1.00E+02	R	0.08	1426	H:H	9.37E-02	R	0.06	1069	H:H	1.20E-02	R
Fluoride as F-	1500	12400	220968000	H:h	1.00E+02	R	0.3	5346	H:h	2.19E+00	R	0.4	7128	H:h	7.30E+00	R
Waste Stream classifies: H:H / H:h / G		Worst Case Scenario		H:H			Worst Case Scenario		H:H			Worst Case Scenario		H:H		
Risk to Environment: R / AR		Risk to Environment		R		R	Risk to Environment		R		R	Risk to Environment		R		R

Table A-20

CLASSIFICATION SUMMARY: WASTE STREAM - DR WET SCRUBBER MUD

[Waste Characterization - Iscor Vanderbijlpark Steel]

NAME OF WASTE STREAM: DR WET SCRUBBER MUD — VOLUME: 97,000 KG / MONTH

INORGANIC COMPOUNDS	[1]Acc. Risk Value (MR) ppb	TOTAL ANALYSIS [2]Lab Conc. ppm	TOTAL ANALYSIS [3]EEC ppb	TOTAL ANALYSIS [4]Disposal Site	[5]PROBIT RUN Risk Quantification %	[5]PROBIT RUN Risk R / AR	TCLP EXTRACTION [2]Lab Conc. ppm	TCLP EXTRACTION [3]EEC ppb	TCLP EXTRACTION [4]Disposal Site	[5]PROBIT RUN Risk Quantification %	[5]PROBIT RUN Risk R / AR	ACID RAIN EXTRACTION [2]Lab Conc. ppm	ACID RAIN EXTRACTION [3]EEC ppb	ACID RAIN EXTRACTION [4]Disposal Site	[5]PROBIT RUN Risk Quantification %	[5]PROBIT RUN Risk R / AR
Aluminium as Al	10000	37000	2368740	H:h	1.00E+02	R	0.6	40.3	G	0.00E+00	AR	<0.15	0.00	G	0.00E+00	AR
Arsenic as As	430	12	768	H:H	3.81E-02	R	<0.02	0.00	G	0.00E+00	AR	<0.02	0.00	G	0.00E+00	AR
Barium as Ba	7800	270	17285	H:h	1.62E-01	R	0.98	62.7	G	0.00E+00	AR	0.19	12.16	G	0.00E+00	AR
Cadmium as Cd	31	<10	640	H:H	9.22E+01	R	<0.03	0.00	G	0.00E+00	AR	<0.03	0.00	G	0.00E+00	AR
Cobalt as Co	6900	7.0	448	G	0.00E+00	AR	<0.07	0.00	G	0.00E+00	AR	<0.07	0.00	G	0.00E+00	AR
Chromium^{3+} as Cr^{3+}	4700	33	2113	G	8.66E-08	AR	<0.07	0.00	G	0.00E+00	AR	<0.07	0.00	G	0.00E+00	AR
Copper as Cu	100	<2.0	128	H:H	2.95E-03	R	<0.05	0.00	G	0.00E+00	AR	<0.05	0.00	G	0.00E+00	AR
Iron as Fe	9000	116000	7426320	H:h	1.00E+02	R	<0.05	0.00	G	0.00E+00	AR	0.06	3.84	G	0.00E+00	AR
Lead as Pb	100	26	1665	H:H	8.41E+01	R	0.02	1.28	G	0.00E+00	AR	<0.02	0.00	G	0.00E+00	AR
Manganese as Mn	300	700	44814	H:H	1.00E+02	R	4.9	314	H:H	5.21E-04	R	0.07	4.48	G	0.00E+00	AR
Mercury as Hg	22	<5.0	320	H:H	7.68E+01	R	<0.02	0.00	G	0.00E+00	AR	<0.02	0.00	G	0.00E+00	AR
Nickel as Ni	1140	<66	4225	H:H	2.62E+00	R	<0.13	0.00	G	0.00E+00	AR	<0.13	0.00	G	0.00E+00	AR
Selenium as Se	260	<5.0	320	H:H	2.13E-03	R	<0.02	0.00	G	0.00E+00	AR	<0.02	0.00	G	0.00E+00	AR
Silver as Ag	2000	<10	640	G	1.54E-09	AR	<0.02	0.00	G	0.00E+00	AR	<0.02	0.00	G	0.00E+00	AR
Titatium as Ti	731	2218	141996	H:H	1.00E+02	R	<0.02	0.00	G	0.00E+00	AR	<0.02	0.00	G	0.00E+00	AR
Vanadium as V	1300	<41	2625	H:h	8.84E-02	R	<0.02	0.00	G	0.00E+00	AR	<0.02	0.00	G	0.00E+00	AR
Zinc as Zn	700	29	1857	H:H	4.75E-01	R	0.06	3.80	G	0.00E+00	AR	<0.04	0.00	G	0.00E+00	AR
Fluoride as F-	1500	15200	973104	H:h	1.00E+02	R	0.2	12.8	G	0.00E+00	AR	<0.1	0.00	G	0.00E+00	AR
Waste Stream classifies: H:H / H:h / G			Worst Case Scenario	H:H				Worst Case Scenario	H:H				Worst Case Scenario	G		
Risk to Environment: R / AR			Risk to Environment	R		R		Risk to Environment	R		R		Risk to Environment	AR		AR

Table A-21

CLASSIFICATION SUMMARY: WASTE STREAM - EAF SLAG
[Waste Characterization - Iscor Vanderbijlpark Steel]

INORGANIC COMPOUNDS	[1] Acc. Risk Value (MR) ppb	NAME OF WASTE STREAM: EAF SLAG								VOLUME: 10,500,000 KG / MONTH						
		TOTAL ANALYSIS			[5] PROBIT RUN		TCLP EXTRACTION			[5] PROBIT RUN		ACID RAIN EXTRACTION			[5] PROBIT RUN	
		[2] Lab Conc. ppm	[3] EEC ppb	[4] Disposal Site	Risk Quantification %	Risk R / AR	[2] Lab Conc. ppm	[3] EEC ppb	[4] Disposal Site	Risk Quantification %	Risk R / AR	[2] Lab Conc. ppm	[3] EEC ppb	[4] Disposal Site	Risk Quantification %	Risk R / AR
Aluminium as Al	10000	71000	492030000	H:h	1.00E+02	R	36	249480	H:h	9.63E+01	R	< 0.15	0.00	G	0.00E+00	AR
Arsenic as As	430	19	131670	H:H	1.00E+02	R	0.02	139	G	1.74E-09	AR	< 0.02	0.00	G	0.00E+00	AR
Barium as Ba	7800	1007	6978510	H:h	1.00E+02	R	1.3	9009	H:h	1.24E-03	R	0.18	1247	G	2.33E-13	AR
Cadmium as Cd	31	< 10	69300	H:H	1.00E+02	R	< 0.03	0.00	G	0.00E+00	AR	< 0.03	0.00	G	0.00E+00	AR
Cobalt as Co	6900	6.2	42966	H:H	1.77E+01	R	< 0.07	0.00	G	0.00E+00	AR	< 0.07	0.00	G	0.00E+00	AR
Chromium^{3+} as Cr^{3+}	4700	33	228690	H:h	9.99E+01	R	< 0.07	0.00	G	0.00E+00	AR	< 0.07	0.00	G	0.00E+00	AR
Copper as Cu	100	< 2.0	13860	H:H	1.00E+02	R	< 0.05	0.00	G	0.00E+00	AR	< 0.05	0.00	G	0.00E+00	AR
Iron as Fe	9000	5600	38808000	H:h	1.00E+02	R	16	110880	H:h	6.58E+01	R	0.06	416	G	0.00E+00	AR
Lead as Pb	100	54	374220	H:H	1.00E+02	R	0.06	416	H:H	4.33E+00	R	< 0.02	0.00	G	0.00E+00	AR
Manganese as Mn	300	8600	59598000	H:H	1.00E+02	R	60	415800	H:H	1.00E+02	R	2.2	15246	R	9.99E+01	R
Mercury as Hg	22	< 5.0	34650	H:H	1.00E+02	R	< 0.02	0.00	G	0.00E+00	AR	< 0.02	0.00	G	0.00E+00	AR
Nickel as Ni	1140	< 66	457380	H:H	1.00E+02	R	< 0.13	0.00	G	0.00E+00	AR	< 0.13	0.00	G	0.00E+00	AR
Selenium as Se	260	< 5.0	34650	H:H	1.00E+02	R	< 0.02	0.00	G	0.00E+00	AR	< 0.02	0.00	G	0.00E+00	AR
Silver as Ag	2000	< 10	69300	H:h	9.92E+01	R	< 0.02	0.00	G	0.00E+00	AR	< 0.02	0.00	G	0.00E+00	AR
Titatium as Ti	731	3526	24435180	H:H	1.00E+02	R	0.12	832	H:H	1.09E-03	R	< 0.02	0.00	G	0.00E+00	AR
Vanadium as V	1300	< 41	284130	H:h	1.00E+02	R	0.03	208	G	2.33E-13	AR	< 0.02	0.00	G	0.00E+00	AR
Zinc as Zn	700	18	124740	H:H	1.00E+02	R	0.06	416	G	1.93E-06	AR	< 0.04	0.00	G	0.00E+00	AR
Fluoride as F-	1500	12300	85239000	H:h	1.00E+02	R	0.20	1386	G	1.66E-04	AR	< 0.10	0.00	G	0.00E+00	AR
Waste Stream classifies: H:H / H:h / G			Worst Case Scenario	H:H				Worst Case Scenario	H:H				Worst Case Scenario	H:H		
Risk to Environment: R / AR			Risk to Environment	R		R		Risk to Environment	R		R		Risk to Environment	R		R

Table A-22

CLASSIFICATION SUMMARY: WASTE STREAM - FOUNDRY CYCLONE DUST

[Waste Characterization - Iscor Vanderbijlpark Steel]

INORGANIC COMPOUNDS	[1] Acc. Risk Value (MR) ppb	NAME OF WASTE STREAM: FOUNDRY CYCLONE DUST										VOLUME: 4,000 KG / MONTH				
		TOTAL ANALYSIS			[5] PROBIT RUN		TCLP EXTRACTION			[5] PROBIT RUN		ACID RAIN EXTRACTION			[5] PROBIT RUN	
		[2] Lab Conc. ppm	[3] EEC ppb	[4] Disposal Site	Risk Quantification %	Risk R / AR	[2] Lab Conc. ppm	[3] EEC ppb	[4] Disposal Site	Risk Quantification %	Risk R / AR	[2] Lab Conc. ppm	[3] EEC ppb	[4] Disposal Site	Risk Quantification %	Risk R / AR
Aluminium as Al	10000	18000	47520	H:h	7.30E+00	R	5.2	14	G	0.00E+00	AR	0.35	0.924	G	0.00E+00	AR
Arsenic as As	430	<12	32	G	0.00E+00	AR	<0.02	0.00	G	0.00E+00	AR	<0.02	0.00	G	0.00E+00	AR
Barium as Ba	7800	120	317	G	0.00E+00	AR	0.41	1.1	G	0.00E+00	AR	0.14	0.370	G	0.00E+00	AR
Cadmium as Cd	31	<10	26	H:h	6.59E-05	R	<0.03	0.00	G	0.00E+00	AR	<0.03	0.00	G	0.00E+00	AR
Cobalt as Co	69[illegible]	7.4	20	G	0.00E+00	AR	<0.07	0.00	G	0.00E+00	AR	<0.07	0.00	G	0.00E+00	AR
Chromium $^{3+}$ as Cr^{3+}	4700	28900	76296	H:h	8.28E+01	R	<0.07	0.00	G	0.00E+00	AR	<0.07	0.00	G	0.00E+00	AR
Copper as Cu	100	14	37	G	8.85E-09	AR	<0.05	0.00	G	0.00E+00	AR	<0.05	0.00	G	0.00E+00	AR
Iron as Fe	9000	31700	83688	H:h	4.44E+01	R	20	53	G	0.00E+00	AR	0.89	2.35	G	0.00E+00	AR
Lead as Pb	100	173	457	H:H	6.30E+00	R	<0.02	0.00	G	0.00E+00	AR	<0.02	0.00	G	0.00E+00	AR
Manganese as Mn	300	300	792	H:H	4.62E-01	R	21	55	G	1.38E-12	AR	0.58	1.53	G	0.00E+00	AR
Mercury as Hg	22	<5.0	13	H:h	1.82E-06	R	<0.02	0.00	G	0.00E+00	AR	<0.02	0.00	G	0.00E+00	AR
Nickel as Ni	[illegible]140	<66	174	G	1.22E-13	AR	0.16	0.422	G	0.00E+00	AR	<0.13	0.00	G	0.00E+00	AR
Selenium as Se	260	<5.0	13	G	0.00E+00	AR	<0.02	0.00	G	0.00E+00	AR	<0.02	0.00	G	0.00E+00	AR
Silver as Ag	2000	<10	26	G	0.00E+00	AR	<0.02	0.00	G	0.00E+00	AR	<0.02	0.00	G	0.00E+00	AR
Titatium as Ti	731	1591	4200	H:H	1.39E+01	R	<0.02	0.00	G	0.00E+00	AR	<0.02	0.00	G	0.00E+00	AR
Vanadium as V	1300	<41	108	G	0.00E+00	AR	<0.02	0.00	G	0.00E+00	AR	<0.02	0.00	G	0.00E+00	AR
Zinc as Zn	700	91	240	G	3.55E-09	AR	0.28	0.739	G	0.00E+00	AR	0.04	0.110	G	0.00E+00	AR
Fluoride as F-	1500	14800	39072	H:h	9.69E+01	R	0.6	1.58	G	0.00E+00	AR	0.57	1.5	G	0.00E+00	AR
Waste Stream classifies: H:H / H:h / G		Worst Case Scenario		H:H			Worst Case Scenario		G			Worst Case Scenario		G		
Risk to Environment: R / AR		Risk to Environment		R		R	Risk to Environment		AR		AR	Risk to Environment		AR		AR

