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**ENVIRONMENTAL SCOPING REPORT FOR THE AMENDMENT TO THE
HAZARDOUS WASTE MANAGEMENT PLAN AT B2GOLD OTJIKOTO GOLD MINE**

MARCH 2017

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ACRONYMS

ASEC	A. Speiser Environmental Consultants
CV	Curriculum Vitae
EAP	Environmental Assessment Practitioner
EIA	Environmental Impact Assessment
EMP	Environmental Management Plan
IAPS	Interested and Affected Parties
MET	Ministry Of Environment and Tourism
MOHSS	Ministry of Health and Social Services



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EXECUTIVE SUMMARY

MACRH 2017

INTRODUCTION

B2Gold Otjikoto Gold mine operations lodged an application for the amendment to their waste management plan for the treatment of its hazardous waste (**Appendix 1**). The Department of Environmental Affairs (DEA) in the Ministry of Environment and Tourism (MET) requested Otjikoto Gold mine to conduct a scoping report for the anticipated changes to their waste management (**Appendix 2**). According to the Environmental Management Act 2007, the treatment of waste is a listed activity that may not be undertaken without an environmental clearance certificate. B2Gold Otjikoto mine has obtained three environmental clearance certificates from the MET in 2012, 2013 and 2014. The initial Environmental Impact Assessment (EIA) was conducted by SLR Namibia in July 2012 and was approved by MET. Subsequently the landfill and HFO Powerplant scoping report was approved in 2013 and in 2014, the Wolfshag pit and process plant upgrade was also approved.

To fulfil the requirements of the EMA 2007, B2Gold Otjikoto Mine approached A. Speiser Environmental Consultants (ASEC) to prepare and submit an environmental scoping report for consideration by the DEA for the amendment to their hazardous waste management in order for the MET to issue an ECC for this listed activity.

Otjikoto Gold Mine (ML 169) is located approximately 70 km north-east of Otjiwarongo and 50 km south-west of Otavi, 2-3 km east of the B1 National Road, in the Otjozondjupa Region, north-central Namibia.

Otjikoto Gold Mine started operations in January 2015. Their waste management plan commitments have been implemented since inception. A number of challenges have been encountered in the management of disposable hazardous waste and have warranted the need

to amend the current Environmental Clearance Certificate (ECC) for ML 169. The rationale for the amendment is that:

- Only two well managed hazardous waste sites, with limited volume capacities exist in the country.
- Disposable hydrocarbon contaminated wastes and cyanide packaging wastes are not accepted at the two facilities due to the large volumes and limited capacities of the sites and may end up on municipal landfills.
- Better control and management of hazardous wastes with in-house applications will minimize indirect secondary impacts.

The scoping report will cover the proposed change to the Otjikoto Gold Mine waste management to destroy disposable hazardous waste on site by means of incineration. As this method of waste treatment, incineration was regarded as the best practical option for addressing the safe disposal of hazardous waste at Otjikoto mine.

The waste management plan has been updated accordingly.

SCOPE AND OBJECTIVES

A detailed EIA and EMP for the mine was conducted by SLR Namibia “Environmental Impact Assessment for the Proposed Otjikoto Gold Mine Project” (July 2012) during which numerous specialist studies were conducted. Two comprehensive specialist studies on air quality were conducted in 2012 and 2013 and these studies are still relevant. The only specialist study input into the scoping report for the amendment to disposal waste will be on air quality and monitoring.

The following process was followed to conduct the scoping report:

- Submission of Form 2 to MET (18/6/2016) (**Appendix 1**)
- Response from MET requesting a scoping report regarding the amendment to disposable waste (02/11/2016) (**Appendix 2**)
- Site visit by the environmental consultant (04/02/2017)
- Compilation of scoping report and amendments to disposable waste section of the EMP
- Specialist input regarding air quality
- Advertisement and distribution of scoping report to stakeholders and IAPs for comments
- Submission of the scoping report and EMP to MET.

PUBLIC CONSULTATION

Detailed stakeholder engagement processes were conducted during the original EIA and identified interested and affected parties and stakeholders (IAPs) who have engaged with SLR

Namibia and B2Gold during the recent years will be provided with the opportunity to comment on the scoping report. The current list is summarised in the **Table 1** below.

Table: Summary of Interested and Affected Parties

Category	Stakeholders
Local and Regional Authorities	Otjiwarongo Town Council Otavi Town Council
Key Government Ministries and Parastatals	Ministry of Environment and Tourism Ministry of Mines and Energy Ministry of Agriculture Water and Forestry Ministry of Health and Social Services
Farm and Lodge owners in the surrounding of Otjikoto Mine	See Appendix 4 : List Farm and Lodge owners in the surrounding of Otjikoto Mine

NAMIBIAN LAWS RELEVANT TO THE AMENDMENT

The different components of pollution still fall under different agencies – water-borne effluent and waste water under Department of Water Affairs, air-borne pollution under Ministry of Health and Social Services (MoHSS), workplace health-related pollution under Ministry of Labour, Industrial Relations & Employment Creation. MET is responsible only at the EIA and EMP levels, and plays a role in emergency responses. However, there is not currently any specific pollution legislation under which MET can act.

The following statutory documents describe the legal requirements regarding the management of wastes. Please note that the order does not reflect the significance of the Act.

PROPOSED AMENDMENT TO THE DISPOSABLE HAZARDOUS WASTE

Initially two sites have been identified for erecting the incinerator. The figure below shows the two sites. Site A is situated near the waste receiving and handling area within the landfill site, while site B is at the north-eastern area of the Drill rig workshop.

Both sites are within existing areas of operations and these sites have already been disturbed and no additional land needs to be cleared of vegetation.

B2Gold decided to opt for Site A, as the site is fenced in and hence unauthorised access to the incinerator site can be better controlled.

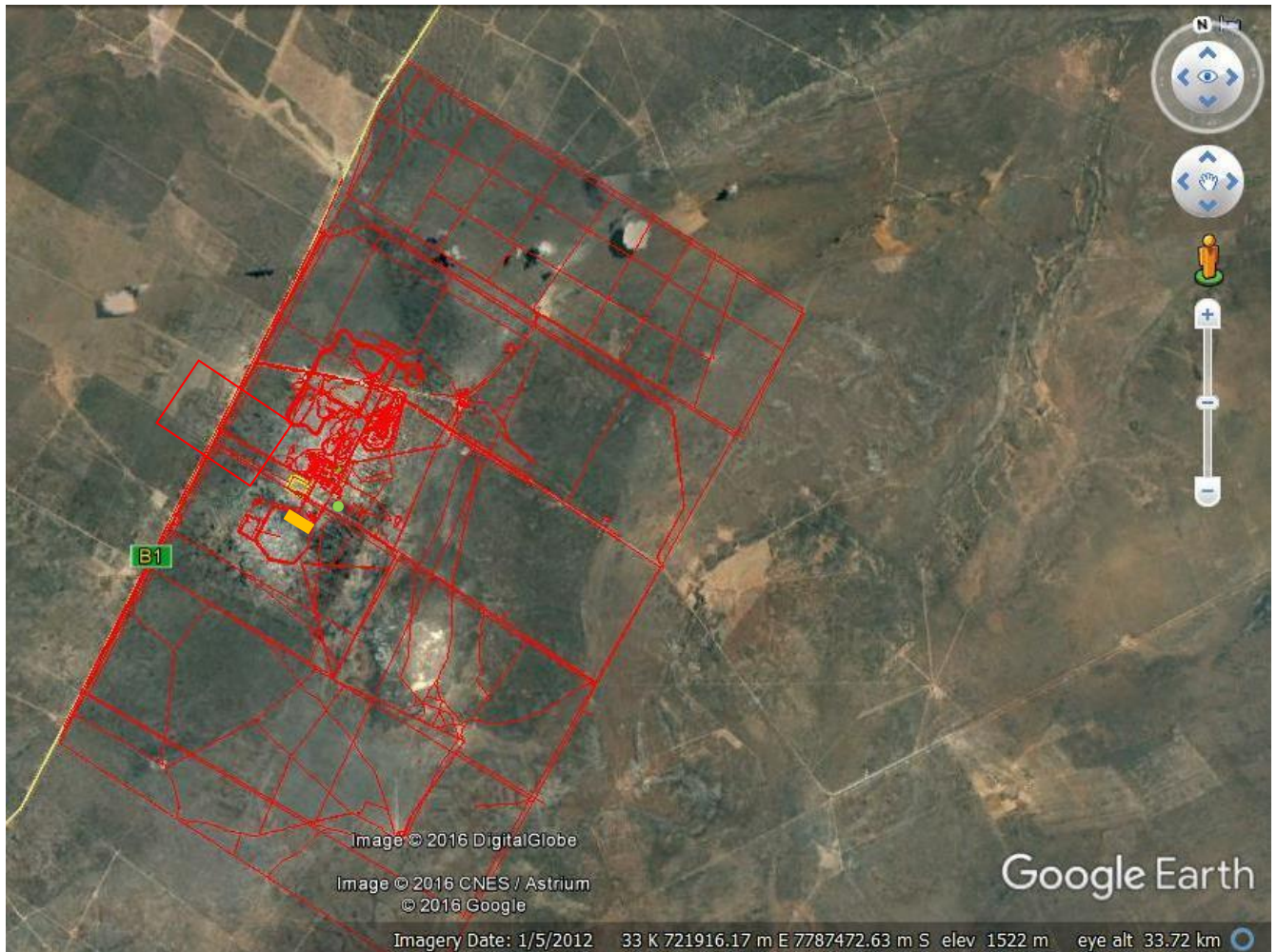


Figure: The figure shows site A (yellow) and site B (green), which were both considered to erect the incinerator.

