

REPORT N° 01

PROPOSED SHONGWENI LANDFILL

DRAFT ENVIRONMENTAL MANAGEMENT
PROGRAMME

PUBLIC

JANUARY 2016

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eThekwini Cleansing and Solid Waste Unit

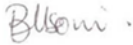

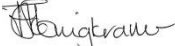
Type of document (version)
Public

Project no: 46250
Date: January 2016

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QUALITY MANAGEMENT

ISSUE/REVISION	FIRST ISSUE	REVISION 1	REVISION 2	REVISION 3
Remarks	Draft			
Date	January 2016			
Prepared by	Bathabile Msomi			
Signature				
Checked by	Carla Elliott			
Signature				
Authorised by	Hilary Konigkramer			
Signature				
Project number	46250			
Report number	001			
File reference	46250_DSW Shongweni Landfill Site_Draft EMPr			

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1 INTRODUCTION

1.1 BACKGROUND

The eThekweni Cleaning and Solid Waste Department, commonly known as Durban Solid Waste (DSW) initiated a process to secure regional general waste landfill sites to cater for future waste disposal requirements within the north, south and west zones of the eThekweni Municipal Area (EMA) in 1996. In respect of the west zone, DSW have submitted two separate applications, one for the proposed Shongweni Regional Landfill site, and a second application for the proposed Cato Ridge Regional Landfill site. DSW have confirmed that they are currently seeking authorisation for both the Cato Ridge and Shongweni sites in order to secure waste disposal facilities for approximately 150 years.

WSP Environmental (Pty) Ltd (WSP) undertook an Environmental Impact Assessment (EIA) process for the proposed Shongweni Regional Landfill site on behalf of DSW. The Final Environmental Impact Assessment Report (EIR) for the proposed Shongweni landfill was submitted in March 2010 to the competent authority, the KwaZulu-Natal (KZN) Department of Agriculture, Environmental Affairs and Rural Development (DAEARD).

In September 2014 the DAEARD, now known as the KZN Department of Economic Development, Tourism and Environmental Affairs (DEDTEA), issued a letter to DSW requesting that additional information be provided to assist them to considering and take a decision in respect of the proposed Shongweni Regional Landfill site. An Addendum Report (2015) has been prepared to facilitate the provision of the additional information requested. In addition, the DEDTEA requested that a draft Environmental Management Programme (EMPr) be compiled. The EMPr (this document) consolidates mitigation measures recommended in the 2010 EIR and additional management measures identified as part of additional information considered during the compilation of the Addendum Report.

1.2 PROJECT DESCRIPTION

The proposed Shongweni Regional Landfill site is located approximately 3 km south of the N3 highway, approximately 35 km west of Durban and approximately 45 km from Pietermaritzburg (**Figure 1**). The site is bounded by the main Johannesburg/Durban railway line to the north, secondary roads to the east and west and open veld to the south. The site lies at around 400m AMSL, at approximately 30°45'30"E longitude and 29°50'30"S latitude. The topography comprises a wide valley with several smaller valleys running into the main valley, sloping southwards. The area is drained by the Mgoshongweni River which is a tributary of the Mlazi River.

Initially the portion of the property to be rezoned for waste disposal purposes was approximately 208ha. The revised boundary line results in an area of about 195ha to be rezoned. The change in property boundary line derived from the change in the required buffer zone of approximately 200m between the landfill operational footprint and an informal settlement situated directly east of the site. The total footprint of the proposed landfill development is 550.2 ha with the landfill footprint estimated at 176 ha and buffer zone for acquisition is estimated at 374ha. Only general solid waste will be disposed of at the proposed facility. It is proposed that the valleys be filled and built up in levels of 10m in height with 2m high cell lifts.