Table A-23

CLASSIFICATION SUMMARY: WASTE STREAM - BOF GRID

[Waste Characterization - Iscor Vanderbijlpark Steel]

INORGANIC COMPOUNDS	[1] Acc. Risk Value (MR) ppb	WASTE STREAM NAME: BOF GRID										VOLUME: 459,000 KG / MONTH				
		TOTAL ANALYSIS			[5] PROBIT RUN		TCLP EXTRACTION			[5] PROBIT RUN		ACID RAIN EXTRACTION			[5] PROBIT RUN	
		[2] Lab Conc. ppm	[3] EEC ppb	[4] Disposal Site	Risk Quantification %	Risk R / AR	[2] Lab Conc. ppm	[3] EEC ppb	[4] Disposal Site	Risk Quantification %	Risk R / AR	[2] Lab Conc. ppm	[3] EEC ppb	[4] Disposal Site	Risk Quantification %	Risk R / AR
Aluminium as Al	1000	6000	1817640	H:h	1.00E+02	R	1.6	485	G	0.00E+00	AR	0.17	51	G	0.00E+00	AR
Arsenic as As	430	< 12	3635	H:H	3.71E+01	R	< 0.02	0.00	G	0.00E+00	AR	< 0.02	0.00	G	0.00E+00	AR
Barium as Ba	7800	14	4241	G	7.35E-07	AR	0.47	142	G	0.00E+00	AR	0.10	30.3	G	0.00E+00	AR
Cadmium as Cd	31	< 10	3029	H:H	1.00E+02	R	0.13	39.4	H:H	2.78E-03	R	< 0.03	0.00	G	0.00E+00	AR
Cobalt as Co	690	5.2	1575	G	2.28E-11	AR	< 0.07	0.00	G	0.00E+00	AR	< 0.07	0.00	G	0.00E+00	AR
Chromium^{3+} as Cr^{3+}	4700	133	40291	H:h	3.82E+01	R	< 0.07	0.00	G	0.00E+00	AR	< 0.07	0.00	G	0.00E+00	AR
Copper as Cu	100	24	7271	H:H	1.00E+02	R	< 0.05	0.00	G	0.00E+00	AR	< 0.05	0.00	G	0.00E+00	AR
Iron as Fe	9000	778000	235687320	H:h	1.00E+02	R	1210	366557	H:h	9.97E+01	R	0.44	133	G	0.00E+00	AR
Lead as Pb	100	< 18	5453	H:H	1.00E+02	R	0.11	33.3	G	2.49E-09	AR	< 0.02	0.00	G	0.00E+00	AR
Manganese as Mn	300	10000	3029400	H:H	1.00E+02	R	82	24841	H:H	1.00E+02	R	0.20	60.6	G	4.79E-12	AR
Mercury as Hg	22	< 5.0	1515	H:H	1.00E+02	R	< 0.02	0.00	G	0.00E+00	AR	< 0.02	0.00	G	0.00E+00	AR
Nickel as Ni	114	< 66	19994	H:H	8.64E+01	R	< 0.13	0.00	G	0.00E+00	AR	< 0.13	0.00	G	0.00E+00	AR
Selenium as Se	260	< 5.0	1515	H:H	1.46E+01	R	< 0.02	0.00	G	0.00E+00	AR	< 0.02	0.00	G	0.00E+00	AR
Silver as Ag	2000	< 10	3029	H:h	1.13E-02	R	< 0.02	0.00	G	0.00E+00	AR	< 0.02	0.00	G	0.00E+00	AR
Titatium as Ti	731	470	142382	H:H	1.00E+02	R	0.02	6.10	G	0.00E+00	AR	< 0.02	0.00	G	0.00E+00	AR
Vanadium as V	1800	57	17268	H:h	7.11E+01	R	0.04	12.1	G	0.00E+00	AR	< 0.02	0.00	G	0.00E+00	AR
Zinc as Zn	700	307	93003	H:H	1.00E+02	R	0.59	179	G	9.56E-11	AR	< 0.04	0.0	G	0.00E+00	AR
Fluoride as F-	1500	15100	4574394	H:h	1.00E+02	R	< 0.1	0.00	G	0.00E+00	AR	0.4	121	G	0.00E+00	AR
Waste Stream classifies: H:H / H:h / G		Worst Case Scenario		H:H			Worst Case Scenario		H:H			Worst Case Scenario		G		
Risk to Environment: R / AR		Risk to Environment		R		R	Risk to Environment		R		R	Risk to Environment		AR		AR

Table A-24

CLASSIFICATION SUMMARY: WASTE STREAM - DR RAW MATERIAL DUST, FURNACE DUST & SEPARATION DUST

[Waste Characterization - Iscor Vanderbijlpark Steel]

INORGANIC COMPOUNDS	[1]Acc. Risk Value (MR) ppb	WASTE STREAM NAME: DR RAW MATERIAL DUST, FURNACE DUST & SEPARATION DUST										VOLUME: 26,000,000 KG/ MONTH				
		TOTAL ANALYSIS			[5]PROBIT RUN		TCLP EXTRACTION			[5]PROBIT RUN		ACID RAIN EXTRACTION			[5]PROBIT RUN	
		[2]Lab Conc. ppm	[3]EEC ppb	[4]Disposal Site	Risk Quantification %	Risk R / AR	[2]Lab Conc. ppm	[3]EEC ppb	[4]Disposal Site	Risk Quantification %	Risk R / AR	[2]Lab Conc. ppm	[3]EEC ppb	[4]Disposal Site	Risk Quantification %	Risk R / AR
Aluminium as Al	10000	8900	152724000	H:h	1.00E+02		4.0	68640	H:h	2.31E+01	R	<0.15	0.00	G	0.00E+00	AR
Arsenic as As	430	<12	205920	H:H	1.00E+02		<0.02	0.00	G	0.00E+00	AR	<0.02	0.00	G	0.00E+00	AR
Barium as Ba	7800	260	4461600	H:h	1.00E+02		1.0	17160	H:h	1.54E-01	R	0.33	5663	G	1.57E-05	AR
Cadmium as Cd	31	<10	171600	H:H	1.00E+02		<0.03	0.00	G	0.00E+00	AR	<0.03	0.00	G	0.00E+00	AR
Cobalt as Co	6900	5.4	92664	H:H	7.18E+01		<0.07	0.00	G	0.00E+00	AR	<0.07	0.00	G	0.00E+00	AR
Chromium^{3+} as Cr^{3+}	4700	31	531960	H:h	1.00E+02		<0.07	0.00	G	0.00E+00	AR	<0.07	0.00	G	0.00E+00	AR
Copper as Cu	100	3	51480	H:H	1.00E+02		<0.05	0.00	G	0.00E+00	AR	<0.05	0.00	G	0.00E+00	AR
Iron as Fe	9000	49300	8459880000	H:h	1.00E+02		4.0	68640	H:h	2.98E+01	R	<0.05	0.00	G	0.00E+00	AR
Lead as Pb	100	<18	308880	H:H	1.00E+02		<0.02	0.00	G	0.00E+00	AR	<0.02	0.00	G	0.00E+00	AR
Manganese as Mn	303	500	8580000	H:H	1.00E+02		19	326040	H:H	1.00E+02	R	1.1	18876	H:H	1.00E+02	R
Mercury as Hg	22	<5.0	85800	H:H	1.00E+02		<0.02	0.00	G	0.00E+00	AR	<0.02	0.00	G	0.00E+00	AR
Nickel as Ni	1140	<66	1132560	H:H	1.00E+02		<0.13	0.00	G	0.00E+00	AR	<0.13	0.00	G	0.00E+00	AR
Selenium as Se	260	<5.0	85800	H:H	1.00E+02		<0.02	0.00	G	0.00E+00	AR	<0.02	0.00	G	0.00E+00	AR
Silver as Ag	2000	<10	171600	H:h	1.00E+02		<0.02	0.00	G	0.00E+00	AR	<0.02	0.00	G	0.00E+00	AR
Titatium as Ti	731	360	6177600	H:H	1.00E+02		<0.02	0.00	G	0.00E+00	AR	<0.02	0.00	G	0.00E+00	AR
Vanadium as V	1300	<41	703560	H:h	1.00E+02		<0.02	0.00	G	0.00E+00	AR	<0.02	0.00	G	0.00E+00	AR
Zinc as Zn	700	16	274560	H:H	1.00E+02		0.3	5148	H:H	2.74E+01	R	0.04	686	G	2.87E-04	AR
Fluoride as F-	1500	11600	199056000	H:h	1.00E+02		<0.1	3432	G	1.97E-01	AR	0.1	1716	H:h	1.14E-03	R
Waste Stream classifies: H:H / H:h / G		Worst Case Scenario		H:H			Worst Case Scenario		H:H			Worst Case Scenario		H:H		
Risk to Environment: R / AR		Risk to Environment		R		R	Risk to Environment		R		[illegible]	Risk to Environment		R		R

Table A-25

CLASSIFICATION SUMMARY: WASTE STREAM - VAALDAM SLUDGE

[Waste Characterization - Iscor Vanderbijlpark Steel]

INORGANIC COMPOUNDS	[1] Acc. Risk Value (MR) ppb	NAME OF WASTE STREAM: VAALDAM SLUDGE													VOLUME: 2,000,000 KG / MONTH					
		TOTAL ANALYSIS			[5] PROBIT RUN		TCLP EXTRACTION			[5] PROBIT RUN		ACID RAIN EXTRACTION			[5] PROBIT RUN	
		[2] Lab Conc. ppm	[3] EEC ppb	[4] Disposal Site	Risk Quantification %	Risk R / AR	[2] Lab Conc. ppm	[3] EEC ppb	[4] Disposal Site	Risk Quantification %	Risk R / AR	[2] Lab Conc. ppm	[3] EEC ppb	[4] Disposal Site	Risk Quantification %	Risk R / AR
Aluminium as Al	10000	108000	142560000	H:h	1.00E+02	R	<0.15	0.00	G	0.00E+00	AR	<0.15	0.00	G	0.00E+00	AR
Arsenic as As	430	32	42240	H:H	1.00E+02	R	<0.02	0.00	G	0.00E+00	AR	<0.02	0.00	G	0.00E+00	AR
Barium as Ba	7800	357	471240	H:h	1.00E+02	R	0.84	1109	G	5.55E-14	AR	0.21	277	G	0.00E+00	AR
Cadmium as Cd	31	6.9	9108	H:H	1.00E+02	R	<0.03	0.00	G	0.00E+00	AR	<0.03	0.00	G	0.00E+00	AR
Cobalt as Co	[illegible]900	14.0	18480	H:H	5.02E-01	R	<0.07	0.00	G	0.00E+00	AR	<0.07	0.00	G	0.00E+00	AR
Chromium^{3+} as Cr^{3+}	4700	148	195360	H:h	9.97E+01	R	<0.07	0.00	G	0.00E+00	AR	<0.07	0.00	G	0.00E+00	AR
Copper as Cu	100	35	46200	H:H	1.00E+02	R	<0.05	0.00	G	0.00E+00	AR	<0.05	0.00	G	0.00E+00	AR
Iron as Fe	9000	57200	75504000	H:h	1.00E+02	R	<0.05	0.00	G	0.00E+00	AR	<0.05	0.00	G	0.00E+00	AR
Lead as Pb	100	112	147840	H:H	1.00E+02	R	0.05	66	G	5.88E-06	AR	<0.02	0.00	G	0.00E+00	AR
Manganese as Mn	300	572	755040	H:H	1.00E+02	R	[illegible]	805	H:H	5.07E-01	R	0.01	13	G	0.00E+00	AR
Mercury as Hg	22	<5.0	6600	H:H	1.00E+02	R	<0.02	0.00	G	0.00E+00	AR	<0.02	0.00	G	0.00E+00	AR
Nickel as Ni	1140	<66	87120	H:H	1.00E+02	R	<0.13	0.00	G	0.00E+00	AR	<0.13	0.00	G	0.00E+00	AR
Selenium as Se	260	<5.0	6600	H:H	9.66E+01	R	<0.02	0.00	G	0.00E+00	AR	<0.02	0.00	G	0.00E+00	AR
Silver as Ag	2000	<10	13200	H:h	2.08E+01	R	<0.02	0.00	G	0.00E+00	AR	<0.02	0.00	G	0.00E+00	AR
Titatium as Ti	731	3902	5150640	H:H	1.00E+02	R	<0.02	0.00	G	0.00E+00	AR	<0.02	0.00	G	0.00E+00	AR
Vanadium as V	1300	73	96360	H:h	1.00E+02	R	<0.02	0.00	G	0.00E+00	AR	<0.02	0.00	G	0.00E+00	AR
Zinc as Zn	700	100	132000	H:H	1.00E+02	R	0.12	158	G	1.98E-11	AR	<0.04	0.00	G	0.00E+00	AR
Fluoride as F-	1500	14	18480	H:h	6.58E+01	R	<0.1	0.00	G	0.00E+00	AR	<0.1	0.00	G	0.00E+00	AR
Waste Stream classifies: H:H / H:h / G		Worst Case Scenario		H:H			Worst Case Scenario		H:H			Worst Case Scenario		G		
Risk to Environment: R / AR		Risk to Environment		R		R	Risk to Environment		R		R	Risk to Environment		AR		AR

Table A-26

CLASSIFICATION SUMMARY: WASTE STREAM - DOLOCHAR -1mm
[Waste Characterization - Iscor Vanderbijlpark Steel]