The following disposable hazardous waste will be incinerated at the incinerator:

- Hydrocarbon contaminated materials, such as oil rags, hydraulic hose pipes, smaller oil/lubricant containers;
- Dead animals, e.g. birds, small mammals from incidental impacts;
- Hazardous reagents packaging, e.g. cyanide bags with packaging;
- Fat, oil and grease from the canteen;
- Medical waste from the clinic and
- Any other disposable hazardous waste that might be generated on site and cannot be accepted at external facilities.

INCINERATOR

An incinerator is a waste treatment process which essentially burns waste material in a gas or oil burning furnace. The waste materials is converted by high temperature (up to 1500°C) into

ash, flue gas and heat. Following the combustion process, the ash that is created is rendered safe and may be disposed of at a landfill site. The flue gases which arise as a result of combustion are then cleaned through a heated refractory screen and the use of stainless steel grit arrestors to remove small particles (fly ash). The flue gases are further passed through a scrubber system, rendering these gases non-toxic and safe to be released into the environment.

When conducted in the correct manner, incineration is an effective means of reducing the volume of waste generated, which consequently has a significant reduction on the area that is required for landfill sites. It further reduces the danger of potential ground water pollution at these landfill sites. Incineration is a safe, hygienic and cost effective option of disposing contaminated, hazardous waste.

DESCRIPTION OF THE INCINERATOR 450LA

The incinerator 450LA will be placed in a building. Up to 220 kg per hour can be incinerated in the 450LA incinerator. This will be sufficient for B2Gold Otjikoto mines demand. Otjikoto generates on average 500 kg of hazardous waste per week.

The incinerator will use diesel which will be delivered to a diesel tank at the incinerator site. The practice of delivering diesel to remote and mobile equipment with a diesel bowser is a normal practice in mining operations.

Under normal operating conditions the incinerator will be required for an 8 hour period – 7 hours burning and 1 hour for cleaning purposes, as this is vital to the efficiency of the incinerator.

PROJECT NEED, DESIRABILITY AND ALTERNATIVES

This amendment is an alternative to the current method to dispose of disposable hazardous waste which indicated in the approved EIA (2013), the removal of hazardous waste from site to a well-managed offsite hazardous waste facility. Since January 2015 at the start of operation, Otjikoto Gold Mine experienced several challenges regarding the management of disposable hazardous waste. The disposable hazardous waste is not accepted at the hazardous waste facility due to the limited capacity of storage space and this waste therefore ends up at the municipal landfill. This amendment to the current waste management process will positively change the handling and disposal of hazardous waste management at the mine and minimize the extent of impact beyond the Mines area of control.

Please note the same incinerator has been installed at the Katutura hospital last year.

INPUT FROM AIR QUALITY SPECIALIST

Airshed Planning Professionals (Airshed), who were involved in the EIA process from the beginning of the EIA process and have provided two comprehensive air quality specialist studies (2012 and 2013), were asked to submit a proposal to do an air quality study. However,

after reviewing the provided information which is presented in this scoping report, Airshed does not see it necessary to conduct a new air quality study, as air quality aspects have been covered in the initial specialist studies for the Mine EIA.

Airshed was requested to comment on the incinerator proposals obtained by B2Gold and their conclusion is – “... *the proposals and brochures indicates that all of the companies understand the requirements of waste incineration well. The methods used for sizing are appropriate and the resulting residence times conform to the engineering “rules of thumb” used in the industry.*”

Further Airshed was asked to provide input into the emission air quality monitoring of the incinerator and provided the following answer:

“It should also be noted that the operation of such an incinerator to minimise resultant air pollution is highly dependent on the quality of operations, so that operator training (possibly carried at site by the supplier) should be a priority.”

The revised EMP in section 10 and **Appendix 6** will address this issue. All the proposals received for erecting the incinerator on site include training of personnel on site, operating manual and a bi-annual service and maintenance by the supplier.

AMENDED HAZARDOUS WASTE MANAGEMENT PLAN OF OTJIKOTO MINE

The Hazardous Waste Management Plan of Otjikoto Mine (June 2016) has been updated according to the proposed changes in the above chapters and is attached in **Appendix 6**.

The consultant is of the opinion that no impact assessment needs to be conducted, as the incinerator will be erected within the mine foot print and on already disturbed area. An area of 3m x 3m will be needed for the incinerator and storage area of the material to be destroyed in the incinerator exists on both sites (site A and site B, see section 7). Air quality impacts will be minimal as the incinerator has built-in controls to filter air emissions and reduce potential air pollution.

In addition other, worth sources of air pollution exist within the vicinity of B2Gold Mine, such as charcoal producing and particles from the diesel train.

Operating staff of the LA450 incinerator at B2Gold mine will be trained by the providing company. Additionally, the control box is equipped with digital temperature controllers, which monitor the exact temperature. The controllers set point can be locked to prevent accidental maladjustment and fiddling of unauthorised personnel. The controllers are “semi-intelligent” and thus can indicate if there are problems with the temperature sensors.

Additional noise, next to the day-to-day noise at a mine, will only be experienced during construction of the building which will house the incinerator. Otherwise no additional noise will be created while operating the incinerator.

No vibration or odour will be generated during the operation of the incinerator.

It is foreseen that the proposed incinerator will cater for all the challenges experienced in the disposal of hazardous waste at the Otjikoto Gold Mine as it would deal with the complete destruction of hazardous waste that has a significant potential for affecting the health and well-being of surrounding communities.

CONCLUSION

The amendments to the hazardous waste treatment at Otjikoto Mine has only positive environmental impacts:

- No new site will be disturbed
- Disposable hydrocarbon contaminated wastes and cyanide packaging wastes are not accepted at the two facilities due to the large volumes and limited capacities of the sites and may end up on municipal landfills.
- Better control and management of hazardous wastes with in-house applications will minimize environmental impacts.
- This incinerator type (LA450) is already in use in Namibia
- Air quality monitoring is undertaken at Otjikoto mine as part of the operations potential air quality risk management.

It is important that staff is trained by the incinerator provider to ensure that the facility is properly operated. Further bi-annual emission measurements should be conducted as set out in section 7.



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Otjikoto Gold Mine started operations in January 2015. Their waste management plan commitments have been implemented since inception. A number of challenges have been encountered in the management of disposable hazardous waste and have warranted the need to amend the current Environmental Clearance Certificate (ECC) for ML 169. The rationale for the amendment is that:

- Only two well managed hazardous waste sites, with limited volume capacities exist in the country.
- Disposable hydrocarbon contaminated wastes and cyanide packaging wastes are not accepted at the two facilities due to the large volumes and limited capacities of the sites and may end up on municipal landfills.
- Better control and management of hazardous wastes with in-house applications will minimize indirect secondary impacts.

The application for amendment of conditions of the ECC has been submitted to MET in July 2016 and in their response they requested that a scoping report should be conducted regarding the changes to the disposable hazardous waste operation.

The scoping report will cover the proposed change to the Otjikoto Gold Mine waste management to destroy disposable hazardous waste on site by means of incineration. As this method of waste treatment, incineration was regarded as the best practical option for addressing the safe disposal of hazardous waste at Otjikoto mine.

The waste management plan has been updated accordingly.

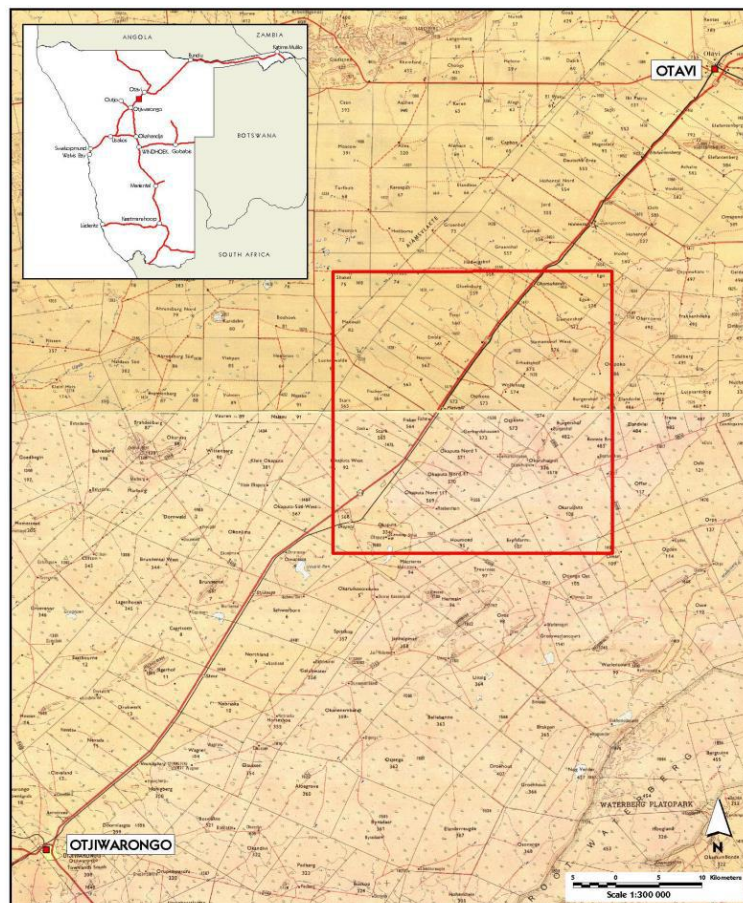


Figure 1: Regional setting of the Otjikoto Gold Mine. (Figure taken from SLR Namibia original EIA report, 2012)