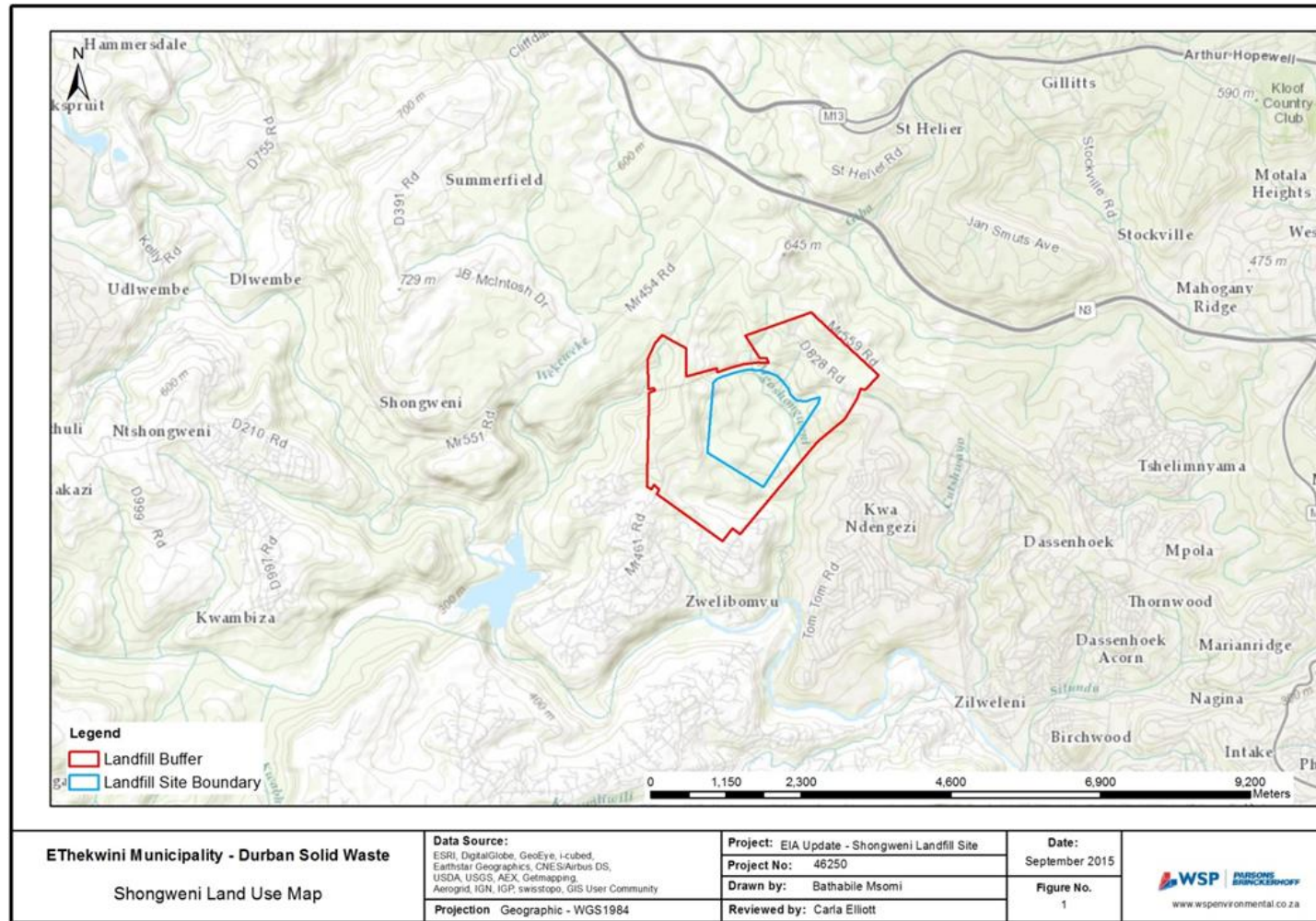


Figure 1: Project Locality (WSP GIS, 2015)

Waste will be disposed and compacted into cells and covered daily. Similar compaction equipment to that used at other DSW landfill sites will be used to compact waste to a minimum of 1000 kg/m³. Stormwater and groundwater diversion and control measures have been proposed. The Mgoshongweni River that runs through the valley and the production of leachate and landfill gas has been identified as potential critical factors. To address the first of these it is proposed that a culvert be built in the streambed and waste be landfilled over it. Secondly, collection and treatment systems for leachate and landfill gas have been fully integrated into planned site operations.

1.3 TERMS OF REFERENCE

The EMPr (this document) has been prepared in support of DSW's Environmental Authorisation (EA) and Waste Management Licence (WML) applications for the proposed Shongweni landfill. The EMPr has been prepared in compliance with Section 19 of the National Environmental Management Act (Act 107 of 1998) as amended (NEMA) 2014 Environmental Impact Assessment (EIA) Regulations and will be submitted in conjunction with the 2015 EIR Addendum Report for the proposed project.