INORGANIC COMPOUNDS	[1] Acc. Risk Value (MR) ppb	NAME OF WASTE STREAM: DOLOCHAR -1mm												VOLUME: 1,500,000 KG / MONTH		
		TOTAL ANALYSIS			[5] PROBIT RUN		TCLP EXTRACTION			[5] PROBIT RUN		ACID RAIN EXTRACTION			[5] PROBIT RUN	
		[2] Lab Conc. ppm	[3] EEC ppb	[4] Disposal Site	Risk Quantification %	Risk R / AR	[2] Lab Conc. ppm	[3] EEC ppb	[4] Disposal Site	Risk Quantification %	Risk R / AR	[2] Lab Conc. ppm	[3] EEC ppb	[4] Disposal Site	Risk Quantification	Risk R / AR
Aluminium as Al	10000	54300	53757000	H:h	1.00E+02	R	2.1	2079	G	6.93E-12	AR	0.28	277	G	0.00E+00	AR
Arsenic as As	430	17	16830	H:H	9.96E+01	R	<0.02	0.00	G	0.00E+00	AR	<0.02	0.00	G	0.00E+00	AR
Barium as Ba	7800	360	356400	H:h	9.99E+01	R	0.61	604	G	0.00E+00	AR	0.26	257	G	0.00E+00	AR
Cadmium as Cd	31	5.6	5544	H:H	1.00E+02	R	<0.03	0.00	G	0.00E+00	AR	<0.03	0.00	G	0.00E+00	AR
Cobalt as Co	6900	5.5	5445	G	3.63E-05	AR	<0.07	0.00	G	0.00E+00	AR	<0.07	0.00	G	0.00E+00	AR
Chromium^{3+} as Cr^{3+}	4700	38	37620	H:h	3.32E+01	R	<0.07	0.00	G	0.00E+00	AR	<0.07	0.00	G	0.00E+00	AR
Copper as Cu	100	6.9	6831	H:H	1.00E+02	R	<0.05	0.00	G	0.00E+00	AR	<0.05	0.00	G	0.00E+00	AR
Iron as Fe	9000	59100	58509000	H:h	1.00E+02	R	39	38610	H:h	4.91E+00	R	0.14	139	G	0.00E+00	AR
Lead as Pb	100	26	25740	H:H	1.00E+02	R	<0.02	0.00	G	0.00E+00	AR	<0.02	0.00	G	0.00E+00	AR
Manganese as Mn	300	1200	1188000	H:H	1.00E+02	R	15	14850	H:H	9.99E+01	R	0.20	198	G	5.88E-06	AR
Mercury as Hg	22	<5.0	4950	H:H	1.00E+02	R	<0.02	0.00	G	0.00E+00	AR	<0.02	0.00	G	0.00E+00	AR
Nickel as Ni	1140	<66	65340	H:H	1.00E+02	R	<0.13	0.00	G	0.00E+00	AR	<0.13	0.00	G	0.00E+00	AR
Selenium as Se	260	<5.0	4950	H:H	8.96E+01	R	0.03	30	G	0.00E+00	AR	<0.02	0.00	G	0.00E+00	AR
Silver as Ag	2000	<10	9900	H:h	8.47E+00	R	<0.02	0.00	G	0.00E+00	AR	<0.02	0.00	G	0.00E+00	AR
Titatium as Ti	731	2642	2615580	H:H	1.00E+02	R	0.07	69	G	0.00E+00	AR	<0.02	0.00	G	0.00E+00	AR
Vanadium as V	1300	<41	40590	H:h	9.87E+01	R	<0.02	0.00	G	0.00E+00	AR	<0.02	0.00	G	0.00E+00	AR
Zinc as Zn	700	13	12870	H:H	8.83E+01	R	<0.02	0.00	G	0.00E+00	AR	<0.04	0.00	G	0.00E+00	AR
Fluoride as F-	1500	160	158400	H:h	1.00E+02	R	<0.1	0.00	G	0.00E+00	AR	<0.1	0.00	G	0.00E+00	AR
Waste Stream classifies: H:H / H:h / G		Worst Case Scenario		H:H			Worst Case Scenario		H:H			Worst Case Scenario		G		
Risk to Environment: R / AR		Risk to Environment		R		R	Risk to Environment		R		R	Risk to Environment		AR		AR

Table A-27

CLASSIFICATION SUMMARY: WASTE STREAM - DOLOCHAR +1mm
[Waste Characterization - Iscor Vanderbijlpark Steel]

INORGANIC COMPOUNDS	[1] Acc. Risk Value (MR) ppb	NAME OF WASTE STREAM: DOLOCHAR +1mm										VOLUME: 9,000,000 KG / MONTH					
		TOTAL ANALYSIS			[5] PROBIT RUN		TCLP EXTRACTION			[5] PROBIT RUN		ACID RAIN EXTRACTION			[5] PROBIT RUN	
		[2] Lab Conc. ppm	[3] EEC ppb	[4] Disposal Site	Risk Quantification %	Risk R / AR	[2] Lab Conc. ppm	[3] EEC ppb	[4] Disposal Site	Risk Quantification %	Risk R / AR	[2] Lab Conc. ppm	[3] EEC ppb	[4] Disposal Site	Risk Quantification %	Risk R / AR
Aluminium as Al	1000[illegible]	52400	311256000	H:h	1.00E+02	R	2.9	17226	H:h	2.94E-02	R	0.60	3564	G	5.66E-09	AR
Arsenic as As	43[illegible]	26	154440	H:H	1.00E+02	R	<0.02	0.00	G	0.00E+00	AR	<0.02	0.00	G	0.00E+00	AR
Barium as Ba	780[illegible]	443	2631420	H:h	1.00E+02	R	0.90	5346	G	8.71E-06	AR	0.23	1366	G	7.55E-13	AR
Cadmium as Cd	31	8.6	51084	H:H	1.00E+02	R	<0.03	0.00	G	0.00E+00	AR	<0.03	0.00	G	0.00E+00	AR
Cobalt as Co	6900	6.7	39798	H:H	1.41E+01	R	<0.07	0.00	G	0.00E+00	AR	<0.07	0.00	G	0.00E+00	AR
Chromium^{3+} as Cr^{3+}	4700	98	582120	H:h	1.00E+02	R	<0.07	0.00	G	0.00E+00	AR	<0.07	0.00	G	0.00E+00	AR
Copper as Cu	100	8.0	47520	H:H	1.00E+02	R	<0.05	0.00	G	0.00E+00	AR	<0.05	0.00	G	0.00E+00	AR
Iron as Fe	[illegible]000	78000	463320000	H:h	1.00E+02	R	0.74	4396	G	2.23E-07	AR	<0.05	0.00	G	0.00E+00	AR
Lead as Pb	100	43	255420	H:H	1.00E+02	R	0.02	119	H:H	1.60E-03	R	<0.02	0.00	G	0.00E+00	AR
Manganese as Mn	300	1800	10692000	H:H	1.00E+02	R	0.12	713	H:H	2.49E-01	R	0.01	59	G	3.40E-12	AR
Mercury as Hg	22	<5.0	29700	H:H	1.00E+02	R	<0.02	0.00	G	0.00E+00	AR	<0.02	0.00	G	0.00E+00	AR
Nickel as Ni	114[illegible]	<66	392040	H:H	1.00E+02	R	<0.13	0.00	G	0.00E+00	AR	<0.13	0.00	G	0.00E+00	AR
Selenium as Se	260	<5.0	29700	H:H	1.00E+02	R	0.07	416	H:H	1.71E-02	R	<0.02	0.00	G	0.00E+00	AR
Silver as Ag	200[illegible]	<10	59400	H:h	9.83E+01	R	<0.02	0.00	G	0.00E+00	AR	<0.02	0.00	G	0.00E+00	AR
Titatium as Ti	731	2820	16750800	H:H	1.00E+02	R	0.09	535	G	1.71E-05	AR	<0.02	0.00	G	0.00E+00	AR
Vanadium as V	130[illegible]	<41	243540	H:h	1.00E+02	R	<0.02	0.00	G	0.00E+00	AR	<0.02	0.00	G	0.00E+00	AR
Zinc as Zn	70[illegible]	18	106920	H:H	1.00E+02	R	0.07	416	G	1.93E-06	AR	<0.04	0.00	G	0.00E+00	AR
Fluoride as F-	150[illegible]	177	1051380	H:h	1.00E+02	R	0.16	950	G	3.81E-06	AR	0.15	891	G	1.92E-06	AR
Waste Stream classifies: H:H / H:h / G		Worst Case Scenario		H:H			Worst Case Scenario		H:H			Worst Case Scenario		G		
Risk to Environment: R / AR		Risk to Environment		R		R	Risk to Environment		R		R	Risk to Environment		AR		AR

Table A-28

CLASSIFICATION SUMMARY: WASTE STREAM - BOF SLUDGE (MUD)
[Waste Characterization - Iscor Vanderbijlpark Steel]

INORGANIC COMPOUNDS	[1] Acc. Risk Value (MR) ppb	WASTE STREAM NAME: BOF SLUDGE (MUD)										VOLUME: 3,000,000 KG / MONTH				
		TOTAL ANALYSIS			[5] PROBIT RUN		TCLP EXTRACTION			[5] PROBIT RUN		ACID RAIN EXTRACTION			[5] PROBIT RUN	
		[2] Lab Conc. ppm	[3] EEC ppb	[4] Disposal Site	Risk Quantification %	Risk R / AR	[2] Lab Conc. ppm	[3] EEC ppb	[4] Disposal Site	Risk Quantification %	Risk R / AR	[2] Lab Conc. ppm	[3] EEC ppb	[4] Disposal Site	Risk Quantification %	Risk R / AR
Aluminium as Al	10000	11600	22968000	H:h	1.00E+02	R	1.9	3762	G	1.08E-08	AR	<0.15	0.00	G	0.00E+00	AR
Arsenic as As	430	46	91080	H:H	1.00E+02	R	<0.02	0.00	G	0.00E+00	AR	<0.02	0.00	G	0.00E+00	AR
Barium as Ba	7800	54	106920	H:h	7.31E+01	R	0.67	1327	G	5.22E-13	AR	0.15	297	G	0.00E+00	AR
Cadmium as Cd	31	22	43560	H:H	1.00E+02	R	0.05	99	H:H	1.29E+00	R	<0.03	0.00	G	0.00E+00	AR
Cobalt as Co	6900	22	43560	H:H	1.84E+01	R	<0.07	0.00	G	0.00E+00	AR	<0.07	0.00	G	0.00E+00	AR
Chromium^{3+} as Cr^{3+}	4700	210	415800	H:h	1.00E+02	R	<0.07	0.00	G	0.00E+00	AR	<0.07	0.00	G	0.00E+00	AR
Copper as Cu	100	42	83160	H:H	1.00E+02	R	<0.05	0.00	G	0.00E+00	AR	<0.05	0.00	G	0.00E+00	AR
Iron as Fe	9000	554000	1096920000	H:h	1.00E+02	R	629	1245420	H:h	1.00E+02	R	0.28	554	G	0.00E+00	AR
Lead as Pb	100	48	95040	H:H	1.00E+02	R	0.03	59	G	1.79E-06	AR	<0.02	0.00	G	0.00E+00	AR
Manganese as Mn	300	10900	21582000	H:H	1.00E+02	R	54	106920	H:H	1.00E+02	R	0.04	79	G	1.38E-10	AR
Mercury as Hg	22	<5.0	9900	H:H	1.00E+02	R	<0.02	0.00	G	0.00E+00	AR	<0.02	0.00	G	0.00E+00	AR
Nickel as Ni	1140	<66	130680	H:H	1.00E+02	R	<0.13	0.00	G	0.00E+00	AR	<0.13	0.00	G	0.00E+00	AR
Selenium as Se	260	<5.0	9900	H:H	9.96E+01	R	<0.02	0.00	G	0.00E+00	AR	<0.02	0.00	G	0.00E+00	AR
Silver as Ag	2000	<10	19800	H:h	4.92E+01	R	<0.02	0.00	G	0.00E+00	AR	<0.02	0.00	G	0.00E+00	AR
Titatium as Ti	731	700	1386000	H:H	1.00E+02	R	0.07	139	G	2.20E-12	AR	<0.02	0.00	G	0.00E+00	AR
Vanadium as V	1300	<41	81180	H:h	1.00E+02	R	<0.02	0.00	G	0.00E+00	AR	<0.02	0.00	G	0.00E+00	AR
Zinc as Zn	700	5508	10905840	H:H	1.00E+02	R	1.0	1980	H:H	6.79E-01	R	<0.04	0.00	G	0.00E+00	AR
Fluoride as F-	1500	411	813780	H:h	1.00E+02	R	2.7	5346	H:h	2.19E+00	R	3.5	6930	H:h	6.56E+00	R
Waste Stream classifies: H:H / H:h / G			Worst Case Scenario	H:H				Worst Case Scenario	H:H				Worst Case Scenario	H:h		
Risk to Environment: R / AR			Risk to Environment	R		R		Risk to Environment	R		R		Risk to Environment	R		R

APPENDIX C

AREA (HECTARE) REQUIRED FOR DISPOSAL OF ISCOR VANDERBIJLPARK STEEL SOLID WASTE CALCULATIONS ACCORDING TO TOTAL LOAD PRINCIPLE – TCLP MOBILITY (INCLUDING SLAGS)

TABLE B-1

Table B-1

AREA (HECTARE) REQUIRED FOR DISPOSAL OF ISCOR VANDERBIJLPARK STEEL SOLID WASTE CALCULATIONS ACCORDING TO TOTAL LOAD PRINCIPLE - TCLP MOBILITY (INCLUDING SLAGS)