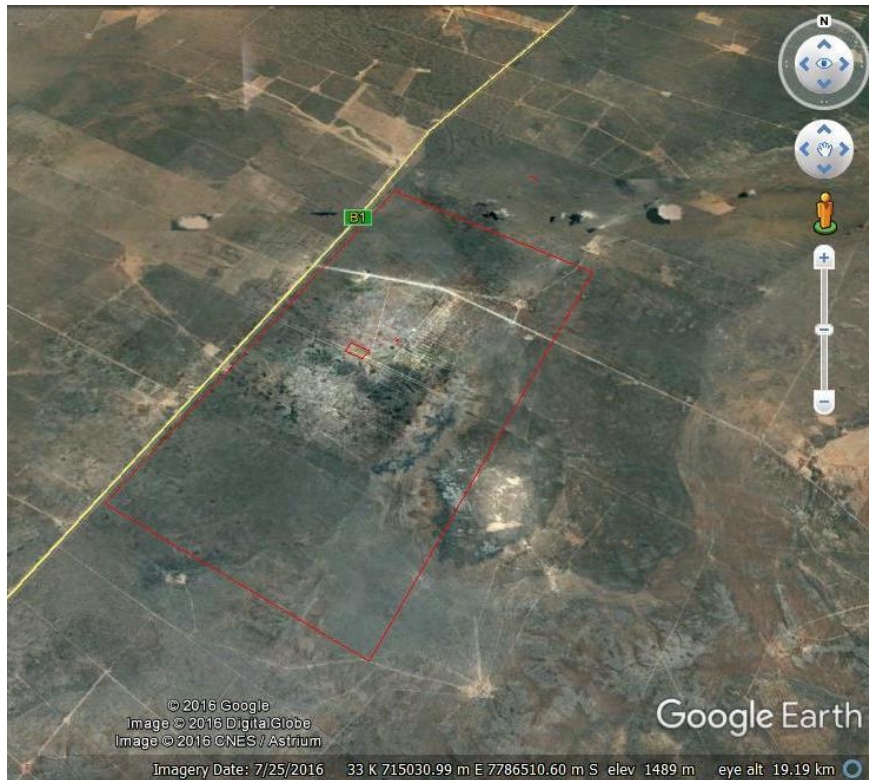


Figure 2: Local setting of ML 169.

2 SCOPE AND OBJECTIVES

The scope and objectives for the scoping report for the amendment of the hazardous waste management plan was discussed between Ms A. Kanandjembo (Environmental Manager) and Ms A. Speiser and the proposal was accepted in February 2017.

The scoping report will consist of the following aspects:

- describe the affected environment based on available documentation;
- identify and assess the potential positive and negative impacts of the amendment;
- liaise with air quality specialist;
- update the section of hazardous waste disposal of the environmental management plan (EMP); and
- distribute draft scoping report to IAPs identified during the original EIA for Otjikoto Gold mine.

3 APPROACH AND METHODOLOGY

3.1 NAMIBIAN ENVIRONMENTAL LEGISLATION

The Environmental Management Act was gazetted on 27 December 2007 (Government Gazette No 3966) and the commencement of the Act, the list of activities that may not be undertaken

without an environmental clearance certificate and the Environmental Impact Assessment Regulations were promulgated on 6 February 2012 (Government Gazette No. 4878).

Section 19 of the Environmental Impact Assessment regulations sets out the process of an amendment of an existing environmental clearance certificate under section 39 of Act. Form 2 was submitted to MET (**Appendix 2**) and the response (**Appendix 1**) from the Ministry of Environment and Tourism was that an environmental scoping report needs to be undertaken as incineration is regarded as waste treatment which is a listed activity.

3.2 APPROACH AND METHODOLOGY

A detailed EIA and EMP for the mine was conducted by SLR Namibia “Environmental Impact Assessment for the Proposed Otjikoto Gold Mine Project” (July 2012) during which numerous specialist studies were conducted. Two comprehensive specialist studies on air quality were conducted in 2012 and 2013 and these studies are still relevant. The only specialist study input into the scoping report for the amendment to disposal waste will be on air quality and monitoring.

The following process was followed to conduct the scoping report:

- Submission of Form 2 to MET (18/6/2016) (**Appendix 1**)
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- Site visit by the environmental consultant (04/02/2017)
- Compilation of scoping report and amendments to disposable waste section of the EMP
- Specialist input regarding air quality
- Advertisement and distribution of scoping report to stakeholders and IAPs for comments
- Submission of the scoping report and EMP to MET.

4. EIA CONSULTANT

Alexandra Speiser of ASEC cc compiled the scoping assessment report and her curricula vitae can be found in **Appendix 3**.

Alex Speiser has 17 years of experience of EIA preparation in Namibia and is an Associated Member (AIEMA) of the Institute of Environmental Management & Assessment, UK and the Environmental Assessment Practitioners Association for Namibia (EAPAN). She is also a member of the Chamber of Mines (Namibia).

5. PUBLIC CONSULTATION

5.1 OBJECTIVES OF PUBLIC CONSULTATION

The public consultation process aimed to ensure that all persons or organisations that may be affected or interested in the project were informed of the issues and were able to register their

views and concerns. Building from there, the process provided opportunities to influence the project design so that its benefits can be maximised and potential negative impacts be minimised.

5.2 INTERESTED AND AFFECTED PARTIES

Detailed stakeholder engagement processes were conducted during the original EIA and identified interested and affected parties and stakeholders (IAPs) who have engaged with SLR Namibia and B2Gold during the recent years will be provided with the opportunity to comment on the scoping report. The current list is summarised in **Table 1**.

Table 1: Summary of Interested and Affected Parties

Category	Stakeholders
Local and Regional Authorities	Otjiwarongo Town Council Otavi Town Council
Key Government Ministries and Parastatals	Ministry of Environment and Tourism Ministry of Mines and Energy Ministry of Agriculture Water and Forestry Ministry of Health and Social Services
Farm and Lodge owners in the surrounding of Otjikoto Mine	See Appendix 4 : List Farm and Lodge owners in the surrounding of Otjikoto Mine

5.3 MAIN ISSUES RAISED BY IAPS

Table 2 summarises the main issues raised during the EIA Scoping Phase consultation process, which have been addressed in the EIA Scoping Report.

Table 2: Summary of issues raised during IAP consultations

	Issue
1.	
2.	
3.	
4.	
5.	

6. NAMIBIAN LAWS RELEVANT TO THE AMENDMENT

The different components of pollution still fall under different agencies – water-borne effluent and waste water under Department of Water Affairs, air-borne pollution under Ministry of Health and Social Services (MoHSS), workplace health-related pollution under Ministry of Labour, Industrial Relations & Employment Creation. MET is responsible only at the EIA and EMP levels, and plays a role in emergency responses. However, there is not currently any specific pollution legislation under which MET can act.

The following statutory documents describe the legal requirements regarding the management of wastes. Please note that the order does not reflect the significance of the Act.

6.1 ENVIRONMENTAL MANAGEMENT ACT 7, 2007 AND REGULATIONS, 2012

The Environmental Management Act (EMA) (7 of 2007) has been enacted and is regulated by the Ministry of Environment and Tourism (MET). This Act was gazetted on 27 December 2007 (Government Gazette No. 3966) and the Environmental Impact Assessment Regulations: Environmental Management Act, 2007 (Government Gazette No. 4878) were promulgated on 6 February 2012. In terms of this legal framework certain identified activities may not commence without an Environmental Clearance - a certificate that is issued by MET. This environmental clearance can only be granted after consideration of an EIA.

The objective of the Environmental Management Act, No 7 of 2007 (EMA) is to prevent and mitigate the significant effects of activities on the environment by:

- Ensuring that the significant effects of activities on the environment are considered in time and carefully;
- ensuring that there are opportunities for timeous participation of interested and affected parties throughout the assessment process; and
- ensuring that the findings of an assessment are taken into account before any decision is made in respect of activities.

Section 5 of the Act describes the “powers of the Minister in respect of waste”.

6.2 PETROLEUM PRODUCTS REGULATIONS, 2000

The Act stipulates how to conduct the business in respect of petroleum products, including the application of health, hygiene, safety and environmental standards and requirements, including: *‘The duties of a person in respect of the protection of the health of others and in the avoidance of environmental harm, the precautions in respect of the keeping, handling, conveying, using and disposing of petroleum products and in respect of underground leaks or other spillages of petroleum products.’*

6.3 ATMOSPHERIC POLLUTION PREVENTION ORDINANCE, NO. 11 OF 1976

The Namibian Atmospheric Pollution Prevention Ordinance, 11 of 1976 does not include any ambient air standards, but the Chief Air Pollution Officer (CAPCO) provides air quality guidelines

for consideration during the issuing of Air Pollution Certificates (APC). Air Pollution Certificates are only issued for so called “Scheduled Processes” which are processes resulting in noxious or offensive gasses and typically pertain to point source emissions. The air pollution guidelines included in the APC are primarily for criteria pollutants namely, sulphur dioxide, oxides of nitrogen, carbon monoxide, ozone, lead and particulate matter.

Typically when no local ambient air quality criteria exists, or are in the process of being developed, reference is made to international criteria. This serves to provide an indication of the severity of the potential impacts from proposed activities. The most widely referenced international air quality criteria are those published by the World Bank Group (WB), the World Health Organisation (WHO) and the European Community (EC).