1.4 AIMS AND OBJECTIVES

The EMPr is the primary document for managing potential environmental risks and opportunities during the project. It provides the framework for managing the environmental controls and processes to be implemented by the project proponent and contractors in carrying out their respective responsibilities.

This EMPr serves as a live document and should be revised and updated to reflect any new information that should arise.

The objectives of the EMPr are to:

- Provide effective, site-specific and implementable procedures and mitigation measures to monitor and control environmental impacts of the construction and operation phases, such that the related activities do not adversely impact the environment in the surrounding area.
- Comply with all applicable laws, regulations, standards and guidelines for the protection of the environment.
- Train employees and contractors with regard to environmental obligations.
- Ensure that during the life of the project, DSW mitigates negative impacts associated with the operation of the landfill. An important component of this is the monitoring, evaluation, and communication of findings and adherence to the principle of 'continuous improvement'.

1.5 ENVIRONMENTAL ASSESSMENT PRACTITIONER

The EMPr was prepared by the following Environmental Assessment Practitioners (EAPs):

Table 1: Details of EAPs

Name of representative of the EAP	Education qualifications	EAP Experience (years)
Bathabile Msomi	BSocSc (Honours) Environmental Management, University of KwaZulu-Natal	3 years
Carla Elliott	MSocSc (Environmental Management), University of KwaZulu-Natal	9 years

2 LEGAL REQUIREMENTS

The EMPr forms part of the required documentation in support of the EA and WML application process submitted to DEDTEA with following applicable reference numbers:

- Environmental Authorisation:
 - Environmental Conservation Act Application: EIA/3775 (original application)
 - NEMA GNR 983 Listed Activities: DM//0009/2015
- Waste Management Licence:
 - National Environmental Management Waste Act (Act 59 of 2008) (NEMWA) GNR 718 Activities: DM/WML/0009/10

The EMPr has been prepared in compliance with GNR 982 of the 2014 EIA Regulations. It intends to meet the requirements of the environmental law of South Africa and the principle recommendations contained within the 2010 EIR and the 2015 EIR Addendum Report.

It should be noted that the EMPr does not address the regulatory requirements under the Occupational Health and Safety Act (Act 85 of 1993) (OHSA); as these do not fall within the remit of the authorisation and licencing process. It is the responsibility of DSW to identify and comply with the relevant regulations of the OHSA.

3 ENVIRONMENTAL MANAGEMENT PROGRAMME

This section of the EMPr forms the core of the document and outlines specific issues related to the proposed project during the construction and operational phases and the recommended mitigation measures.

Timeframes stipulated for the implementation of the EMPr conditions have been categorised as 'on-going' indicating immediate and on-going implementation following authorisation of the final EMPr. Where applicable / possible, the project specific phase has been stated for implementation.

3.1 FUNCTIONS AND RESPONSIBILITIES

Roles and responsibilities shall be defined, documented and communicated in order to facilitate effective environmental management through the implementation of the EMPr. Management shall provide resources essential to the implementation and control of the EMPr including human resources, technology and financial resources.

Table 2 provides an overview of the roles and responsibilities of individuals on site related to the construction activities.

Table 2: Roles and Responsibilities

Responsible Person	Responsibilities
Project Manager	<ul style="list-style-type: none"> ■ Review and approve the EMPr prior to authorisation by the DEDTEA. ■ Review and authorise updates to the EMPr. ■ Ensure resource allocation for implementation of the EMPr requirements. ■ Ensure that environmental requirements are integrated into project plans, work method statements, tender and contract documents. ■ Ensure necessary support to the Health, Safety and Environment (HSE) representative for implementation of the EMPr. ■ Undertake environmental system reviews, site inspections, audits and other verification activities to assure that the EMPr implementation is at an optimal level. ■ Participate in environmental performance verification activities to verify the level of compliance with the EMPr in delivering the legal and environmental obligations. ■ Assess the efficacy of the EMPr and identify possible areas of improvement or amendment required within the EMPr. ■ Participate in incident investigations (as required). ■ Initiate external audits (as required).
Site Manager/HSE Representative	<ul style="list-style-type: none"> ■ Ensure implementation of the EMPr. ■ Ensure that the latest EMPr documents are filed and readily accessible as required. ■ Ensure communication of EMPr requirements to relevant contractor and sub-contractor personnel. ■ Facilitate environmental induction of all project staff and either deliver or coordinate delivery of all such training that would be required for the effective implementation of the EMPr. This includes identifying additional project training requirements and implementing the training programme. ■ Ensure maintenance of site document control requirements. ■ Maintain training records for all project personnel including contractors. ■ Maintain environmental incidents and stakeholder complaints register. ■ Undertake environmental system reviews, site inspections, audits and other verification activities to assure that the EMPr implementation is at an optimal level. ■ Report significant incidents internally and externally as required by law and the conditions of the EA. ■ Investigate incidents and recommend corrective and preventative actions. ■ Provide support and advice to the contractor and all sub-contractors in the implementation of environmental management procedures and corrective actions. ■ Ensure that monitoring programs, which assess the performance of the EMPr, are implemented. ■ Assess the efficacy of the EMPr and identify possible areas of improvement or amendment required within the EMPr.