	Al	Ba	Cd	Fe	Pb	Mn	Zn	F-
ACCEPTABLE RISK (g/ha)	15152	11818	46.9	13636	152	454	1061	2273
TOTAL LOAD (g/ha)	1515200	1181800	4697	1363600	15200	45400	106100	227300
WASTE SITE: H:H / H:h	Al	Ba	Cd	Fe	Pb	Mn	Zn	F-
WASTE STREAM NAME	g/m	g/m	g/m	g/m	g/m	g/m	g/m	g/m
BOF SLAG (COURSE)	57750	84000	0.00	5915000	2800	3850000	2800	105000
EAF BAGHOUSE DUST	4350	600	185	0.00	90	55500	76500	19500
BOF BAGHOUSE 2 DUST	740	130	0.00	96	0.00	4	64	4000
BOF BAGHOUSE 3 DUST	230	33	15	19	2	4200	12600	800
CONTINEOUS CASTER V3 SLUDGE	0.00	9.92	6.2	28881	2.17	80.6	4.34	6.2
BF D DUST	27740	3496	0.00	11400	304	91200	21660	7600
BF SLUDGE	109800	2416	146	70760	3660	158600	397720	1952
DR PRODUCT DUST	67500	13230	0.00	0.00	0.00	621000	2160	8100
DR WET SCRUBBER MUD	61	95.1	0.00	0.00	1.9	475	5.8	19.4
EAF SLAG	378000	13650	0.00	168000	830	630000	630	2100
VAALDAM SLUDGE	0.00	1680	0.00	0.00	100	1220	240	0.00
DOLOCHAR -1mm	3150	915	0.00	58500	0.00	22500	0.00	0.00
DOLOCHAR +1mm	26100	8100	0.00	8660	180	1080	630	1440
BOF SLUDGE (MUD)	5700	2010	150	1887000	90	162000	3000	8100
TOTAL (g/m)	681121	130365	482	8146296	7860	5597860	518014	158618
TOTAL (g/yr.)	8173452	1564380	5786	97755552	94321	67174315	6216170	1903411
(A) HECTARES REQUIRED (ha/yr.)	5.4	1.3	1.2	71.7	6.2	1480	58.6	8.4
WASTE SITE: G								
LADLE FURNACE 1&2 BAGHOUSE DUST	39	7.3	0.00	0.00	6.6	0.500	1.3	1220
BOF BAGHOUSE 1 DUST	250	13	0.00	10	3	11	16	900
FOUNDRY CYCLONE DUST	21	1.6	0.00	80	0.00	84	1.12	2.4
TOTAL (g/m)	310	21.9	0.00	90	9.6	95.5	18.42	2122.4
TOTAL (g/yr.)	3720	263	0.00	1080	115	1146	221	25468.8
(B) HECTARES REQUIRED (ha/yr.)	0.002	0.0002	0.00	0.0008	0.008	0.025	0.002	0.112
(A+ B) TOTAL HECTARES REQUIRED (ha/yr.)	5.4	1.3	1.2	71.7	6.2	1480	58.6	8.5

APPENDIX C

AREA (HECTARE) REQUIRED FOR DISPOSAL OF ISCOR VANDERBIJLPARK STEEL SOLID WASTE CALCULATIONS ACCORDING TO TOTAL LOAD PRINCIPLE – ACID RAIN (MONO DISPOSAL) (INCLUDING SLAGS)

TABLE B-2

Table B-2

AREA (HECTARE) REQUIRED FOR DISPOSAL OF ISCOR VANDERBIJLPARK STEEL SOLID WASTE CALCULATIONS ACCORDING TO TOTAL LOAD PRINCIPLE - ACID RAIN (MONO DISPOSAL) (INCLUDING SLAGS)

	Al	Ba	Cd	Fe	Pb	Mn	Zn	F-
ACCEPTABLE RISK (g/ha)	15152	11818	46.9	13636	152	454	1061	2273
TOTAL LOAD (g/ha)	1515200	1181800	4697	1363600	15200	45400	106100	227300

WASTE SITE: H:H / H:h

WASTE STREAM NAME	Al g/m	Ba g/m	Cd g/m	Fe g/m	Pb g/m	Mn g/m	Zn g/m	F- g/m
BOF SLAG (COURSE)	8750	14700	0.00	23800	0.00	87500	0.00	10500
BF D DUST	1292	950	0.00	3420	76	18620	760	14820
BF SLUDGE	0.00	732	0.00	195	0.00	24400	7808	19276
DR PRODUCT DUST	7560	4860	0.00	2430	0.00	1080	1620	10800
EAF SLAG	0.00	1890	0.00	630	0.00	23100	0.00	0.00
BOF SLUDGE (MUD)	0.00	450	0.00	870	0.00	120	0.00	10500
TOTAL (g/m)	17602	23582	0.00	31345	76	154820	10188	65896
TOTAL (g/yr.)	211224	282984	0.00	376140	912	1857840	122256	790752
(A) HECTARES REQUIRED (ha/yr.)	0.139	0.239	0.00	0.276	0.060	40.9	1.2	3.5

WASTE SITE: G

WASTE STREAM NAME	Al	Ba	Cd	Fe	Pb	Mn	Zn	F-
EAF BAGHOUSE DUST	0.00	60	0.00	315	0.00	30	0.00	150
LADLE FURNACE 1&2 BAGHOUSE DUST	19	2.7	0.00	0.900	5.4	0.300	0.00	80
BOF BAGHOUSE 2 DUST	340	70	0.00	48	0.00	0.00	0.00	1540
BOF BAGHOUSE 3 DUST	420	11	0.00	94	9.00	0.00	45	360
BOF BAGHOUSE 1 DUST	130	7	0.00	21	6	32	0.00	830
CONTINEOUS CASTER V3 SLUDGE	0.00	4	0.00	5301	1.24	7.44	0.00	0.00
FOUNDRY CYCLONE DUST	1.4	0.560	0.00	3.56	0.00	2.32	0.160	2.3
DR WET SCRUBBER MUD	0.00	18.43	0.00	5.82	0.00	6.79	0.00	0.00
VAALDAM SLUDGE	0.00	420	0.00	0.00	0.00	20	0.00	0.00
DOLOCHAR -1mm	420	390	0.00	210	0.00	300	0.00	0.00
DOLOCHAR +1mm	5400	2070	0.00	0.00	0.00	90	0.00	1350
TOTAL (g/m)	6730	3054	0.00	5999	21.6	489	45	4312.3
TOTAL (g/yr.)	80764.8	36645	0.00	71991	260	5866	541.92	51747.6
(B) HECTARES REQUIRED (ha/yr.)	0.053	0.031	0.00	0.053	0.017	0.129	0.005	0.228
(A+ B) TOTAL HECTARES REQUIRED (ha/yr.)	0.193	0.270	0.000	0.3	0.077	41	1.2	3.7

APPENDIX C

AREA (HECTARE) REQUIRED FOR DISPOSAL OF ISCOR VANDERBIJLPARK STEEL SOLID WASTE CALCULATIONS ACCORDING TO TOTAL LOAD PRINCIPLE – TCLP MOBILITY (EXCLUDING SLAGS)

TABLE C-1

Table C-1

AREA (HECTARE) REQUIRED FOR DISPOSAL OF ISCOR VANDERBIJLPARK STEEL SOLID WASTE CALCULATIONS ACCORDING TO TOTAL LOAD PRINCIPLE - TCLP MOBILITY (EXCLUDING SLAGS)

	Al	Ba	Cd	Fe	Pb	Mn	Zn	F-
ACCEPTABLE RISK (g/ha)	15152	11818	46.9	13636	152	454	1061	2273
TOTAL LOAD (g/ha)	1515200	1181800	4697	1363600	15200	45400	106100	227300

WASTE SITE: H:H / H:h

WASTE STREAM NAME	Al g/m	Ba g/m	Cd g/m	Fe g/m	Pb g/m	Mn g/m	Zn g/m	F- g/m
EAF BAGHOUSE DUST	4350	600	165	0.00	90	55500	76500	19500
BOF BAGHOUSE 2 DUST	740	130	0.00	96	0.00	4	64	4000
BOF BAGHOUSE 3 DUST	230	33	15	19	2	4200	12600	800
CONTINEOUS CASTER V3 SLUDGE	0.00	9.92	6.2	28861	2.17	80.6	4.34	6.2
BF D DUST	27740	3496	0.00	11400	304	91200	21660	7600
BF SLUDGE	109800	2416	146	70780	3660	158600	397720	1952
DR PRODUCT DUST	67500	13230	0.00	0.00	0.00	621000	2160	8100
DR WET SCRUBBER MUD	61	95.1	0.00	0.00	1.9	475	5.8	19.4
VAALDAM SLUDGE	0.00	1680	0.00	0.00	100	1220	240	0.00
DOLOCHAR -1mm	3150	915	0.00	58500	0.00	22500	0.00	0.00
DOLOCHAR +1mm	26100	8100	0.00	6660	180	1080	630	1440
BOF SLUDGE (MUD)	5700	2010	150	1887000	90	162000	3000	8100
TOTAL (g/m)	245371	32715	482	2063296	4430	1117860	514584	51518
TOTAL (g/yr.)	2944452	392580	5786	24759552	53161	13414315	6175010	618211
(A) HECTARES REQUIRED (ha/yr.)	1.94	0.332	1.23	18.2	3.50	295	58.2	2.72

WASTE SITE: G

LADLE FURNACE 1&2 BAGHOUSE DUST	39	7.3	0.00	0.00	6.6	0.500	1.3	1220
BOF BAGHOUSE 1 DUST	250	13	0.00	10	3	11	16	900
FOUNDRY CYCLONE DUST	21	1.6	0.00	80	0.00	84	1.12	2.4
TOTAL (g/m)	310	21.9	0.00	90	9.6	95.5	18.42	2122.4
TOTAL (g/yr.)	3720	263	0.00	1080	115	1146	221	25468.8
(B) HECTARES REQUIRED (ha/yr.)	0.002	0.0002	0.00	0.0008	0.008	0.025	0.002	0.112

(A+ B) TOTAL HECTARES REQUIRED (ha/yr.)	1.95	0.332	1.23	18.2	3.51	295	58.2	2.8

APPENDIX C

AREA (HECTARE) REQUIRED FOR DISPOSAL OF ISCOR VANDERBIJLPARK STEEL SOLID WASTE CALCULATIONS ACCORDING TO TOTAL LOAD PRINCIPLE – ACID RAIN (MONO DISPOSAL) (EXCLUDING SLAGS)

TABLE C-2

Table C-2

AREA (HECTARE) REQUIRED FOR DISPOSAL OF ISCOR VANDERBIJLPARK STEEL SOLID WASTE CALCULATIONS ACCORDING TO TOTAL LOAD PRINCIPLE - ACID RAIN (MONO DISPOSAL) (EXCLUDING SLAGS)

	Al	Ba	Cd	Fe	Pb	Mn	Zn	F-
ACCEPTABLE RISK (g/ha)	15152	11818	46.9	13636	152	454	1061	2273
TOTAL LOAD (g/ha)	1515200	1181800	4697	1363600	15200	45400	106100	227300

WASTE SITE: H:H / H:h	Al	Ba	Cd	Fe	Pb	Mn	Zn	F-
WASTE STREAM NAME	g/m	g/m	g/m	g/m	g/m	g/m	g/m	g/m
BF D DUST	1292	950	0.00	3420	76	18620	760	14820
BF SLUDGE	0.00	732	0.00	195	0.00	24400	7808	19276
DR PRODUCT DUST	7560	4860	0.00	2430	0.00	1080	1620	10800
BOF SLUDGE (MUD)	0.00	450	0.00	870	0.00	120	0.00	10500
TOTAL (g/m)	8852	6992	0.00	6915	76	44220	10188	55396
TOTAL (g/yr.)	106224	83904	0.00	82980	912	530640	122256	664752
(A) HECTARES REQUIRED (ha/yr.)	0.070	0.071	0.00	0.06	0.060	11.7	1.15	2.92

WASTE SITE: G	Al	Ba	Cd	Fe	Pb	Mn	Zn	F-
EAF BAGHOUSE DUST	0.00	60	0.00	315	0.00	30	0.00	150
LADLE FURNACE 1&2 BAGHOUSE DUST	19	2.7	0.00	0.900	5.4	0.300	0.00	80
BOF BAGHOUSE 2 DUST	340	70	0.00	48	0.00	0.00	0.00	1540
BOF BAGHOUSE 3 DUST	420	11	0.00	94	9.00	0.00	45	360
BOF BAGHOUSE 1 DUST	130	7	0.00	21	6	32	0.00	830
CONTINEOUS CASTER V3 SLUDGE	0.00	4	0.00	5301	1.24	7.44	0.00	0.00
DR WET SCRUBBER MUD	0.00	18.43	0.00	5.82	0.00	6.79	0.00	0.00
FOUNDRY CYCLONE DUST	1.4	0.560	0.00	3.56	0.00	2.32	0.160	2.3
VAALDAM SLUDGE	0.00	420	0.00	0.00	0.00	20	0.00	0.00
DOLOCHAR -1mm	420	390	0.00	210	0.00	300	0.00	0.00
DOLOCHAR +1mm	5400	2070	0.00	0.00	0.00	90	0.00	1350
TOTAL (g/m)	6730	3054	0.00	5999	21.6	489	45	4312.3
TOTAL (g/yr.)	80764.8	36645	0.00	71991	260	5866	541.92	51747.6
(B) HECTARES REQUIRED (ha/yr.)	0.053	0.031	0.00	0.053	0.017	0.129	0.005	0.228

	Al	Ba	Cd	Fe	Pb	Mn	Zn	F-
(A+ B) TOTAL HECTARES REQUIRED (ha/yr.)	0.123	0.102	0.000	0.11	0.077	11.8	1.16	3.15