The operation of an incinerator would be a “Scheduled Processes” and would therefore require an APC specifying the operational criteria. This, however, is not being implemented in Namibia. The best practice would therefore be to notify the Ministry Health and Social Services of the anticipated emissions, through the EIA process.

In the absence of Namibian guidance on air emission the air quality will be monitored according to the South African Minimum Emission Standards regulations of 2013 (see Section 9 for more information).

6.4 HAZARDOUS SUBSTANCE ORDINANCE, NO. 14 OF 1974

The Act regulates the validity of licences or registration referred to in Section 5. It deals with hazardous substances of Groups I to IV. However, while environmental aspects are not really explicitly stated, guidelines for the importing, storage, handling, etc. of hazardous substances are set out.

6.5 POLLUTION CONTROL AND WASTE MANAGEMENT BILL (3RD DRAFT SEPTEMBER 2003)

As a Bill, the Pollution Control and Waste Management Bill does not represent statutory legislation (e.g. an Act). However it is mentioned here as it demonstrates the principle controls likely to be in place in the future. The purpose of this Bill is to regulate and prevent discharge of pollutants to the air, water and enable the country to fulfil its international obligations in this regard.

With regard to this particular impact assessment and its consideration of dust and odour, the statements on nuisance are of relevance. The Bill states:

52. (1) No person may cause, permit or carry out any activity that gives rise to noise, dust or odour to the extent that, in the opinion of the competent authority, it creates or is likely to create a nuisance. ...

(3) In determining whether or not a noise, dust or odour constitutes a nuisance, the competent authority shall have regard to:

(a) the time of day or night at which the noise, dust or odour is generated;

(b) the ambient noise, dust or odour levels in the area;

(c) the extent to which the activity which is causing the noise, dust or odour is in conflict with permitted land uses in the area; and

(d) any other

6.6 LABOUR ACT, NO. 11 OF 2007 AND LABOUR AMENDMENT ACT, NO. 2 OF 2012

Paragraph 135 reads –

(1) The Minister may, after consulting the Labour Advisory Council, make regulations in relation to any matter -

(a) required or permitted to be prescribed by this Act;

(b) that may be necessary or expedient in order to achieve the objects of this Act.

(2) Without derogating from the generality of subsection (1) any regulation made under subsection (1) may include any matter relating to -

(ar) the manufacturing, storage, transport and labeling of chemicals and other hazardous substances;

7. PROPOSED AMENDMENT TO THE DISPOSABLE HAZARDOUS WASTE

In this chapter a description of the hazardous waste which will be subject to the changes of the existing disposable hazardous waste management plan will be provided. All other hazardous waste will be disposed of as in the current updated Environmental Management Plan (SLR Namibia, August 2014).

This chapter therefore describes the waste which will be destroyed in the proposed incinerator.

7.1 PROPOSED INCINERATOR SITES

Initially two sites have been identified for erecting the incinerator. **Figure 3:** The figure shows site A (yellow) and site B (green), which were both considered to erect the incinerator. shows the two sites. Site A (**Plate 1**) is situated near the waste receiving and handling area within the landfill site, while site B (**Plate 2**) is at the north-eastern area of the Drill rig workshop.

As shown in the plates, both sites are within existing areas of operations and these sites have already been disturbed and no additional land needs to be cleared of vegetation.

B2Gold decided to opt for Site A, as the site is fenced in and hence unauthorised access to the incinerator site can be better controlled.



Plate 1: Site A for the incinerator on the existing handling area at the landfill site.



Plate 2: Site B of the incinerator at the north-eastern area of the Drill Workshop.

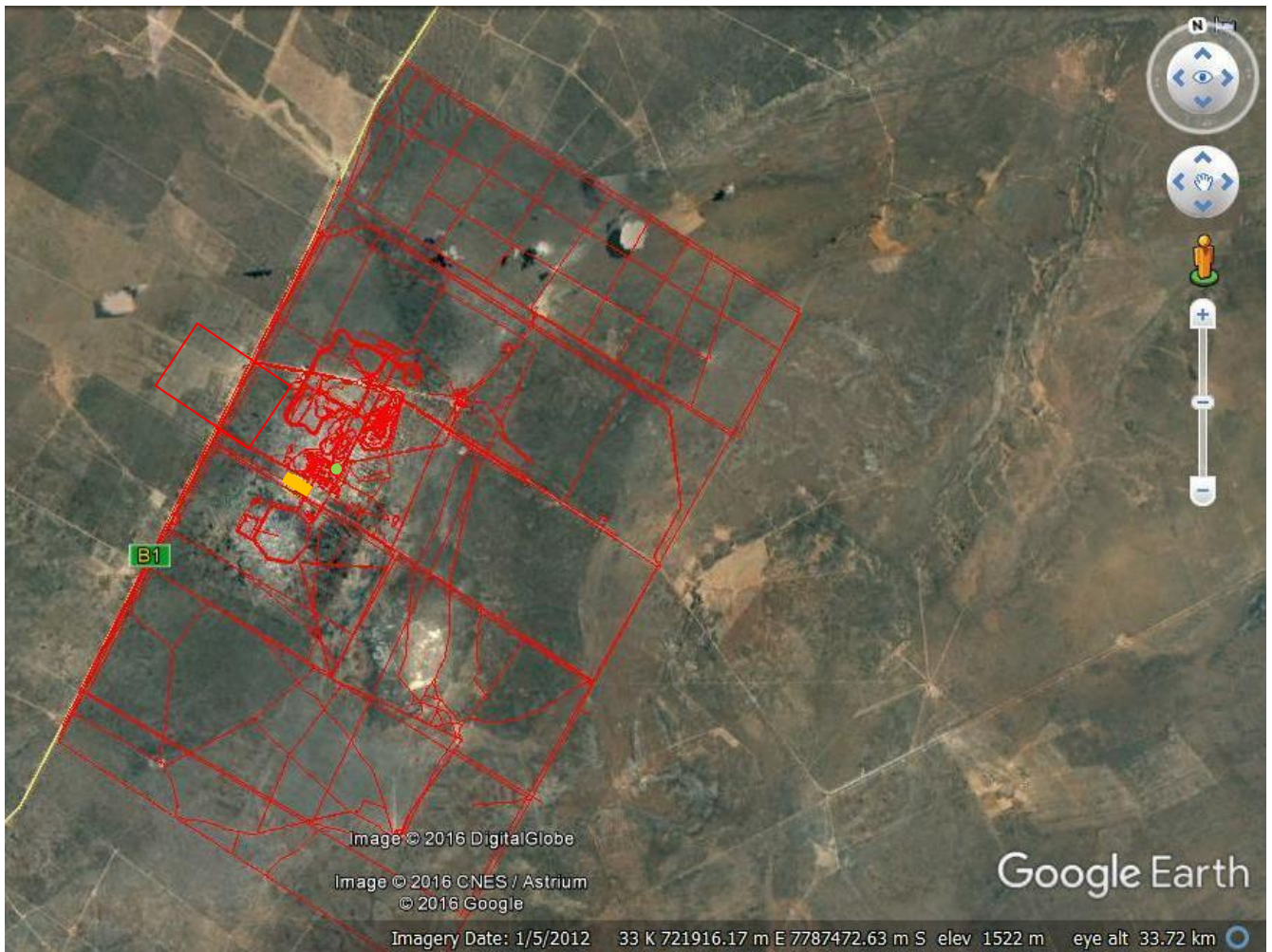


Figure 3: The figure shows site A (yellow) and site B (green), which were both considered to erect the incinerator.

The following disposable hazardous waste will be incinerated at the incinerator:

- Hydrocarbon contaminated materials, such as oil rags, hydraulic hose pipes, smaller oil/lubricant containers;
- Dead animals, e.g. birds, small mammals from incidental impacts;
- Hazardous reagents packaging, e.g. cyanide bags with packaging;
- Fat, oil and grease from the canteen;
- Medical waste from the clinic and
- Any other disposable hazardous waste that might be generated on site and cannot be accepted at external facilities.

Plate 3 shows some of the above listed waste material.



Hydrocarbon contaminated oil/lubricant containers



Redundant hydraulic hose pipes



Hydrocarbon contaminated oil rags



Empty cyanide bags

Plate 3: Examples of hazardous waste to be destroyed in the incinerator.

7.2 INCINERATOR

An incinerator is a waste treatment process which essentially burns waste material in a gas or oil burning furnace. The waste materials is converted by high temperature (up to 1500°C) into ash, flue gas and heat. Following the combustion process, the ash that is created is rendered safe and may be disposed of at a landfill site. The flue gases which arise as a result of combustion are then cleaned through a heated refractory screen and the use of stainless steel grit arrestors to remove small particles (fly ash). The flue gases are further passed through a scrubber system, rendering these gases non-toxic and safe to be released into the environment.

When conducted in the correct manner, incineration is an effective means of reducing the volume of waste generated, which consequently has a significant reduction on the area that is required for landfill sites. It further reduces the danger of potential ground water pollution at these landfill sites. Incineration is a safe, hygienic and cost effective option of disposing contaminated, hazardous waste.

7.2.1 *Proposed Incinerator at B2Gold Mine*

Initially B2Gold obtained three quotations of different incinerator types:

- The Incinerator Factory (Pty) Ltd (RSA based)
- The S.A. Incinerator Co. (Pty) Ltd (RSA based)
- Scholer Industries Pty. Ltd (Australian based)

The preferred incinerator is the 'Hospital/General waste incinerator 450LA from S.A. Incinerator Co. (Pty) Ltd. The detailed specifications are provided in Error! Reference source not found.. This incinerator has also been installed at the Katutura Hospital.