<p>Environmental Control Officer (ECO)</p>	<ul style="list-style-type: none"> ■ Undertake compliance audits against the EMPr and conditions of the EA. ■ Provide support and advice to the project team, contractor and all subcontractors in the implementation of environmental management procedures and corrective actions. ■ Report significant incidents internally and externally as required by law and the conditions of the EA. ■ Ensure that monitoring programs, which assess the performance of the EMPr, are implemented. ■ Assist in the investigation of incidents and non-conformances and confirm in conjunction with the HSE representative that corrective and preventive action is taken and is effective. ■ Assess the efficacy of the EMPr and identify possible areas of improvement or amendment required within the EMPr. ■ Facilitate the amendment of the EMPr in conjunction with the DSW Site Manager (as required). ■ Provide environmental training for key project personnel (in communication with HSE representative). ■ Prepare audit reports (and submit reports to the relevant authority as required).
<p>Contractors, Staff and Service Providers</p>	<ul style="list-style-type: none"> ■ Regular on-site auditing to assess performance against the requirements of this EMPr. ■ Completion of the appropriate training requirements as specified in the training programme. ■ Implementation and maintenance of environmental management controls as set out in the project's environmental management documentation.

3.2 TRAINING

DSW has the responsibility to ensure that all persons involved in the project are aware of, and are familiar with, the environmental requirements for the project. All project personnel, including contractors and sub-contractors are required to receive training of a type and level of detail that is appropriate for the environmental aspects of their work. As a minimum, all personnel are required to complete the training requirements stipulated in **Table 3** below.

All senior and supervisory staff members shall familiarise themselves with the full contents of the EMPr. They shall know and understand the specifications of the EMPr and be able to assist other staff members in matters relating to the EMPr.

During the operational phase, training requirements for staff and contractors must be outlined within the Operational Plan.

Table 3: Training Requirements

Training Requirement	Frequency
<p>Site Induction: The purpose of the induction is to ensure that, as a minimum, all on-site personnel understand the EMPr in terms of:</p> <ul style="list-style-type: none"> ■ Key environmental and social issues relating to the project. ■ Relevant conditions of the EA. ■ Location and protection of environmentally sensitive areas (streams / wetlands). ■ Waste management and minimisation. ■ Minimising potential impacts to air, noise and water quality. ■ Erosion and sediment control. ■ Surface and groundwater contamination. ■ Spill control measures. ■ Emergency Response Plan. ■ Incident reporting procedures. ■ Pollution prevention practices. ■ Roles and responsibility relating to environmental management. 	<p>Construction Phase: prior to commencement of work by staff and / or contractors.</p>
<p>Toolbox Talks: Toolbox talks are intended to deliver specific training in an aspect of work or control including:</p> <ul style="list-style-type: none"> ■ Waste handling procedures. ■ Spill kit training. <p><i>The HSE Manager should identify potential areas for which ad hoc training and awareness is required to promote compliance with the EMPr. This can be done on conjunction with the ECO.</i></p>	<p>Construction Phase: weekly or as required.</p>
<p>Pre-Start Meeting: Pre-start meetings should be undertaken prior to commencement of a shift or the commencement of a new activity in order to discuss the planned work and operational aspects of the tasks. HSE issues and controls should be discussed and understood.</p>	<p>Construction Phase: as required.</p>

3.3

CONSTRUCTION AND OPERATIONAL PHASE MONITORING

Environmental monitoring of the proposed construction must be undertaken by an independent ECO at a frequency set out within the EA and / or WML (once a month recommended). Monitoring is to be undertaken so as to ensure compliance with all aspects of the EMPr.