SAMPLING/MONITORING AND LABORATORY ANALYSIS DETAILS: WASTE STREAMS

TYPE OF SAMPLES	OFT/ISCOR SAMPLING DATE	DATE DELIVERED AT LAB	DATE COMPLETED BY LAB	NAME OF LABORATORY		REPORT NUMBER	DESCRIPTION OF SAMPLES/ LABORATORY ANALYSIS
				SGS SA (PTY) LTD	POLTECH		
WASTE STREAMS (1 - 30) - Inorganic	16 till 18-08-2000	18-08-2000	9-11-2000	Yes		2290-1Z	Samples: 1 - 30 = 30 samples - Inorganic Micro's
(1 - 30) - Organic	16 till 18-08-2000		18-11-2000		Yes	DL NO. 2290-1	Samples: 1 - 30 = 30 samples - Organic PAH's & VOC's on TCLP EXTRACT
(1 - 8) - Inorganic	2-11-2000	3-11-2000	22-01-2001	Yes		2809-1Z	Samples: 1 - 8 = 8 samples - Inorganic Micro's
(1 - 8) - Organic	2-11-2000	11-12-2000	14-12-2000	*Yes		2846	Samples: 1 - 8 = 8 samples - Organic PAH's & VOC's on TCLP EXTRACT

*Yes = SGS LAB NOT ACCRREDITED FOR VOC & PAH ANALYSES PERFORMED

APPENDIX D

LABORATORY ANALYSIS: INORGANIC

SGS MINERAL SERVICES

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CERTIFICATE OF ANALYSIS

To : OCKIE FOURIE TOXICOLOGISTS PTY
P O BOX 73179
LYNNWOOD RIDGE
0040
ATT: DR H O FOURIE
FAX:012 348 7436/TEL:348 9732

DI No : 2290Z
Date Received : 18/08/00
Description : HEAD ANALYSIS (27)

ANALYSIS		FLOW SLAG (FINE) B/FURNACE H72	FLOW SLAG (COARSE) B/FURNACE	BOF SLAG WITH SULPHUR
Ag	ppm	22	<10	98
Al	%	3.89	2.64	3.40
As	ppm	<12	<12	<12
Ba	ppm	288	453	159
Cd	ppm	<10	<10	<10
Co	ppm	5.0	7.8	5.2
Cr	ppm	1282	8121	1621
Cu	ppm	14	60	24
Fe	%	16.0*	22.3*	20.0*
Hg	ppm	<5.0	<5.0	<5.0
Mn	%	3.04	5.85	2.99
Ni	ppm	<66	<66	<66
Pb	ppm	<18	<18	<18
Se	ppm	<5.0	<5.0	<5.0
Ti	ppm	3023	4026	2706
V	ppm	229	454	212
Zn	ppm	19	64	65
F-	g/100g	1.89	1.07	2.26
Waste Names →		① BOF Slag (Fine)	② BOF Slag (Course)	③ Desulphurisation Slag
		Table A-1	Table A-2	Table A-3

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Research for IVS

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DI No : 2290Z
Date Received : 18/08/00
Description : HEAD ANALYSIS (27)

ANALYSIS		BOF SLAG WITHOUT SULPHUR	EAF BAGHOUSE DUST	LADLE F/NACE 1&2 BAGHOUSE DUST
Ag	ppm	<10	14	<10
Al	%	2.68	0.59	2.44
As	ppm	<12	22	24
Ba	ppm	52	106	52
Cd	ppm	<10	<10	<10
Co	ppm	3.8	8.1	4.0
Cr	ppm	827	658	99
Cu	ppm	<2.0	551	148
Fe	%	20.9*	46.2*	11.2*
Hg	ppm	<5.0	<5.0	<5.0
Mn	%	4.06	3.67	1.98
Ni	ppm	<66	<66	<66
Pb	ppm	<18	1189	103
Se	ppm	<5.0	<5.0	<5.0
Ti	ppm	2983	552	117
V	ppm	263	50	<41
Zn	ppm	12	2.64%	814
F-	g/100g	1.42	2.26	37.93
		(4) BOF Slag (Unprocessed)	(5) EAF Baghouse dust	(6) Ladle furnace 1 & 2 Baghouse dust
		Table A-4	Table A-5	Table A-6

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DI No : 2290Z
Date Received : 18/08/00
Description : HEAD ANALYSIS (27)

ANALYSIS		BOF SECONDARY 3 DEGASSING DUST	BOF SECONDARY 2 DEGASSING DUST	BOF SECONDARY 1 DEGASSING DUST
Ag	ppm	13	<10 ✓	20
Al	%	0.99	0.52	1.24
As	ppm	79	22	19
Ba	ppm	44	17	26
Cd	ppm	<10	<10	<10
Co	ppm	6.9	4.4	11
Cr	ppm	62	90	1.02%
Cu	ppm	15	22	42
Fe	%	31.1*	56.1*	15.1*
Hg	ppm	<5.0	<5.0	<5.0
Mn	%	0.31	1.02	12.7
Ni	ppm	<66	<66	<66
Pb	ppm	<18	361	62
Se	ppm	<5.0	<5.0	<5.0
Ti	ppm	1742	720	551
V	ppm	<41	<41	150
Zn	ppm	1268	1.02%	406
F-	g/100g	5.93	2.23	19.44
		(7) BOF Baghouse 2 Dust ✓	(8) BOF Baghouse 3 Dust ✓	(9) BOF Baghouse 1 Dust ✓
		Table A-7	Table A-8	Table A-9

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DI No : 22907

Date Received : 18/08/00

Description : HEAD ANALYSIS (27)

ANALYSIS		BOF WET SCRUBBER 1,2&3 SLUDGE	BOF RHOB DUST	C/NEOUS CASTER V3 SCALE SLUDGE
Ag	ppm	<10	19	<10
Al	%	0.60	2.30	<0.04
As	ppm	<12	15	<12
Ba	ppm	14	23	20
Cd	ppm	<10	<10	<10
Co	ppm	5.2	4.6	9.6
Cr	ppm	133	1045	233
Cu	ppm	24	49	36
Fe	%	77.8*	11.0*	73.1*
Hg	ppm	<5.0	<5.0	<5.0
Mn	%	1.00	10.3	0.14
Ni	ppm	<66	<66	<66
Pb	ppm	<18	87	<18
Se	ppm	<5.0	<5.0	<5.0
Ti	ppm	470	292	179
V	ppm	57	120	<41
Zn	ppm	307	371	14
F-	g/100g	1.51	18.45	0.94
		(10) BOF Grid	(11) RHOB Baghouse	(12) Contineous Cast
			Dust	V3 Sludge
		Table A-23		Table A-10

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DI No : 2290Z
Date Received : 18/08/00
Description : HEAD ANALYSIS (27)

ANALYSIS		KCL DUST SINTER GRAVEL BED	SINTER DUST AG	SINTER DUST BG
Ag	ppm	<10	<10	<10
Al	%	4.83	1.07	1.34
As	ppm	<12	<12	<12
Ba	ppm	1.1	200	234
Cd	ppm	<10	<10	<10
Co	ppm	<2.0	5.9	7.0
Cr	ppm	<2.0	96	93
Cu	ppm	<2.0	8.2	10
Fe	%	3.28	41.4*	36.6*
Hg	ppm	<5.0	<5.0	<5.0
Mn	%	0.45	0.93	0.87
Ni	ppm	<66	<66	<66
Pb	ppm	412	<18	<18
Se	ppm	<5.0	<5.0	<5.0
Ti	ppm	154	710	865
V	ppm	<41	<41	<41
Zn	ppm	395	36	48
F-	g/100g	1.71	0.96	1.05
		(13) KCL DUST	(14) SINTER AG 100 DUST	(15) SINTER BG 100 DUST
			Table A-11	Table A-12

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DI No : 22907
Date Received : 18/08/00
Description : HEAD ANALYSIS (27)

ANALYSIS		SINTER DUST CG	BF C CYCLONE DUST	BF D C/LONE DUST + WET SCRUB
Ag	ppm	<10	<10	<10
Al	%	<0.04	1.16	1.38
As	ppm	<12	<12	<12
Ba	ppm	7.8	281	182
Cd	ppm	<10	<10	<10
Co	ppm	3.5	5.3	8.9
Cr	ppm	10	100	108
Cu	ppm	<2.0	8.2	8.2
Fe	%	0.32	41.5*	28.2*
Hg	ppm	<5.0	<5.0	<5.0
Mn	%	0.48	1.05	0.55
Ni	ppm	<66	<66	<66
Pb	ppm	<18	<18	138
Se	ppm	39	<5.0	<5.0
Ti	ppm	36	1142	3475
V	ppm	<41	<41	<41
Zn	ppm	48	45	402
F-	g/100g	1.05	1.18	1.35
		(16) Sinter CC 100 Dust	(17) BF C Dust	(18) BF D Dust
		Table A-13	Table A-14	Table A-15

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DI No : 2290Z
Date Received : 18/08/00
Description : HEAD ANALYSIS (27)

ANALYSIS		BF C WET SCRUBBER SLUDGE	BF PRIME GRANULAR SLAG	BF DEGRADED GRANULAR SLAG
Ag	ppm	<10	<10	<10
Al	%	1.60	6.98	8.28
As	ppm	32	23	18
Ba	ppm	282	1004	1197
Cd	ppm	<10	<10	<10
Co	ppm	7.0	5.2	7.0
Cr	ppm	55	28	45
Cu	ppm	27	10	<2.0
Fe	%	32.3*	0.57	0.55
Hg	ppm	<5.0	<5.0	<5.0
Mn	%	0.40	0.72	1.12
Ni	ppm	<65	<66	<66
Pb	ppm	1352	67	57
Se	ppm	<5.0	18	8.7
Ti	ppm	940	3467	4218
V	ppm	<41	<41	<41
Zn	ppm	7017	31	25
F-	g/100g	1.51	1.51	1.66
		(19) BF Sludge	(20) BF Prime	(21) BF ~~Degraded~~ Off grade
			Granulated Slag	Granulated Slag
		Table A-16	Table A-17	Table A-18

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DI No : 22907
Date Received : 18/08/00
Description : HEAD ANALYSIS (27)

ANALYSIS		ESP	DR WET SCRUBBER MUD	COKE OVEN SEMABLE PITCH
Ag	ppm	<10	<10	<10
Al	%	7.52	3.70	0.10
As	ppm	18	12	18
Ba	ppm	616	270	12
Cd	ppm	<10	<10	15
Co	ppm	10	7.0	8.8
Cr	ppm	54	33	34
Cu	ppm	<2.0	<2.0	30
Fe	%	3.56	11.6*	5.11
Hg	ppm	<5.0	<5.0	45
Mn	%	0.08	0.07	0.04
Ni	ppm	<66	<66	<66
Pb	ppm	38	26	358
Se	ppm	<5.0	<5.0	<5.0
Ti	ppm	3890	2218	139
V	ppm	<41	<41	<41
Zn	ppm	9.8	29	1179
F-	g/100g	1.24	1.52	1.35
		(25) DR PRODUCT DUST	(26) DR WET SCRUBBER MUD	(27) COKE OVEN Semable Pitch
		Table A-19	Table A-20	

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DI No : 2290Z
Date Received : 18/08/00
Description : HEAD ANALYSIS (27)

ANALYSIS		ARC FURNACE SLAG HECKETT 85	CASTIRON CYCONE DUST	DR CYCLONE DUST
Ag	ppm	<10	<10	<10
Al	%	7.10	1.80	0.89
As	ppm	19	<12	<12
Ba	ppm	1007	120	260
Cd	ppm	<10	<10	<10
Co	ppm	6.2	7.4	5.4
Cr	ppm	33	2.89%	31
Cu	ppm	<2.0	14	3.0
Fe	%	0.56	3.17	49.3*
Hg	ppm	<5.0	<5.0	<5.0
Mn	%	0.86	0.03	0.05
Ni	ppm	<66	<66	<66
Pb	ppm	54	173	<18
Se	ppm	<5.0	<5.0	<5.0
Ti	ppm	3526	1591	360
V	ppm	<41	<41	<41
Zn	ppm	18	91	16
F-	g/100g	1.23	1.48	1.16
		(28) EAF SLAG	(29) FOUNDRY CYCLONE DUST	(30) DR Raw Material Dust
		Table A-21	TABLE A-22	TABLE A-24

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FAX:012 348 7436/TEL:348 9732

DI No : **2290-1Z**
Date Received : **18/08/00**
Description : ***ISCOR V/DBIJL (TCLP/ACID RAIN)***

ANALYSIS		01 Flow slag (fine)Blst TCLP	02 Flow slag(coarse)Blst TCLP	03 BOF Slag with Sulphur TCLP
Ag	mg/l	<0.02	<0.02	<0.02
Al	mg/l	3.0	2.5	2.7
As	mg/l	<0.02	<0.02	<0.02
Ba	mg/l	0.42	2.4	0.45
Cd	mg/l	<0.03	<0.03	<0.03
[illegible]	mg/l	<0.07	<0.07	<0.07
Cr	mg/l	<0.07	<0.07	<0.07
Cu	mg/l	<0.05	<0.05	<0.05
Fe	mg/l	0.51	169	0.31
Hg	mg/l	<0.02	<0.02	<0.02
Mn	mg/l	0.10	110	0.24
Ni	mg/l	<0.13	<0.13	<0.13
Pb	mg/l	0.03	0.08	0.03
Se	mg/l	0.02	<0.02	0.03
Ti	mg/l	<0.02	0.03	0.03
V	mg/l	0.11	0.07	0.03
Zn	mg/l	<0.04	0.08	<0.04
F-	mg/l	2	3	8
pH	final	10.8	6.9	10.0
Waste Name ⇒		① BOF Slag (Fine)	② BOF Slag (Course)	③ Desulphurisation Slag
		Table A-1	Table A-2	Table A-3

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NOTE: *Results confirmed. **Results amended. This certificate supersedes all previous documents bearing the reference DI 2290-1.