7.2.2 *Description of the Incinerator 450LA*

The incinerator 450LA will be placed in a building and **Table 3** and **Figure 4** provide the specification and details of the layout. Up to 220 kg per hour can be incinerated in the 450LA incinerator. This will be sufficient for B2Gold Otjikoto mines demand. Otjikoto generates on average 500 kg of hazardous waste per week.

The incinerator will use diesel which will be delivered to a diesel tank at the incinerator site. The practice of delivering diesel to remote and mobile equipment with a diesel bowser is a normal practice in mining operations.

Under normal operating conditions the incinerator will be required for an 8 hour period – 7 hours burning and 1 hour for cleaning purposes, as this is vital to the efficiency of the incinerator.

Table 3: Illustration and specifications of the LA450 Incinerator.

	<p>Supply, Delivery & Installation of an LA450 Incinerator Model: LA450 Capacity: 220kg/h Dimension (LxWxH): 2840 x 2450 x 2710mm With Chimney Chimney height: 12m Weight: 13 ton</p> <p><i>Includes:</i> Special transport from RSA to WHK Delivery to site Special Transport to site with crane for offloading and also erecting of chimney</p> <p>The complete installation includes:</p> <ul style="list-style-type: none"> • Transport Factory to Windhoek • Transport Windhoek to Site • Loading and offloading at all sites • Rigging incinerator into position • Erecting of chimney • Sealing of roof structure • Commissioning • One-day training of Staff
	<p>Control Box</p> <ul style="list-style-type: none"> • The control box is equipped with digital temperature controllers. • An exact temperature control • The controllers set point can be locked to prevent accidental maladjustment and fiddling of personnel • The controllers are “semi-intelligent” and thus can indicate if there are problems with the temperature sensors. Thus problem diagnostics are so much easier • The panel has made provision for alarm indicators, indicating the status of the operation of the incinerator. • The control box is mounted on the wall with a small junction box mounted on the incinerator for cable terminations. Less heat exposure onto electronic components. <p>The control board shall make provision for the following indicators for each burner:</p> <ul style="list-style-type: none"> • Fan ON • Burner ON • Burner TRIPPED • Controller/Temperature probe faulty • Incinerator Ready • The Indicator bulbs shall be of the LED cluster long lasting type. • A lamp-test pushbutton shall be included in the circuitry.



Bulk Diesel Tank

- Type: ±2000L
- Farmers tank style
- With robust stand
- 1.5m above floor level

These diesel tanks are equipped with sight glasses for level indication. They are also equipped with special locking devices, making fuel theft more difficult.



ASH TROLLEY

- The Bin size shall have a suitable width to cover the whole width of the incinerator hearth. The size of the bin shall be of enough volume to carry one day's ash residue per incinerator
- The trolley must be on wheels with suitable hard rubber wheels of a diameter not less than 30cm
- The wheels shall run on ball bearings
- This trolley shall be constructed of such a height to suitable fit in front of the loading door. It shall have a "spout" such that when the incinerator hearth is cleaned the ashes can be scraped directly into the bin without spillage.
- The trolley bin shall be constructed out of SS 304 or 3CR12 sheet.
- A lip shall be welded all around the top edge to prevent operator injury and strengthen the structure of the bin
- The bin shall be suspended on a pivot such that its content can be poured out without picking the trolley / frame up
- The bin frame shall be painted with an epoxy paint (Hammerite)



The surrounding of the B2Gold Mine is considered a rural area. The provider recommends from previous experience, that owls and other birds somehow get trapped in the chimney and die a horrible death. Putting a Chinese cowl over the chimney will prevent this.



Tool stand and other additional safety and operational features

A floor standing tool stand of sufficient height shall be mounted close to each incinerator loading door. Each stand shall make provision to hang the standard incinerator tools:

- Scraper
- Poker
- Dustpan / Ashpan
- Broom with Steel Bristles

It shall also make provision to hang the following protective equipment:

- Fire Retardant Apron
- Set of Gloves
- Breather Mask
- Hard Hat with face shield
- Fire extinguisher Powder type 9kg
- The stand shall be bolted to the floor at a distance of not less than 3m in the radius away from the loading door.
- It shall be positioned such that it does not impair the operators' movement



8. PROJECT NEED, DESIRABILITY AND ALTERNATIVES

This amendment is an alternative to the current method to dispose of disposable hazardous waste which indicated in the approved EIA (2013), the removal of hazardous waste from site to a well-managed offsite hazardous waste facility. Since January 2015 at the start of operation, Otjikoto Gold Mine experienced several challenges regarding the management of disposable hazardous waste. The disposable hazardous waste is not accepted at the hazardous waste facility due to the limited capacity of storage space and this waste therefore ends up at the municipal landfill. This amendment to the current waste management process will positively change the handling and disposal of hazardous waste management at the mine and minimize the extent of impact beyond the Mines area of control.

Please note the same incinerator has been installed at the Katutura hospital last year.

9. INPUT FROM AIR QUALITY SPECIALIST

Airshed Planning Professionals (Airshed), who were involved in the EIA process from the beginning of the EIA process and have provided two comprehensive air quality specialist studies (2012 and 2013), were asked to submit a proposal to do an air quality study. However, after reviewing the provided information which is presented in this scoping report, Airshed does not see it necessary to conduct a new air quality study, as air quality aspects have been covered in the initial specialist studies for the Mine EIA. A summary of Airshed's input is provided below and attached in **Appendix 5**.

Airshed was requested to comment on the incinerator proposals obtained by B2Gold and their conclusion is – *“... the proposals and brochures indicates that all of the companies understand the requirements of waste incineration well. The methods used for sizing are appropriate and the resulting residence times conform to the engineering “rules of thumb” used in the industry.”*

Further Airshed was asked to provide input into the emission air quality monitoring of the incinerator and provided the following answer:

“It should also be noted that the operation of such an incinerator to minimise resultant air pollution is highly dependent on the quality of operations, so that operator training (possibly carried at site by the supplier) should be a priority.”

The revised EMP in section 10 and **Appendix 6** will address this issue. All the proposals received for erecting the incinerator on site include training of personnel on site, operating manual and a bi-annual service and maintenance by the supplier.

Airshed's response further states – *“Regarding air quality monitoring requirements, we do not think that continuous ambient monitoring is required for a properly operated incinerator. Continuous monitoring of the CO content of the outlet gas provides a good indication of proper operation and should be included in the specification for the equipment, as this will also assist the operator to maintain optimum combustion conditions. For the other pollutants, stack measurements once or twice a year should be sufficient. These should include the concentration*

for all of the compounds as per the extract from the South African Minimum Emission Standards regulations of 2013 in **Table 4**: Extract from the South African Minimum Emission Standards regulations of 2013 for facilities treating general and hazardous waste by the application of heat. below. As the tests for dioxins and furans are very specialized and expensive, these could be dispensed with if no chlorine-containing material, specifically PVC, is incinerated.”

Table 4: Extract from the South African Minimum Emission Standards regulations of 2013 for facilities treating general and hazardous waste by the application of heat. will be included into the revised EMP and measurements shall be taken twice a year and analysed against these standards.

Table 4: Extract from the South African Minimum Emission Standards regulations of 2013 for facilities treating general and hazardous waste by the application of heat.

Description:	Facilities where general and hazardous waste are treated by the application of heat.	
Application:	All installation treating 10kg per day of waste or more.	
Substances or mixture of substances		mg/Nm³ under normal conditions of 273 Kelvin and 101.3 kPa
Common name	Chemical symbol	
Particular matter	n/a	10
Carbon monoxide	CO	50
Sulphur dioxide	SO ₂	50
Oxides of nitrogen	NO _x expressed as NO ₂	200
Hydrogen chloride	HCl	10
Hydrogen fluoride	HF	1
Sum of lead, arsenic, antimony, chromium, cobalt, copper, manganese, nickel, vanadium	Pb + As + Sb + Cr + Co + Cu + Mn + Ni + V	0.5
Mercury	Hg	0.05
Cadmium	Cd + Tl	0.05
Total organic compounds	TOC	10
Ammonia	NH ₃	10
		ng I-TEQ /Nm³ under normal conditions of 10% O₂, 273 Kelvin and 101.3 kPa
Dioxins and furans	PCDDs / PCDFs	0.1

Note:

mg/Nm³ means milligrams per cubic meter. It is used primarily when measuring gaseous pollutants. The unit will vary depending on things like temperature, and pressure. A control at normal conditions is essential for proper measurement.

ng I-TEQ /Nm³ means nanograms per cubic meter of International-Toxicity Equivalents

PCDDs: polychlorinated dibenzo-p-dioxins

PCDFs: polychlorinated dibenzofurans

Current air quality monitoring programme include PM10, ambient dust at 6 sites.

10. AMENDED HAZARDOUS WASTE MANAGEMENT PLAN OF OTJIKOTO MINE

The Hazardous Waste Management Plan of Otjikoto Mine (June 2016) has been updated according to the proposed changes in the above chapters and is attached in **Appendix 6**.

The consultant is of the opinion that no impact assessment needs to be conducted, as the incinerator will be erected within the mine foot print and on already disturbed area. An area of 3m x 3m will be needed for the incinerator and storage area of the material to be destroyed in the incinerator exists on both sites (site A and site B, see **Chapter 7**). Air quality impacts will be minimal as the incinerator has built-in controls to filter air emissions and reduce potential air pollution.

In addition other, worth sources of air pollution exist within the vicinity of B2Gold Mine, such as charcoal producing and particles from the diesel train.