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DI No : 2290-1Z
Date Received : 18/08/00
Description : ISCOR V/DBIJL (TCLP/ACID RAIN)

ANALYSIS		04 BOF Slag without Sulp TCLP	05 EAF Baghouse Dust TCLP	06 Ladle Fur 1&2 BagDust TCLP
Ag	mg/l	<0.02	<0.02	<0.02
Al	mg/l	1.5	2.9	3.9
As	mg/l	<0.02	0.02	0.02
Ba	mg/l	0.19	0.40	0.73
Cd	mg/l	0.08	0.11	<0.03
Co	mg/l	<0.07	<0.07	<0.07
Cr	mg/l	<0.07	1.8	<0.07
Cu	mg/l	<0.05	<0.05	<0.05
Fe	mg/l	0.40	<0.05	<0.05
Hg	mg/l	<0.02	<0.02	<0.02
Mn	mg/l	0.12	37	0.05
Ni	mg/l	<0.13	<0.13	<0.13
Pb	mg/l	<0.02	0.06	0.66
Se	mg/l	0.03	0.06	0.23
Ti	mg/l	<0.02	<0.02	0.05
V	mg/l	0.11	0.03	<0.02
Zn	mg/l	<0.04	51	0.13
F-	mg/l	1	13	122
pH	final	10.5	7.5	12.7
		(4) BOF Slag (Unprocessed)	(5) EAF Baghouse dust	(6) Ladle furnace 1&2 baghouse dust
		Table A-4	Table A-5	Table A-6

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To : OCKIE FOURIE TOXICOLOGISTS PTY
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DI No : 2290-1Z
Date Received : 18/08/00
Description : ISCOR V/DBIJL (TCLP/ACID RAIN)

ANALYSIS		07 BOF Second 3 DegDust TCLP	08 BOF Second 2 DegDust TCLP	09 BOF Second 1 DegDust TCLP
Ag	mg/l	<0.02	<0.02	<0.02
Al	mg/l	3.7	2.3	2.5
As	mg/l	0.12	<0.02	0.03
Ba	mg/l	0.65	0.33	0.13
Cd	mg/l	<0.03	0.15	<0.03
Co	mg/l	<0.07	<0.07	0.09
Cr	mg/l	<0.07	<0.07	6.9
Cu	mg/l	<0.05	<0.05	<0.05
Fe	mg/l	0.46	0.19	0.10
Hg	mg/l	<0.02	<0.02	<0.02
Mn	mg/l	0.02*	42*	0.11*
Ni	mg/l	<0.13	<0.13	<0.13
Pb	mg/l	<0.02	0.02	0.03
Se	mg/l	0.07	0.04	0.18
Ti	mg/l	0.05	<0.02	0.03
V	mg/l	<0.02	<0.02	<0.02
Zn	mg/l	0.32*	126**	0.16*
F-	mg/l	20	8	9
pH	final	12.7	7.6	10.8
		(7) BOF Baghouse 2 Dust ✓	(8) BOF Baghouse 3 Dust ✓	(9) BOF Baghouse 1 Dust ✓
		Table A-7	Table A-8	Table A-9

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DI No : 2290-17

Date Received : 18/08/00

Description : ISCOR V/DBIJL (TCLP/ACID RAIN)

ANALYSIS		10 BOF Wet Scrub(1,2,3)Sd TCLP	11 BOF RHOB Dust TCLP	12 Contineous CasterV3 TCLP
Ag	mg/l	<0.02	<0.02	<0.02
Al	mg/l	1.6	2.6	<0.15
As	mg/l	<0.02	0.03	<0.02
Ba	mg/l	0.47	0.17	0.32
Cd	mg/l	0.13	<0.03	0.20
Co	mg/l	<0.07	<0.07	<0.07
Cr	mg/l	<0.07	4.6	<0.07
Cu	mg/l	<0.05	<0.05	<0.05
Fe	mg/l	1.21g/l	1.1	931
Hg	mg/l	<0.02	<0.02	<0.02
Mn	mg/l	82	0.11	2.6
Ni	mg/l	<0.13	<0.13	<0.13
Pb	mg/l	0.11	<0.02	0.07
Se	mg/l	<0.02	0.12	<0.02
Ti	mg/l	0.02	0.03	0.05
V	mg/l	0.04	<0.02	0.02
Zn	mg/l	0.59	0.04	0.14
F-	mg/l	<0.1	0.2	0.2
pH	final	6.2	11.6	6.2
		(10) BOF Grid	(11) RHOB Baghouse Dust	(12) Contineous Cast V3 Sludge
		TABLE A-23		Table A-10

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DI No : 2290-17
Date Received : 18/08/00
Description : ISCOR V/DBIJL (TCLP/ACID RAIN)

ANALYSIS		13 KCL Dust sinter gravel TCLP	14 Sinter Dust AG TCLP	15 Sinter Dust BG TCLP
Ag	mg/l	<0.02	<0.02	<0.02
Al	mg/l	10	2.4	2.5
As	mg/l	0.02	0.03	0.02
Ba	mg/l	0.40	0.73	0.82
Cd	mg/l	0.07	<0.03	<0.03
Co	mg/l	<0.07	<0.07	<0.07
Cr	mg/l	<0.07	<0.07	<0.07
Cu	mg/l	<0.05	<0.05	<0.05
Fe	mg/l	7.9	0.55	<0.05
Hg	mg/l	<0.02	<0.02	<0.02
Mn	mg/l	36	0.04	0.01
Ni	mg/l	<0.13	<0.13	<0.13
Pb	mg/l	1.5	<0.02	<0.02
Se	mg/l	0.05	<0.02	0.03
Ti	mg/l	<0.02	0.07	0.03
V	mg/l	<0.02	0.07	0.05
Zn	mg/l	22	0.06	<0.04
F-	mg/l	3	<0.1	0.3
pH	final	5.5	5.4	9.9
		(13) KCL Dust	(14) Sinter AS 100 Dust	(15) SINTER BS 100 DUST
			Table A-11	Table A-12

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DI No : 2290-17
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Description : ISCOR V/DBIJL (TCLP/ACID RAIN)

ANALYSIS		16 Sinter Dust CG TCLP	17 BF C Cyclone Dust TCLP	18 BF D Cyclone Dust+WetS TCLP
Ag	mg/l	<0.02	<0.02	<0.02
Al	mg/l	2.6	2.1	7.3
As	mg/l	<0.02	<0.02	<0.02
Ba	mg/l	0.41	1.0	0.92
Cd	mg/l	<0.03	<0.03	<0.03
Co	mg/l	<0.07	<0.07	<0.07
Cr	mg/l	<0.07	<0.07	<0.07
Cu	mg/l	<0.05	<0.05	<0.05
Fe	mg/l	0.17	<0.05	3.0
Hg	mg/l	<0.02	<0.02	<0.02
Mn	mg/l	22	0.09	24
Ni	mg/l	<0.13	<0.13	<0.13
Pb	mg/l	<0.02	0.06	0.08
Se	mg/l	<0.02	<0.02	<0.02
Ti	mg/l	0.03	<0.02	<0.02
V	mg/l	<0.02	0.11	<0.02
Zn	mg/l	0.11	0.12	5.7
F-	mg/l	0.2	0.3	2
pH	final	6.2	8.9	5.7
		(16) Sinter CG 100	(17) BF C DUST	(18) BF D DUST
		DUST		
		Table A-13	Table A-14	Table A-15

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DI No : 2290-17
Date Received : 18/08/00
Description : ISCOR V/DBIJL (TCLP/ACID RAIN)

ANALYSIS		19 BF C Wet Scrubber Slud TCLP	20 BF Prime Granular Slag TCLP	21 BF Degraded Gran Slag TCLP
Ag	mg/l	<0.02	<0.02	<0.02
Al	mg/l	45	27	22
As	mg/l	<0.02	<0.02	<0.02
Ba	mg/l	0.99	3.5	1.2
Cd	mg/l	0.06	<0.03	<0.03
Co	mg/l	<0.07	<0.07	<0.07
Cr	mg/l	<0.07	<0.07	<0.07
Cu	mg/l	<0.05	<0.05	<0.05
Fe	mg/l	29	83	12
Hg	mg/l	<0.02	<0.02	<0.02
Mn	mg/l	65	36	7.8
Ni	mg/l	<0.13	<0.13	<0.13
Pb	mg/l	1.5	0.05	<0.02
Se	mg/l	<0.02	<0.02	<0.02
Ti	mg/l	<0.02	0.09	0.18
V	mg/l	<0.02	0.04	0.02
Zn	mg/l	163	0.23	0.10
F-	mg/l	0.8	0.2	0.2
pH	final	5.0	5.5	5.2 OFF GRADE
		(19) BF Sludge ✓	(20) BF Prime Granulated Slag ✓	(21) BF ~~DEGRADED~~ Granulated Slag.
		Table A-16	Table A-17	Table A-18

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DI No : 2290-1Z
Date Received : 18/08/00
Description : ISCOR V/DBIJL (TCLP/ACID RAIN)

ANALYSIS		25 ESP Dust TCLP	26 DR Wet Scrubber Mud TCLP	27 Coke Oven Semable PitchTCLP
Ag	mg/l	<0.02	<0.02	<0.02
Al	mg/l	2.5	0.63	1.2
As	mg/l	<0.02	<0.02	<0.02
Ba	mg/l	0.49	0.98	0.34
Cd	mg/l	<0.03	<0.03	<0.03
[illegible]	mg/l	<0.07	<0.07	<0.07
Cr	mg/l	<0.07	<0.07	<0.07
Cu	mg/l	<0.05	<0.05	<0.05
Fe	mg/l	<0.05	<0.05	2.6
Hg	mg/l	<0.02	<0.02	<0.02
Mn	mg/l	23	4.9	0.56
Ni	mg/l	<0.13	<0.13	<0.13
Pb	mg/l	<0.02	0.02	0.02
Se	mg/l	<0.02	<0.02	<0.02
Ti	mg/l	<0.02	<0.02	<0.02
V	mg/l	<0.02	<0.02	<0.02
Zn	mg/l	0.08	0.06	1.4
F-	mg/l	0.3	0.2	0.4
pH	final	6.0	6.9	6.9
		(25) DR PRODUCT DUST	(26) DR WET SCRUBBER MUD	(27) COKE OVEN SEMABLE PITCH
		Table A-19	Table A-20	

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DI No : 2290-1Z
Date Received : 18/08/00
Description : ISCOR V/DBIJL (TCLP/ACID RAIN)

ANALYSIS		29 Castiron Cyclone Dust TCLP	28 Arc Furnace Slag Hck85 TCLP	30 DR Cyclone Dust TCLP
Ag	mg/l	<0.02	<0.02	<0.02
Al	mg/l	5.2	36	4.0
As	mg/l	<0.02	0.02	<0.02
Ba	mg/l	0.41	1.3	1.0
Cd	mg/l	<0.03	<0.03	<0.03
[illegible]o	mg/l	<0.07	<0.07	<0.07
Cr	mg/l	<0.07	<0.07	<0.07
Cu	mg/l	<0.05	<0.05	<0.05
Fe	mg/l	20	16	4.0
Hg	mg/l	<0.02	<0.02	<0.02
Mn	mg/l	21	60	19
Ni	mg/l	0.16	<0.13	<0.13
Pb	mg/l	<0.02	0.06	<0.02
Se	mg/l	<0.02	<0.02	<0.02
Ti	mg/l	<0.02	0.12	<0.02
V	mg/l	<0.02	0.03	<0.02
Zn	mg/l	0.28	0.06	0.30
F-	mg/l	0.5	0.2	0.1
pH	final	5.4	NB 4.9	4.6
		(29) Foundry Cyclone Dust	(28) EAF Slag	(30) DR Raw Material Dust
		Table A-22	TABLE A-21	TABLE A-24

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DI No : 2290-17
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Description : ISCOR V/DBIJL (TCLP/ACID RAIN)

ANALYSIS		A01 Flow slag (fine)Blst AR	A02 Flow slag(coarse)Blst AR	A03 BOF Slag with Sulphur AR
Ag	mg/l	<0.02	<0.02	<0.02
Al	mg/l	0.52	0.25	3.3
As	mg/l	<0.02	<0.02	<0.02
Ba	mg/l	0.18	0.42	0.06
Cd	mg/l	<0.03	<0.03	<0.03
[illegible]	mg/l	<0.07	<0.07	<0.07
Cr	mg/l	<0.07	<0.07	<0.07
Cu	mg/l	<0.05	<0.05	<0.05
Fe	mg/l	0.50	0.68	0.50
Hg	mg/l	<0.02	<0.02	<0.02
Mn	mg/l	1.2	2.5	0.10
Ni	mg/l	<0.13	<0.13	<0.13
Pb	mg/l	<0.02	<0.02	0.02
Se	mg/l	<0.02	<0.02	<0.02
Ti	mg/l	<0.02	<0.02	<0.02
V	mg/l	<0.02	0.07	<0.02
Zn	mg/l	0.96	<0.04	<0.04
F-	mg/l	0.5	0.3	1.7
pH	final	7.2	7.6	11.3
		① BOF Slag (Fine)	② BOF SLAG (Coarse)	③ DESULPHURISATION SLAG
		Table A-1	Table A-2	Table A-3