Operating staff of the LA450 incinerator at B2Gold mine will be trained by the providing company. Additionally, the control box is equipped with digital temperature controllers, which monitor the exact temperature. The controllers set point can be locked to prevent accidental maladjustment and fiddling of unauthorised personnel. The controllers are “semi-intelligent” and thus can indicate if there are problems with the temperature sensors.

Additional noise, next to the day-to-day noise at a mine, will only be experienced during construction of the building which will house the incinerator. Otherwise no additional noise will be created while operating the incinerator.

No vibration or odour will be generated during the operation of the incinerator.

It is foreseen that the proposed incinerator will cater for all the challenges experienced in the disposal of hazardous waste at the Otjikoto Gold Mine as it would deal with the complete destruction of hazardous waste that has a significant potential for affecting the health and well-being of surrounding communities.

10. CONCLUSION

The amendments to the hazardous waste treatment at Otjikoto Mine has only positive environmental impacts:

- No new site will be disturbed
- Disposable hydrocarbon contaminated wastes and cyanide packaging wastes are not accepted at the two facilities due to the large volumes and limited capacities of the sites and may end up on municipal landfills.
- Better control and management of hazardous wastes with in-house applications will minimize environmental impacts.
- This incinerator type (LA450) is already in use in Namibia
- Air quality monitoring is undertaken at Otjikoto mine as part of the operations potential air quality risk management.

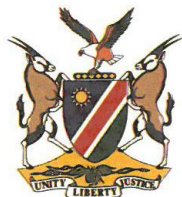
It is important that staff is trained by the incinerator provider to ensure that the facility is properly operated. Further bi-annual emission measurements should be conducted as set out in chapter 7.

A. Speiser

A. Speiser Environmental Consultants cc

APPENDICES

Appendix 1: Letter from MET requesting the scoping report.



REPUBLIC OF NAMIBIA

MINISTRY OF ENVIRONMENT AND TOURISM

Tel: (00 26461) 284 2111
Fax: (00 26461) 229 936

E-mail: salmo.djuulume@met.gov.na
Enquiries: Mr. Salmo Djuulume

Cnr Robert Mugabe &
Dr Kenneth Kaunda Street
Private Bag 13306
Windhoek
Namibia

02 November 2016

OFFICE OF THE ENVIRONMENTAL COMMISSIONER

The Managing Director
B2 GOLD Namibia (Pty) Ltd
P. O. Box 80363
Olympia, Namibia

Dear Sir/Madam

SUBJECT: APPLICATION FOR AMENDMENT OF ENVIRONMENTAL CLEARANCE CERTIFICATE CONDITIONS FOR THE PROPOSED DISPOSABLE HAZARDOUS WASTE MANAGEMENT IN OTAVI, OTJOZONDJUPA REGION

The application to amend the Environmental Clearance Certificate (landfill issued in October 2013) conditions for the proposed disposable hazardous waste treatment plant for the B2 Gold Mine has a reference. This project falls under listed activities, it is different from existing projects and shall be treated separately.

It is therefore recommended that B2Gold conducts an environmental assessment at a level of scoping by compiling a Scoping Report and an Environmental Management Plan specifically for the proposed treatment plant.

Yours sincerely,



Teofilus Nghitila
ENVIRONMENTAL COMMISSIONER



“Stop the poaching of our rhinos”

All official correspondence must be addressed to the Permanent Secretary

Appendix 2: Form 2 submitted to MET to apply for the amendment to management hazardous waste.



B2GOLD Namibia (Pty) Ltd
Registration number 93/613

20 Nachtigal Street
Ausspannplatz
P.O. Box 80363, Olympia
Windhoek

Windhoek Head Office
Tel: +264 (0)61 295 8700
Fax: +264 (0)61 295 8799

Otjikoto Mine
Tel: +264 (0)67 301 8000
Fax to email: +264 (0)88 655 7462

www.b2gold.com

The Permanent Secretary
Ministry of Environment and Tourism
Private Bag 13306
Windhoek

18 July 2016,

**Attention: Mr. T Nghitila
Environmental Commissioner**

**APPLICATION FOR AMENDMENT OF ENVIRONMENTAL CLEARANCE CERTIFICATE CONDITIONS –
DISPOSABLE HAZARDOUS WASTE MANAGEMENT**

Dear Sir,

The Otjikoto Gold mine has been in operations since January 2015. The Mine is situated in the Otavi Constituency of the Otjozondjupa Region, approximately 47km from Otavi town. The current Environmental Clearance Certificate (ECC) was granted in January 2015 (Changes to the Otjikoto Gold Mine Project).

Otjikoto has been implementing its waste management plan commitments since inception. The following challenges encountered in the management of disposable hazardous waste during the 2015 operational year, have warranted the need to amend the Mine's ECC as outlined in the application attached;

- A limited number of managed hazardous waste disposal facilities in the country
- A lack of storage capacity at managed hazardous waste sites, leading to selective storage of high risk hazardous waste only
- A likelihood of hazardous waste disposed at municipal landfills.

With the above considerations, it is important to manage the impacts related to the handling of hazardous waste, and consequently improve our waste management practices and eliminate the associated impacts.

B2Gold Otjikoto Mine considers the need for in house hazardous waste management as critical and cannot be emphasized strongly enough. The Otjikoto management plan has been reviewed as attached with specific mitigation measures provided for the amendment.

This letter is accompanied by a formal application form (Form 2) for the request to amend the ECC on the management of disposable hazardous wastes during the Life of Otjikoto mine.

Your urgent consideration of our request for an amendment to our ECC would be greatly appreciated.

Yours sincerely,


Gerson Shipera 18/07/2016
Assistant General Manager Otjikoto Mine

Directors: LS Hangala* (Chairman) | MT Dawe **** (MD) | J Kaitungwa* | CE Loots** | WE Lytle*** (MD) | RT Richer **** | WR Viviers**
*Namibian | **South African | ***American | ****Canadian | *****British

REPUBLIC OF NAMIBIA
ENVIRONMENTAL MANAGEMENT ACT,
2007 (Section 39)

APPLICATION FOR AMENDMENT OF CONDITIONS OF
ENVIRONMENTAL CLEARANCE CERTIFICATE



PART A: DETAILS OF APPLICANT

1. Name: (person or business):
B2Gold Namibia (Pty) Ltd
2. Company Registration No.
93/613
3. Correspondence Address:
P.O Box 80363 20 Nachtigal Street
Olympia Ausspännplatz
Windhoek Windhoek
Namibia Namibia
4. Name of Contact Person:
Mr. Gerson Shipena
5. Position of Contact Person:
Assistant General Manager
6. Telephone No.:
+264 - 67-3018000
7. Fax to Email:
+264 - 88 655 7462
8. E-mail Address: (if any)
gshipena@b2gold.com
cwilliams@b2gold.com
akanandjembo@b2gold.com

PART B: PARTICULARS OF CURRENT ENVIRONMENTAL CLEARANCE CERTIFICATE

1. Name of current holder of Environmental Clearance Certificate:
B2Gold Namibia (Pty) Ltd
2. Date of Issue of current Environmental Clearance Certificate:
29 January 2015

PART C: PROPOSED AMENDMENTS TO THE CONDITIONS IN CURRENT ENVIRONMENTAL CLEARANCE CERTIFICATE

1. Condition(s) on the Current Environmental Clearance Certificate:

Please see attached ECCs.

2. Proposed Amendment(s):

B2gold Namibia, Otjikoto Mine has received three Environmental Clearance Certificates for the Otjikoto mine in August 2012, Landfill and Power plant in October 2013 and Changes to the Otjikoto Gold Mine Project in January 2015.

In the Otjikoto mine EIA and EMP, non - mineral waste risks were identified and commitments made to mitigate and manage non-hazardous waste on site within an approved landfill and hazardous waste is to be removed from site and safely handled at a certified hazardous waste site in the country.

The Walvisbay hazardous waste site was chosen for the Otjikoto non-recyclable hazardous waste disposal. Unfortunately, the site can only accept small volumes of *specific* hazardous waste due to limited capacity. The bulk of Otjikoto mine disposable hazardous waste generated cannot be handled at this site. Otjikoto mine operations mainly generate large quantities of hazardous waste of hydrocarbon nature, and cyanide packaging (partially decontaminated).

It is therefore proposed that Otjikoto Mine operations be allowed to destroy disposable hazardous waste on site by means of incineration in a burn bunker and eventually an appropriate incinerator.

More detail is provided in the attached documents on hazardous waste management at Otjikoto mine (Otkikoto mine waste Management plan).

3. Reason for Amendment(s):

Otkikoto mine would like to apply the most responsible method to manage its hazardous waste from generation to destruction. The rational for amending the waste management plan is as follows:

- Only two well managed hazardous waste sites, with limited volume capacities exist in the country.
- Disposable hydrocarbon contaminated wastes and cyanide packaging wastes are not accepted at the two facilities due to the large volumes and limited capacities of the sites and may end up on municipal landfills.
- Better control and management of hazardous wastes with in-house applications will minimise environmental impacts.

4. Describe the environmental changes arising from the proposed amendment(s):

Otkikoto mine has determined that handling of its disposable hazardous waste onsite by total destruction/incineration will eliminate the transfer of hazardous waste into municipal landfills and eventually into the public domain. In addition, the destruction will reduce the quantities to land and therefore minimize potential secondary impacts to the environment. Impacts to ground water, air quality are also minimal with the methods of destruction and incineration.

5. Describe how the environment and the community might be affected by the proposed amendment(s):

- Surface and groundwater (no impacts on water quality)
- Air quality (potential increase in particulate matter, mitigated by methods of incineration)
- Biodiversity (positive impacts on the fauna and flora)
- Land emissions (eliminates disposal on land resulting in positive impacts)
- Health/Safety (minimal impacts on humans)

The above mentioned aspects are discussed in the attached documents.

6. Describe how and to what extent the environmental performance requirements set out in the assessment report previously approved or activity profile previously submitted for this activity may be affected:


The changes to handle non-recyclable hazardous waste on site will be beneficial to both the organization and community. At the moment the impact of hazardous waste is amplified by the stockpiling of cyanide waste packaging leading to potential accidental exposure to the health of the employees and fauna. The transportation of hazardous waste to Walvisbay and subsequent disposal to the community landfill increases the impacts to the community and this is a risk to Otjikoto. Significant positive changes in the performance requirements are anticipated due to improved waste handling and destruction of hazardous waste on-site.

7. Describe any additional measure proposed to eliminate, reduce or control any adverse environmental effect arising from the proposed amendment(s):

Additional management and mitigation measures have been identified and are included in the updated waste management plan. The attached documents describe the proposed measures to control any adverse environmental effects.

PART D: DECLARATION BY APPLICANT

I hereby certify that the particulars given above are correct and true to the best of my knowledge and belief, I understand the environmental clearance certificate maybe suspended, amended or canceled if any of the information given above is false, misleading, wrong or incomplete.

 Signature of Applicant	<u>GR SHIPENIA</u> Full Name in Block Letters	<u>AGM: OTJIKOTO MINE</u> Position
On behalf of <u>B2GOLD NAMIBIA</u>		<u>18.07.2016</u> Date

Appendix 3: Curriculum Vitae - A. Speiser



CURRICULUM VITAE

MARIE ALEXANDRA ANGELIKA SPEISER

A. PROFESSIONAL INFORMATION

First Names: Marie Alexandra Angelika
Surname: Speiser
Nationality: German (Permanent Residence in Namibia 1999)
Countries worked: Namibia, Mozambique, Angola, Botswana, Germany
Language: German and English (fluent)
Afrikaans and Portuguese (fair),
Profession: Environmental Scientists (MPhil), Geologist (MSc)
Contact details: P.O. Box 40386
Windhoek – Namibia
Tel +264 61 244782
Cell 081 1245655
E-mail: amspeiser@yahoo.com, aspeiser1910@gmail.com

B. EDUCATION

2000 Master of Philosophy in Environmental Science, University of Cape Town, South Africa.
Group Thesis Title: *Environmental Situation Analysis of the Orange and Fish River Catchments*
Individual Paper Title: *Small Scale Mining in Namibia*

1994 Master of Science in Geology and Paleontology, Georg-August University Göttingen/Germany.
Thesis Titles: *Fluid inclusion studies in vein quartz from the Kansanshi Mine (Zambia)* and
Geological mapping of the Kansanshi Mine and surroundings.

C. RELEVANT COURSES

November 2004

Environmental Auditor Trainings Course, Institute of Environmental Impact Assessment (IEMA) approved, Crystal Clear Consulting & Merchants (Pty) Ltd, RSA

D. PROFESSIONAL ACTIVITIES

Professional Institutes & Membership:

- Lead Practitioner, Environmental Assessment Professionals of Namibia (EAPAN)
- Institute of Environmental Management & Assessment, UK (Associated Member, AIEMA, October 2010)
- Approved Inspection Authority with the Ministry of Labour and Social Welfare (A.I.A. 08/12)
- Chamber of Mines of Namibia (member)
- Geological Society of Namibia (member)

E. EMPLOYMENT HISTORY

2012 – to 2016 Associated Environmental Consultant to SLR Namibia

2003 - to date A. Speiser – Environmental Consultants cc, Director

Main work conducted and ongoing:

- Work packages 6 leader of the **HiTech AlkCarb Project** funded by the European Union's Horizon 2020 research and innovation programme under grant agreement No. 689909 (Feb. 2016 to Feb. 2020)
- **Environmental Consultant** to Kerry McNamara Architects Inc: Combined Scoping & EIA Report & EMP for the proposed Edelweiss Development (part of Okahandja Extension 7) in Okahandja
- **Environmental Consultant** to Bannerman Resources (Namibia) (Pty) Ltd: EIA/EMP for the proposed Pilot Plant on Bannerman Resources (Namibia) (Pty) Ltd EPL 3345
- **Environmental Consultant** to RPZC (Glencore): EIA/EMP for the proposed expansion of water and power infrastructure for RPZC Mine
- **Environmental Consultant** to RPZC (Glencore): EIA/EMP for the proposed zinc concentrate Storage shed at Lüderitz harbour
- **Environmental Consultant** to Metals Namibia. EO and EMP for exploration activities
- **Environmental Consultant** for the bulk chemical store of Crest Chemical Pty Ltd at Walvis Bay harbour
- **Environmental Coordinator** for the Kassinga (Angola) North and South Iron Ore Project – Area 1 (SMP / AEMR). JV between ASEC and Environmental Resource Management
- **Environmental Coordinator** for the exploration phase at Lofdal, Namibian Rare Earth (Pty) Limited
- **Environmental Consultant** to conduct bi-annual environmental audit reports for Glencore, Bannerman Resources (Namibia) Pty Ltd, Okorusu Fluorspar Pty Ltd, Namibia Rare Earth Pty Ltd, Swakop Uranium,
- **ESIA Coordinator** (amendments to the approved ESIA & ESMP) for the proposed U-mine at Etango (Bannerman Mining Resources Namibia (Pty) Ltd)
- **External Environmental Consultant** to Rössing Uranium (Rio Tinto) – SEMP: exploration drilling in the ML area within the Namib Naukluft Park
- **Reviewer** of Swakop Uranium SEIA conducted by Metago
- **ESIA Coordinator** (scoping phase) for the proposed Cu mine at Omitiomire (Craton Mining & Exploration (Pty) Ltd)
- **Mine Closure Plan** for Okorusu Fluorspar (Okorusu Fluorspar Pty Ltd)
- **Preliminary Environmental Overview** for Omitiomire Cu-deposit (Craton Mining & Exploration (Pty) Ltd)
- **ESIA Coordinator** for the proposed U-mine at Etango (Bannerman Mining Resources Namibia (Pty) Ltd) (Scoping & final ESIA approved by Government)
- **ESIA Coordinator** for the proposed Au-mine at Otjikoto, Central Namibia (Teal Exploration & Mining Inc.)
- **Environmental Consultant** to Walvis Bay Bulk Terminal (Pty) Ltd (EIA to construct a bulk sulphur loading & storage facility at WB harbour)
- **Environmental Consultant** providing input to set up ISO 14001 & OSHAS 18000 at Rosh Pinah Mine, Rosh Pinah Zinc Corporation (Pty) Ltd
- **EIA Coordinator** for the proposed change to bulk sulphur at Skorpion Zinc, Chemical Initiatives (Pty) Ltd
- **September 2005 – June 2006, Environmental Coordinator** for the construction phase of Langer Heinrich Uranium (Pty) Ltd
- **EIA and EMP Coordinator** for proposed exploration activities for dimension stones, relevant document to grant licence by the Ministry of Mines and Energy, Olea Investment Number One (Pty) Ltd.
- **Standard Environmental Guidelines** for exploration activities, Helio Resource Corp., Canada
- **Coordinator** to compile the **Initial EMP for construction and operation** of the Langer Heinrich Uranium Mine, Paladin Resources Ltd
- **EIA & EMP (Phase 1 & 2) Coordinator** for exploration activities in the NW Namib Naukluft Park, West Africa Gold Exploration (Namibia) Pty. Ltd
- **EMP Coordinator** for Sarusas Mine, Skeleton Coast Park, Namibia, Igneous Mining Projects (Pty) Ltd
- **EIA & EMP Coordinator** for current & proposed mariculture projects of Alexkor, Alexander Bay, RSA

Alexandra Speiser

- **Environmental Consultant** – updating the EA & EMS for infrastructure changes at Navachab Mine, AngloGold Namibia (Pty) Ltd.
- **Team Leader**, Environmental and social assessment for World Bank/GEF Project 'Integrated ecosystem management in Namibia through the national conservancy network'
- **Bi-annual monitoring reports** auditing environmental performance of exploration activities (RPZC, B2Gold, Swakop Uranium, Okorusu Fluorspar, Namibia Rare Earth) - **ongoing**
- Development and implementation of an environmental management plan for the Okorusu Fluorspar Mine, Namibia.

2000 - 2003 Environmental Scientist at eco.plan (Pty) Ltd.

During this period I conducted environmental assessments and developed environmental management plans for exploration and infrastructure projects. I further was involved in the project management, public participation processes and office administration.

1999 – 2000 University of Cape Town studying Environmental Science (MPhil degree)

1997 – 1999 Self employed, Contract Geologist Scientist

- RC drilling supervision – Apatite Project / Monapo, Mozambique, subcontracted by GeoAfrica Prospecting Services (Pty.) Ltd.
- Mapping and evaluation of possible talc deposits in Central Namibia, subcontracted by Dr. T. Smaley.
- Involvement in the preliminary fact finding phase to conduct an EIA to upgrade the Cement Factory in Otjiwarongo, Namibia.
- Several Desk Studies for Anglovaal Namibia (Pty) Ltd.
- Various investigations of diamondiferous gravels of the northern bank of the Orange River.
- Drilling Supervision in the Okavango Area for InterConsult Namibia (Pty) Ltd.
- Organization of the Public Meeting for the 'Proposed Klein Windhoek River Bridge and Upgrading of Mission Road.'