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ANALYSIS		A04 BOF Slag without Sulp AR	A05 EAF Baghouse Dust AR	A06 Ladle Fur 1&2 BagDust AR
Ag	mg/l	<0.02	<0.02	<0.02
Al	mg/l	0.34	<0.15	1.9
As	mg/l	<0.02	0.09	0.04
Ba	mg/l	0.09	0.04	0.27
Cd	mg/l	<0.03	<0.03	<0.03
Co	mg/l	<0.07	<0.07	<0.07
Cr	mg/l	<0.07	2.8	<0.07
Cu	mg/l	<0.05	<0.05	<0.05
Fe	mg/l	0.33	0.21	0.09
Hg	mg/l	<0.02	<0.02	<0.02
Mn	mg/l	0.37	0.02	0.03
Ni	mg/l	<0.13	<0.13	<0.13
Pb	mg/l	<0.02	<0.02	0.54
Se	mg/l	<0.02	0.02	0.10
Ti	mg/l	<0.02	<0.02	<0.02
V	mg/l	0.07	0.17	<0.02
Zn	mg/l	<0.04	<0.04	<0.04
F-	mg/l	0.1	0.1	8.0
pH	final	7.7	10.6	12.8
		(4) BOF Slag (Unprocessed) Table A-4	(5) EAF Baghouse Dust Table A-5	(6) Ladle Furnace 1&2 Baghouse Dust Table A-6

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Description : ISCOR V/DBIJL (TCLP/ACID RAIN)

ANALYSIS		A07 BOF Second 3 DegDust AR	A08 BOF Second 2 DegDust AR	A09 BOF Second 1 DegDust AR
Ag	mg/l	<0.02	<0.02	<0.02
Al	mg/l	1.7	4.2	1.3
As	mg/l	0.04	<0.02	<0.02
Ba	mg/l	0.35	0.11	0.07
Cd	mg/l	<0.03	<0.03	<0.03
Co	mg/l	<0.07	<0.07	<0.07
Cr	mg/l	<0.07	<0.07	7.3
Cu	mg/l	<0.05	<0.05	<0.05
Fe	mg/l	0.24	0.94	0.21
Hg	mg/l	<0.02	<0.02	<0.02
Mn	mg/l	<0.01	<0.01	0.32
Ni	mg/l	<0.13	<0.13	<0.13
Pb	mg/l	<0.02	0.09	0.06
Se	mg/l	<0.02	<0.02	<0.02
Ti	mg/l	<0.02	<0.02	<0.02
V	mg/l	<0.02	<0.02	<0.02
Zn	mg/l	<0.04	0.45	<0.04
F-	mg/l	7.7	3.6	8.3
pH	final	12.7	12.0	12.6
		(7) BOF Baghouse 2 Dust ✓	(8) BOF Baghouse 3 Dust ✓	(9) BOF Baghouse 1 Dust ✓
		Table A-7	Table A-8	Table A-9

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Research for IVS

NOTE: *Results confirmed. **Results amended. This certificate supersedes all previous documents bearing the reference DI: 2290-1.

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CERTIFICATE OF ANALYSIS

To : OCKIE FOURIE TOXICOLOGISTS PTY
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LYNNWOOD RIDGE
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ATT: DR H O FOURIE
FAX:012 348 7436/TEL:348 9732

DI No : 2290-1Z
Date Received : 18/08/00
Description : ISCOR V/DBIJL (TCLP/ACID RAIN)

ANALYSIS		A10 BOF Wet Scrub(1,2,3)Sd AR	A11 BOF RHOB Dust AR	A12 Contineous CasterV3 AR
Ag	mg/l	<0.02	<0.02	<0.02
Al	mg/l	0.17	19	<0.15
As	mg/l	<0.02	<0.02	<0.02
Ba	mg/l	0.10	0.09	0.13
Cd	mg/l	<0.03	<0.03	<0.03
[illegible]o	mg/l	<0.07	<0.07	<0.07
Cr	mg/l	<0.07	6.6	<0.07
Cu	mg/l	<0.05	<0.05	<0.05
Fe	mg/l	0.44	0.10	171
Hg	mg/l	<0.02	<0.02	<0.02
Mn	mg/l	0.20	0.05	0.24
Ni	mg/l	<0.13	<0.13	<0.13
Pb	mg/l	<0.02	<0.02	0.04
Se	mg/l	<0.02	<0.02	<0.02
Ti	mg/l	<0.02	<0.02	<0.02
V	mg/l	<0.02	0.06	<0.02
Zn	mg/l	<0.04	<0.04	<0.04
F-	mg/l	0.4	25	<0.1
pH	final	9.0	12.3	6.7
		(10) BOF SLID	(11) RHOB Bag house Dust	(12) Contineous Cast V3 Sludge
		TABLE A-23		Table A-10

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ATT: DR H O FOURIE
FAX:012 348 7436/TEL:348 9732

DI No : 2290-1Z
Date Received : 18/08/00
Description : ISCOR V/DBIJL (TCLP/ACID RAIN)

ANALYSIS		A13 KCL Dust sinter gravel AR	A14 Sinter Dust AG AR	A15 Sinter Dust BG AR
Ag	mg/l	<0.02	<0.02	<0.02
Al	mg/l	1.0	0.84	1.0
As	mg/l	<0.02	<0.02	<0.02
Ba	mg/l	0.20	0.28	0.60
Cd	mg/l	<0.03	<0.03	<0.03
Co	mg/l	<0.07	<0.07	<0.07
Cr	mg/l	<0.07	<0.07	<0.07
Cu	mg/l	<0.05	<0.05	<0.05
Fe	mg/l	0.14	0.14	0.11
Hg	mg/l	<0.02	<0.02	<0.02
Mn	mg/l	4.6	0.03	<0.01
Ni	mg/l	<0.13	<0.13	<0.13
Pb	mg/l	0.03	<0.02	<0.02
Se	mg/l	<0.02	<0.02	<0.02
Ti	mg/l	<0.02	<0.02	<0.02
V	mg/l	<0.02	<0.02	<0.02
Zn	mg/l	8.2	<0.04	ôâ‡□4 <0.04
F-	mg/l	8.0	1.9	2.6
pH	final	6.7	12.0	12.5
		(13) KCL Dust	(14) SINTER AG100 Dust	(15) SINTER BG100 Dust
			Table A-11	Table A-12

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DI No : 2290-17
Date Received : 18/08/00
Description : ISCOR V/DBIJL (TCLP/ACID RAIN)

ANALYSIS		A16 Sinter Dust CG AR	A17 BF C Cyclone Dust AR	A18 BF D Cyclone Dust+WetS AR
Ag	mg/l	<0.02	<0.02	<0.02
Al	mg/l	0.18	<0.15	0.34
As	mg/l	<0.02	<0.02	<0.02
Ba	mg/l	0.20	0.12	0.25
Cd	mg/l	<0.03	<0.03	<0.03
Co	mg/l	<0.07	<0.07	<0.07
Cr	mg/l	<0.07	<0.07	<0.07
Cu	mg/l	<0.05	<0.05	<0.05
Fe	mg/l	<0.05	0.06	0.90
Hg	mg/l	<0.02	<0.02	<0.02
Mn	mg/l	0.91	<0.15	4.9
Ni	mg/l	<0.13	<0.13	<0.13
Pb	mg/l	<0.02	<0.02	0.02
Se	mg/l	<0.02	<0.02	<0.02
Ti	mg/l	<0.02	<0.02	<0.02
V	mg/l	<0.02	0.10	<0.02
Zn	mg/l	<0.04	<0.04	0.20
F-	mg/l	<0.1	<0.1	3.9
pH	final	6.9	11.2	7.1
		(15) SINTER CG 100 Dust	(17) BF C Dust	(15) BF D Dust
		Table A-13	Table A-14	Table A-15

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DI No : 2290-1Z
Date Received : 18/08/00
Description : ISCOR V/DBIJL (TCLP/ACID RAIN)

ANALYSIS		A19 BF C Wet Scrubber Slud AR	A20 BF Prime Granular Slag AR	A21 BF Degraded Gran Slag AR
Ag	mg/l	<0.02	<0.02	<0.02
Al	mg/l	<0.15	<0.15	0.29
As	mg/l	<0.02	<0.02	<0.02
Ba	mg/l	0.30	0.22	0.27
Cd	mg/l	<0.03	<0.03	<0.03
Co	mg/l	<0.07	<0.07	<0.07
Cr	mg/l	<0.07	<0.07	<0.07
Cu	mg/l	<0.05	<0.05	<0.05
Fe	mg/l	0.08	10	2.7
Hg	mg/l	<0.02	<0.02	<0.02
Mn	mg/l	10	1.4	1.1
Ni	mg/l	<0.13	<0.13	<0.13
Pb	mg/l	<0.02	<0.02	<0.02
Se	mg/l	<0.02	<0.02	<0.02
Ti	mg/l	<0.02	<0.02	<0.02
V	mg/l	<0.02	<0.02	<0.02
Zn	mg/l	3.2	0.04	0.05
F-	mg/l	7.9	0.9	0.8
pH	final	7.1	6.3	6.0
		(19) BF Sludge	(20) BF Prime Granulated Slag	(21) BF OFF GRADE GRANULATED Slag
		Table A-16	Table A-17	Table A-18

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DI No : 2290-17
Date Received : 18/08/00
Description : ISCOR V/DBIJL (TCLP/ACID RAIN)

ANALYSIS		A25 ESP Dust AR	A26 DR Wet Scrubber Mud AR	A27 Coke Oven Semable PitchAR
Ag	mg/l	<0.02	<0.02	<0.02
Al	mg/l	0.28	<0.15	<0.15
As	mg/l	<0.02	<0.02	<0.02
Ba	mg/l	0.16	0.19	0.10
Cd	mg/l	<0.03	<0.03	<0.03
Co	mg/l	<0.07	<0.07	<0.07
Cr	mg/l	<0.07	<0.07	<0.07
Cu	mg/l	<0.05	<0.05	<0.05
Fe	mg/l	0.09	0.06	0.22
Hg	mg/l	<0.02	<0.02	<0.02
Mn	mg/l	0.04	0.07	0.25
Ni	mg/l	<0.13	<0.13	<0.13
Pb	mg/l	<0.02	<0.02	0.02
Se	mg/l	<0.02	<0.02	<0.02
Ti	mg/l	<0.02	<0.02	<0.02
V	mg/l	<0.02	<0.02	<0.02
Zn	mg/l	0.06	<0.04	0.11
F-	mg/l	0.4	<0.1	0.8
pH	final	9.4	8.9	4.9
		(25) DR PRODUCT DUST	(26) DR Wet Scrubber MUD	(27) COKE OVEN SEMABLE PITCH
		Table A-19	Table A-20	

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DI No : 2290-17
Date Received : 18/08/00
Description : ISCOR V/DBIJL (TCLP/ACID RAIN)

ANALYSIS		A28 Arc Furnace Slag Hck85 AR	A29 Castiron Cyclone Dust AR	A30 DR Cyclone Dust AR
Ag	mg/l	<0.02	<0.02	<0.02
Al	mg/l	<0.15	0.35	<0.15
As	mg/l	<0.02	<0.02	<0.02
Ba	mg/l	0.18	0.14	0.33
Cd	mg/l	<0.03	<0.03	<0.03
Co	mg/l	<0.07	<0.07	<0.07
Cr	mg/l	<0.07	<0.07	<0.07
Cu	mg/l	<0.05	<0.05	<0.05
Fe	mg/l	0.06	0.89	<0.05
Hg	mg/l	<0.02	<0.02	<0.02
Mn	mg/l	2.2	0.58	1.1
Ni	mg/l	<0.13	<0.13	<0.13
Pb	mg/l	<0.02	<0.02	<0.02
Se	mg/l	<0.02	<0.02	<0.02
Ti	mg/l	<0.02	<0.02	<0.02
V	mg/l	<0.02	<0.02	<0.02
Zn	mg/l	<0.04	0.04	0.04
F-	mg/l	<0.1	0.57	0.1
pH	final	6.1	6.1	6.2
		(28) EAF Slag	(29) FOUNDRY CYCLONE DUST	(30) DR Raw Material Dust
		TABLE A-21	TABLE A-22	TABLE A-24

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ATT: DR H O FOURIE
FAX:012 348 7436/TEL:348 9732

DI No : 2809Z
Date Received : 03/11/00
Description : WASTE STREAMS (HEAD)

ANALYSIS		1 VAAL DAM SLUDGE	2 DR - 1MM	3 DR + 1MM
Ag	ppm	<10	<10	<10
Al	%	10.8	5.43	5.24
As	ppm	32	17	26
Ba	ppm	357	360	443
Cd	ppm	6.9	5.6	8.6
Co	ppm	14	5.5	6.7
Cr	ppm	148	38	98
Cu	ppm	35	6.9	8.0
Fe	%	5.72	5.91	7.80
Hg	ppm	<5.0	<5.0	<5.0
Mn	%	572ppm	0.12	0.18
Ni	ppm	<66	<66	<66
Pb	ppm	112	26	43
Se	ppm	<5.0	<5.0	<5.0
Ti	ppm	3902	2642	2820
V	ppm	73	<41	<41
Zn	ppm	100	13	18
F-	mg/kg	14	160	177
		TABLE A-25	TABLE A-26	TABLE A-27

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Research [illegible] IVS

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Date : 22/01/01

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DI No : 2809Z
Date Received : 03/11/00
Description : WASTE STREAMS (HEAD)

ANALYSIS		4 DR ESP OVEN DUST	5 BOF LADLE NO 2	6 BOF MUD
Ag	ppm	<10	136	<10
Al	%	4.15	1.31	1.16
As	ppm	74	21	46
Ba	ppm	656	34	54
Cd	ppm	26	6.1	22
Co	ppm	15	7.8	22
Cr	ppm	57	1.22%	210
Cu	ppm	17	27	42
Fe	%	29.2*	5.60	55.4*
Hg	ppm	<5.0	<5.0	<5.0
Mn	%	454ppm	16.2*	1.09
Ni	ppm	<66	<66	<66
Pb	ppm	49	97	48
Se	ppm	<5.0	<5.0	<5.0
Ti	ppm	3233	320	700
V	ppm	<41	74	<41
Zn	ppm	26	426	5508
F-	mg/kg	313	47115	411