1995 to 1996 Project Assistant / Geologist at the German Technical Cooperation (GTZ)

- Participation in a six-week training course at the (GTZ) Headquarter in Eschborn/Frankfurt. Focus of the training course was on project management, rural public participation appraisal and social development workshops.
- Project Assistant to the GTZ-Adviser in the Ministry of Environment & Tourism. In cooperation with the Desert Research Foundation of Namibia (DRFN) the *Chemical Residue Analysis – Kavango Region* Project was conducted. The project assessed the environmental impacts of irrigation schemes along the Okavango River, special attention was given to the use of fertilisers and pesticides.
- Project Assistant/Geologist in the *Mineral Prospecting Promotion Project*. This project was set up in cooperation with the Geological Survey of Namibia (GSN) and the Federal Institute for Geo-science and Natural Resources (BGR). The work comprised geophysical interpretation and detailed geological/geophysical ground follow-ups.

1994 – 1995 Contract Geologist

- Supervision of construction sites and conduction of soil surveys to establish possible hydrocarbon-contamination (Germany).

F. PUBLICATIONS

Speiser A., Hein U.F. and Porada H. (1995). The Kansanshi Copper Mine (Solwezi Area, northwestern Zambia): Geology, wall rock alteration and fluid inclusions, in Pasava J. Kirbek B. and Zak K. eds., *Mineral deposits: From their origin to their environmental impacts: Third Biennial Society for Geology Applied to Ore Deposits Meetings*, Rotterdam, Balkema, p. 289 – 392.

Du Plessis P., Eberle D. and Speiser A. Chapter 1: Enabling Host: Southern Namibia. in Eberle D. (eds.) (1997). *Promising Patterns. A new approach to the Mineral Potential of Southern Namibia*.

Boonzaier A., Kuiper S. and Speiser A. (1999). Community Benefits from the Richterveld National Park: The Golden Road to the future? in IAIA 1999 Conference Proceedings.

Alexandra Speiser

Appendix 4: List Farm and Lodge owners in the surrounding of Otjikoto Mine

Farm/Lodge name	Surname	First name	Position
AloeGrove Safari Lodge	Döman	Johan	Owner
Burgershof Farm	Nel	Thinus	Owner
Erpfsfarm	Erpf	Hanzi	Owner
Farm Okarhuipuro	Mouton	Andries	Manager
Fisher Farm	Van Wyk	Steve	
Frans Indongo Lodge	Indongo	Frans	Farmer
Grosswarlencourt Guestfarm			Manager
Guest Farm Oase	Erpf	Bunzi	Owner/Manager
HEDWIGSHOF/Etunda	Asino	Maahti	
Gabus Game Ranch	Kuehl	Heinzi	Owner
Hester Farm & Embla Farm	Smit	Paul	Owner
Houmoed Farm	Liebenberg	Fielies	Owner/Director
Kambaku Game Farm and Safari Tours	Michels	Thorsten	Farmer
Kavango Secondary School	Walter	M	
Khorab Lodge	Andre	Neetling	Owner
Lardner/ GTO Reg. Agric Union	Piet	Stoman	Farmer
Okapuka Jagd Farm	Fourie	Jan	Owner
Okaputa West Farm	Resettlement		Owner
Okarhuiput Farm	Sherad	Steyn	Owner/Manager
Omarassa Jagd			Owner
Orupoku Farm	Enkali	Petrus	Owner
Palmenecke Guest House	Du Toit	Susan	Owner
Platveld Shop	Ishitile	Abisai	Farmer
	Harmse	J.C	Owner/Manager
Roebersfarm	Roeber	Jochen	Owner
Stark Farm	Angula	Nahas	Farmer
Tirol Farm	De Fries	Elke	Farmer
Oros	Steyn	A	Farmer
Onoro	Labuschagne	P.W	Farmer
	Gouws	P.S	Farmer
	Swart	Johan G	Farmer
	Bester	Wally	Farmer
	Mouton	C	Farmer
	Gildenhuys	Fanie	Farmer
	Bassingthwaighte	Gillie	Farmer
Gutweide	Gildenhuys	J	Farmer
Osib	Ambasador N. P	Nashandi	Owner
Amateta	Hon. Nangolo	Mbumba	Owner

Etunda	Matti	Asino	Farm Manager
EGO	Brigadier General	Hamunyela	Owner
HOHENTAL	Mathews	Shilunga	Owner
EGUE	Mathews	Shilunga	Owner
ERHARDSHOF 575	Lucas	Tsanib	Owner
SIEMENSHOF	Epafra	Shapumba	Owner

Appendix 5: Airshed Planning Professionals specialist input regarding air quality.



AIRSHED
PLANNING PROFESSIONALS

Tel: +27 (0)11 805 1940

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Address: 480 Smuts Drive, Halfway Gardens

Postal: P O Box 5260, Halfway House, 1685

Our Ref. No.: 16ASE01

20 February 2017

A Speiser Environmental Consultant CC
P O Box 40386
iWindhoek, Namibia

Attention: Ms Alexandra Speiser

Dear Alexandra

PROPOSAL FOR AIR QUALITY ASSISTANCE ON THE PROPOSED B2 GOLD WASTE INCINERATOR, OTJIKOTO, NAMIBIA

Thank you for the opportunity to provide some comments and a proposal for the abovementioned project. Your continued support is appreciated.

It is understood that B2 Gold needs to incinerate approximately 500 kg of mixed and general waste per day, and have already obtained quotes for the incinerator from three companies. Perusal of the proposals and brochures indicates that all of the companies understand the requirements of waste incineration well. The methods used for sizing are appropriate and the resulting residence times conform to the engineering "rules of thumb" used in the industry.

Our experience with this type of incinerator in the mining industry indicates that there is a large variation in the waste types generated and requiring disposal. These vary from packing material and paper to waste generated in vehicle workshops to putrescible or kitchen wastes. It should also be noted that the type of generator offered is not suitable for waste oil (or any other non-solid waste) and that separate arrangements need to be put in place for this type of waste if it is found on site. It may therefore be useful to obtain more information on the types and quantities of waste to be disposed of over a time period before a final order is placed. This may allow the companies to submit improved quotes.

It should also be noted that the operation of such an incinerator to minimise resultant air pollution is highly dependent on the quality of operations, so that operator training (possibly carried at site by the supplier) should be a priority.

With regards to emission specifications we are not aware that Namibia has promulgated standards in this regard. In South Africa, very strict standards (based on EU standards) apply to any type of waste incinerator with a capacity more than 10 kg/day. To meet these standards, dry type scrubbers, utilising the addition of lime and/or activated carbon powder to the outlet of the secondary combustion chamber and ceramic candle scrubbers to capture the particulate matter are often utilised, and we note that such a system is installed on a new medical waste incinerator proposed for or installed in the City of Windhoek. Often, on-line monitoring equipment for pollutant measurements is also installed.

Given the remoteness of the site we would advise consultation with the Environmental Ministry and/or the Ministry of Mines on the necessity for such sophisticated mitigation measures to be installed, and also whether a full air quality specialist study would be required. If this is the case, we would estimate the cost of such a study to be approximately R100,000.00.

*Directors: L W Burger PhD, MSc Eng. (Chem.), H Liebenberg-Enslin PhD, MSc
Reg. No.: 2002/023269/07*

Regarding air quality monitoring requirements, we do not think that continuous ambient monitoring is required for a properly operated incinerator. Continuous monitoring of the CO content of the outlet gas provides a good indication of proper operation and should be included in the specification for the equipment, as this will also assist the operator to maintain optimum combustion conditions. For the other pollutants, stack measurements once or twice a year should be sufficient. These should include the concentration for all of the compounds as per the extract from the South African Minimum Emission Standards regulations of 2013 below. As the tests for dioxins and furans are very specialised and expensive, these could be dispensed with if no chlorine-containing material, specifically PVC, is incinerated.

Description:	Facilities where general and hazardous waste are treated by the application of heat.		
Application:	All installations treating 10 Kg per day of waste.		
Substance or mixture of substances		Plant status	mg/Nm ³ under normal conditions of 273 Kelvin and 101.3 kPa.
Common name	Chemical symbol		
Particulate matter	N/A	New	10
		Existing	25
Carbon monoxide	CO	New	50
		Existing	75
Sulphur dioxide	SO ₂	New	50
		Existing	50
Oxides of nitrogen	NO _x expressed as NO ₂	New	200
		Existing	200
Hydrogen chloride	HCl	New	10
		Existing	10
Hydrogen fluoride	HF	New	1
		Existing	1
Sum of Lead, arsenic, antimony, chromium, cobalt, copper, manganese, nickel, vanadium	Pb+ As+ Sb+ Cr+ Co+ Cu + Mn+ Ni+ V	New	0.5
		Existing	0.5
Mercury	Hg	New	0.05
		Existing	0.05
Cadmium Thallium	Cd+Tl	New	0.05
		Existing	0.05
Total organic compounds	TOC	New	10
		Existing	10
Ammonia	NH ₃	New	10
		Existing	10
			ng I-TEQ /Nm³ under normal conditions of 10% O₂ , 273 Kelvin and 101.3 kPa.
Dioxins and furans	PCDD/PCDF	New	0.1
		Existing	0.1

I trust this meets with your requirements.

Yours faithfully

Dr Hanlie Liebenberg-Enslin
Managing director

*Directors: L W Burger PhD, MSc Eng. (Chem.), H Liebenberg-Enslin PhD, MSc
Reg. No.: 2002/023269/07*

Appendix 6: Revised Hazardous Waste Management Plan of Otjikoto Mine (June 2016) to include operations of the incinerator.