TABLE A-28

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DI No : 2809Z
Date Received : 03/11/00
Description : WASTE STREAMS (HEAD)

ANALYSIS		7 HOC CAST FLOOR DUST	8 BOF PAN OOND2 GROF STOF	
Ag	ppm	<10	<10	
Al	%	0.18	12.3	
As	ppm	42	33	
Ba	ppm	21	45	
Cd	ppm	19	5.8	
Co	ppm	19	5.8	
Cr	ppm	119	0.33%	
Cu	ppm	22	12	
Fe	%	64.8*	14.6*	
Hg	ppm	<5.0	<5.0	
Mn	%	0.84	5.21	
Ni	ppm	<66	<66	
Pb	ppm	<18	99	
Se	ppm	<5.0	<5.0	
Ti	ppm	396	1552	
V	ppm	<41	279	
Zn	ppm	2268	56	
F-	mg/kg	566	3421	

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DI No : 2809-17
Date Received : 03/11/00
Description : WASTE STREAMS (TCLP/AR)

ANALYSIS		01 VAAL DAM SLUDGE TCLP	02 DR -1MM TCLP	03 DR +1MM TCLP
Ag	mg/l	<0.02	<0.02	<0.02
Al	mg/l	<0.15	2.1	2.9
As	mg/l	<0.02	<0.02	<0.02
Ba	mg/l	0.64	0.61	0.90
Cd	mg/l	<0.03	<0.03	<0.03
Co	mg/l	<0.07	<0.07	<0.07
Cr	mg/l	<0.07	<0.07	<0.07
Cu	mg/l	<0.05	<0.05	<0.05
Fe	mg/l	<0.05	39	0.74
Hg	mg/l	<0.02	<0.02	<0.02
Mn	mg/l	0.61	15	0.12
Ni	mg/l	<0.13	<0.13	<0.13
Pb	mg/l	0.05	<0.02	0.02
Se	mg/l	<0.02	0.03	0.07
Ti	mg/l	<0.02	0.07	0.09
V	mg/l	<0.02	<0.02	<0.02
Zn	mg/l	0.12	<0.02	0.07
F-	mg/l	<0.1	<0.1	0.16
pH	final	5.1	7.7	7.7
		TABLE A-25	TABLE A-26	TABLE A-27

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DI No : 2809-17

Date Received : 03/11/00

Description : WASTE STREAMS (TCLP/AR)

ANALYSIS		04 DR ESP OVEN DUST TCLP	05 BOF LADLE NO 2 TCLP	06 BOF MUD TCLP
Ag	mg/l	<0.02	<0.02	<0.02
Al	mg/l	0.70	3.3	1.9
As	mg/l	0.04	<0.02	<0.02
Ba	mg/l	0.96	0.49	0.67
Cd	mg/l	<0.03	<0.03	0.05
Co	mg/l	<0.07	<0.07	<0.07
Cr	mg/l	<0.07	0.68	<0.07
Cu	mg/l	<0.05	0.12	<0.05
Fe	mg/l	0.39	0.77	629
Hg	mg/l	<0.02	<0.02	<0.02
Mn	mg/l	2.6	0.27	54
Ni	mg/l	<0.13	<0.13	<0.13
Pb	mg/l	<0.02	0.02	0.03
Se	mg/l	<0.02	0.21	<0.02
Ti	mg/l	<0.02	0.08	0.07
V	mg/l	<0.02	<0.02	<0.02
Zn	mg/l	0.07	0.05	1.0
F-	mg/l	1.3	11	2.7
pH	final	6.7	12.2	5.6
				Table A·28

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SGS MINERAL SERVICES

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4670
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CERTIFICATE OF ANALYSIS

To : OCKIE FOURIE TOXICOLOGISTS PTY
P O BOX 73179
LYNNWOOD RIDGE
0040
ATT: DR H O FOURIE
FAX:012 348 7436/TEL:348 9732

DI No : 2809-17
Date Received : *03/11/00*
Description : *WASTE STREAMS (TCLP/AR)*

ANALYSIS		07 HOC CAST FLOOR DUST TCLP	08 BOF PAN OOND 2GROFSTOF TCLP	09 VAAL DAM SLUDGE AR
Ag	mg/l	<0.02	<0.02	<0.02
Al	mg/l	12	37	<0.15
As	mg/l	<0.02	<0.02	<0.02
Ba	mg/l	0.26	0.33	0.21
Cd	mg/l	0.04	<0.03	<0.03
Co	mg/l	<0.07	<0.07	<0.07
Cr	mg/l	<0.07	0.07	<0.07
Cu	mg/l	<0.05	<0.05	<0.05
Fe	mg/l	429	0.46	<0.05
Hg	mg/l	<0.02	<0.02	<0.02
Mn	mg/l	71	0.47	0.01
Ni	mg/l	<0.13	<0.13	<0.13
Pb	mg/l	0.02	0.06	<0.02
Se	mg/l	<0.02	<0.02	<0.02
Ti	mg/l	<0.02	<0.02	<0.02
V	mg/l	<0.02	<0.02	<0.02
Zn	mg/l	45	<0.04	<0.04
F-	mg/l	11	6	<0.1
pH	final	5.4	10.3	6.3
				TABLE A-25

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FAX:012 348 7436/TEL:348 9732

DI No : *2809-17*
Date Received : *03/11/00*
Description : *WASTE STREAMS (TCLP/AR)*

ANALYSIS		10 DR -1MM AR	11 DR +1MM AR	12 DR ESP OVEN DUST AR
Ag	mg/l	<0.02	<0.02	<0.02
Al	mg/l	0.28	0.60	<0.15
As	mg/l	<0.02	<0.02	0.07
Ba	mg/l	0.26	0.23	0.33
Cd	mg/l	<0.03	<0.03	<0.03
Co	mg/l	<0.07	<0.07	<0.07
Cr	mg/l	<0.07	<0.07	<0.07
Cu	mg/l	<0.05	<0.05	<0.05
Fe	mg/l	0.14	<0.05	0.07
Hg	mg/l	<0.02	<0.02	<0.02
Mn	mg/l	0.20	0.01	0.06
Ni	mg/l	<0.13	<0.13	<0.13
Pb	mg/l	<0.02	<0.02	<0.02
Se	mg/l	<0.02	<0.02	<0.02
Tl	mg/l	<0.02	<0.02	<0.02
V	mg/l	<0.02	<0.02	<0.02
Zn	mg/l	<0.04	<0.04	<0.04
F-	mg/l	<0.1	0.15	1.5
pH	final	7.9	12.0	8.1
		TABLE A-26	Table A-27	T

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DI No : 2809-17
Date Received : 03/11/00
Description : WASTE STREAMS (TCLP/AR)

ANALYSIS		13 BOF LADLE NO 2 AR	14 BOF MUD AR	15 HOC CAST FLOOR DUST AR
Ag	mg/l	<0.02	<0.02	<0.02
Al	mg/l	0.86	<0.15	3.5
As	mg/l	<0.02	<0.02	<0.02
Ba	mg/l	0.31	0.15	0.14
Cd	mg/l	<0.03	<0.03	<0.03
Co	mg/l	<0.07	<0.07	<0.07
Cr	mg/l	<0.07	<0.07	<0.07
Cu	mg/l	<0.05	<0.05	<0.05
Fe	mg/l	<0.05	0.28	76
Hg	mg/l	<0.02	<0.02	<0.02
Mn	mg/l	0.11	0.04	69
Ni	mg/l	<0.13	<0.13	<0.13
Pb	mg/l	<0.02	<0.02	0.03
Se	mg/l	0.04	<0.02	<0.02
Ti	mg/l	<0.02	<0.02	<0.02
V	mg/l	<0.02	<0.02	<0.02
Zn	mg/l	<0.04	<0.04	33
F-	mg/l	16	3.5	16
pH	final	12.6	9.3	6.2
			TABLE A-28	

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FAX:012 348 7436/TEL:348 9732

DI No : 2809-17

Date Received : 03/11/00

Description : WASTE STREAMS (TCLP/AR)

ANALYSIS		16 BOF PAN OOND 2GROFSTOF AR		
Ag	mg/l	<0.02		
Al	mg/l	0.49		
As	mg/l	<0.02		
Ba	mg/l	0.18		
Cd	mg/l	<0.03		
Co	mg/l	<0.07		
Cr	mg/l	<0.07		
Cu	mg/l	<0.05		
Fe	mg/l	<0.05		
Hg	mg/l	<0.02		
Mn	mg/l	1.1		
Ni	mg/l	<0.13		
Pb	mg/l	<0.02		
Se	mg/l	0.02		
Ti	mg/l	<0.02		
V	mg/l	<0.02		
Zn	mg/l	<0.04		
F-	mg/l	9.2		
pH	final	7.5		

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APPENDIX D

LABORATORY ANALYSIS: ORGANIC

ANALYTICAL REPORT

SANAS
ACCREDITED LABORATORY
T0114

SGS

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Agricultural & Food Services

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Representative:	TOINETTE MARCUS	SGS reference No:	2846
Client name :	SGS MINERAL SERVICES	Client reference No:	TCLP
Address:	P.O. BOX 2357	Sample info:	TCLP
	SPRINGS	SGS Sampling/Inspected:	Yes ☐ No ☐
		Receiving date:	December 11, 2000
Postal code:	1560	Report date:	December 14, 2000
Tel.:	011 811 2280	Nr. of samples:	8
Fax:	011 811 4670	Page number:	1

Nr.	Client Ref. Nr.	Sample Name	Other Info.	Lab. No.
1	DL 2809	TCLP	Vaaldam Sludge	00/10812
2	DL 2809	TCLP	DR - 1mm	00/10813
3	DL 2809	TCLP	DR - 1mm	00/10814
4	DL 2809	TCLP	DR ESP O/D	00/10815
5	DL 2809	TCLP	BOF Ladle No.2	00/10816
6	DL 2809	TCLP	BOF Mud	00/10817
7	DL 2809	TCLP	HOC CFD	00/10818
8	DL 2809	TCLP	BOF Pan Oond	00/10819
9				

Analyses Performed:	Units:	Method Used	00/10812	00/10813	00/10814	00/10815	00/10816	00/10817	00/10818	00/10819	
VOC's#	P/ND	APHA 6200*	ND	P	P	P	P	P	ND	P	
PAH's#	P/ND	APHA 6440**	P	P	ND	P	ND	ND	ND	P	
VOC's:											
Methyl Ethyl Ketone	mg/L	APHA 6200*		0.780	0.760						
Napthalene	mg/L	APHA 6200*	0.320								
Vinyl Chloride	mg/L	APHA 6200*		0.260	0.310	0.970	0.180	0.490		2.160	
PAH's:											
Anthracene	mg/L	APHA 6440**	0.420	0.390		0.290				1.190	
Napthalene	mg/L	APHA 6440**	0.330								

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Comments:	Samples analysed on an As Received Basis
	* = Samples analysed by GC-ECD, LOD = 0.047µg/L
	** = Samples analysed by HPLC-UV, LOD = 0.027µg/L
	*** = Samples analysed by GC-ECD, LOD = 0.580 µg/L
# = Not Accredited	RTF = Results To Follow, P = Present/Positive, ND = None Detected, NA = Not Analysed, N/A = Not Applicable

Analyst responsible: ____________ Laboratory Manager: ____________
Martin Botha

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FAX: 012 348 7436

DL NO: 2290-1

SAMPLE ID	BTEX compounds	PAH compounds
Flow slag (fine) Bist	BDL	BDL
Flow slag (coarse) Bist	BDL	BDL
BOF slag with sulphur	BDL	BDL
BOF slag without sulphur	BDL	BDL
EAF Baghouse Dust	BDL	BDL
Ladle Fur 1&2 BagDust	BDL	BDL
BOF Second 3 DegDust	BDL	BDL
BOF Second 2 DegDust	BDL	BDL
BOF Second 1 DegDust	BDL	BDL
BOF Wet Scrub (1,2,3) Sd	BDL	BDL
BOF RHOB Dust	BDL	BDL
Contineous Caster V3	BDL	BDL
KCL Dust sinter gravel	BDL	BDL
Sinter Dust AG	BDL	BDL
Sinter Dust BG	BDL	BDL
Sinter Dust CG	BDL	BDL
BF C Cyclone Dust	BDL	BDL
BF D Cyclone Dust+WetS	BDL	BDL
BF C Wet Scrubber Slud	BDL	BDL
BF Prme Granular Slag	BDL	BDL
BF Degraded Gran Slag	BDL	BDL
ESP Dust	BDL	BDL
DR Wet Scrubber Mud	BDL	BDL
Coke Oven Semable Pitch	BDL	BDL
Castiron Cyclone Dust	BDL	BDL
Arc Furnace Slag Hck 85	BDL	BDL
Dr Cyclone Dust	BDL	BDL

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pp DEPARTMENTAL MANAGER

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DL NO: 2290-1

Notes:

The presence of phenolics and organic acids was observed by the mass-spectrum library search. This is not an absolute certainty, but rather a good indication. Specifically phenol and cresols in Coke pitch, acetic acid in the Granular slag and pentane- and hexanediodic acid, dimethyl ester in Castiron Cyclone Dust and DR Cyclone Dust.

Results reported in parts per billion (ppb)
BDL – Below Detection Limit
Detection Limit – 5.0 ppb for aqueous samples
0.05 ppm for solid samples

Analysis done by Poltech

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