In order to facilitate communication between the ECO, Site Manager / HSE Representative and Contractor, it is important that a suitable chain of command is structured that will ensure that the ECO's recommendations have the full backing of the project team before being conveyed to the Contractor. In this way, penalties as a result of non-compliances with the EMPr may be justified as failure to comply with instruction from the highest authority.

Environmental monitoring during the Operational Phase must be undertaken at the frequency set out within the WML, is it recommended that DSW conduct internal audits on biannual basis (every 6 months). A single annual external audit should be undertaken by a suitably qualified, independent consultant.

3.4 ENVIRONMENTAL INCIDENT MANAGEMENT AND REPORTING

The following is applicable to incident management and mitigation:

- Any incident should be reported immediately to the Site Manager / HSE representative (or otherwise designated person).
- Environmental incidents that are deemed to significantly harm or are likely to harm the environment should be reported to the Project Manager (construction and operation) / Site Manager (construction) / Operations Manager (operation) immediately.
- Immediate correspondence should be taken with DSW or the Environmental Control Officer to determine mitigation and close-out requirements.
- All significant incidents are to be reported immediately to the relevant authority (as indicated in the EA).

Environmental incident reporting and recording should include the following information:

- Time, date and nature of the incident.
- Response and investigation undertaken.
- Actions taken and by whom.

Corrective and preventative action requests should be forwarded to the responsible person so that corrective action can be taken. Open non-conformances should only be closed on verification by the Site Manager / HSE Representative that the corrective action has been implemented effectively in order to meet the EMPr requirements.

The cause of all incidents should be investigated to determine root cause and to ensure that corrective action is implemented and to ensure that there is no repeat of the incident.

A summary and review of incidents recorded should be included within the weekly inspection reports by the HSE representative and submitted to the ECO for inclusion within the monthly ECO audit reports during the construction phase.

3.5 NON-CONFORMANCE AND CORRECTIVE ACTION

Difficulties may be encountered with carrying out mitigation measures that could result in future non-compliance. The Contractor may put in place procedures to motivate staff members to comply with the EMPr, and to deal with acts of non-compliance, or malicious damage to the environment by any staff member, agent, contractor or sub-contractor. Should rehabilitation be required as a consequence of the contractor's non-compliance with the EMPr, it is strongly recommended that fines / penalties be set according to the cost required to rehabilitate an area. Penalties for non-compliance need to be discussed with the Contractor at the earliest stage (prior to awarding the contract and during the pre-construction meeting).

3.6 PUBLIC COMPLAINTS AND ENQUIRIES

Enquiries or complaints should be received by DSW from stakeholders and / or the community through the following channels:

Contact Person: Logan Moodley

Telephone: 031 322 4575

Email: Logan.Moodley2@durban.gov.za

Community or public enquiries or complaints must be brought to the attention of the Site Manager / HSE Representative during Construction and Operations Manager who should ensure corrective action and close-out.

As a minimum the following information should be recorded:

- Time, date and nature of enquiry or complaint.
- The means by which the enquiry or complaints was made.
- Personal details of the person / party lodging the enquiry or complaint (subject to privacy considerations).
- Actions taken to investigate and close-out the complaint as well as complainant feedback.

All complaints received will be investigated and a response (even if pending further investigation) will be given to the complainant within 48 hours.

Any actions that cannot be managed immediately should be assigned to the appropriate personnel and will become an outstanding action. The action remains outstanding until it is closed off by the ECO.

3.7 DOCUMENT CONTROL

The HSE Representative (construction and operational phase) is responsible for ensuring the maintenance of relevant documentation on site. The relevance of the documentation required will vary. The following documentation (in no particular order of importance and not exhaustive) will be pertinent at various phases of the landfill development:

- Air quality management plan (**Annexure 1**)
- Approved EMPr
- Construction Method Statements
- Cell Closure Plan
- Emergency Preparedness Plan and Emergency Control Systems
- Health, Security and Safety Plan
- Induction and training records
- Landfill Gas Management Plan
- Landscape plans
- Material Safety Data Sheets (MSDS)
- Minutes of Landfill Monitoring Committee
- Minutes of management review meetings, and actions required as a result
- Monitoring, audit and inspection reports and findings (internal and external)
- Operational Plan
- Occupational, Health and Safety Plan
- Reports of pollution incidents, environmental non-conformances and follow-up action
- Reports of stakeholder and community complaints and follow-up action
- Records of monitoring of contractors and sub-contractors
- Rehabilitation Plan
- Safe disposal certificates
- Stormwater Management Plan
- Waste Management Plan
- Vehicle and equipment maintenance reports

3.8 DEVELOPMENT PROCEDURES

This section provides guideline information pertaining to the development of procedures recommended to govern environmental aspects of the project. It is necessary to develop detailed procedures for any activities which may cause a **negative impact on the environment**.

Procedures should:

- Clearly define the scope of the procedure.
- Identify the person responsible for the maintenance of the procedure as well as describe all responsibilities e.g. keeping the standard procedure up to date and ensuring that all relevant Procedure Reporting sheets are completed, signed and filed.
- Contain references to all pertinent legislation and standards as well as explain what is required in terms thereof.
- Identify any safety risks associated with implementation of the procedure as well as describe how those risks are to be mitigated e.g. use of Personal Protective Equipment.
- Contain relevant activity guidelines which apply to the activity being addressed e.g. guidelines contained in this report.
- Describe monitoring activities required to ensure that the procedure is being correctly implemented.
- Prescribe a reporting and document control system that the responsible person will be required to follow.

4 PROPOSED MITIGATION AND MANAGEMENT MEASURES

4.1 PLANNING PHASE MITIGATION AND MANAGEMENT MEASURES

4.1.1 DESIGN AND PLANNING PHASE

Objectives:

- To minimise negative impacts associated with the planning of the Shongweni landfill site.
- To ensure compliance with the relevant landfill legislations and required permits.

Table 4: Planning Phase Issues and Management Actions

Aspect	Management Actions	Responsible Person	Timeframe
Environmental Management Programme	<ul style="list-style-type: none"> ■ The EMPr must be updated to include all relevant conditions contained within the authorisation / licence received from the relevant authorities. ■ The EMPr must be updated if new environmental impacts are identified during the course of the development. ■ The EMPr must comply with the NEM: WA Waste Classification and Management Regulations, the Standards for the Assessment for of Waste for Landfill Disposal, and the Norms and Standards for Disposal of Waste to Landfill. 	Durban Solid Waste	Pre-Construction Phase; and On-going
Landfill Designs / Layouts	<ul style="list-style-type: none"> ■ Landfill design to comply with landfill classification and containment barrier design as specified in the Standards for Disposal of Waste to Landfill. ■ Compliance with NEM: WA Regulations and Standards for Waste Classification Management. ■ There must be careful planning with regard the type of land use in the surrounding area. Consideration should be given to the potential positive impacts on property value. ■ Designs to comply with the landfill engineering design requirements according to landfill class as stated in the Standards for Disposal of Waste to Landfill. 	Durban Solid Waste	Pre-Construction Phase

	<ul style="list-style-type: none"> ■ A landfill monitoring committee must be established. ■ Capping system must be established in line with current legislation and meeting competent authority requirements. 		
Buffer Zone	<ul style="list-style-type: none"> ■ A health buffer zone that has been designated between the boundary of the proposed Shongweni landfill and the nearest community receptor needs to be maintained. 	Durban Solid Waste	Pre-Construction Phase
Operational Plan	<ul style="list-style-type: none"> ■ DSW need to develop an Operational Plan which will specify the broad operational principles of the Shongweni landfill. ■ Operational plan to be kept on site. 	Durban Solid Waste	Pre-Construction Phase
Emergency Preparedness Plan	<ul style="list-style-type: none"> ■ Prepare an on-site Emergency Preparedness Plan in consultation with eThekweni Emergency Services, which should include: <ul style="list-style-type: none"> - Identification of Hazards; - Assessment of potential risks; - Responsibilities and procedures for emergencies such as fires, leachate spills, dangerous levels of noxious gases and accidents requiring medical responses; - Emergency Response Plan; - Location of emergency equipment; - Timing of inspections and maintenance procedures; and - Communication procedures, including communication with potentially affected communities. 	Durban Solid Waste	Pre-Construction Phase
Rehabilitation Plan	<ul style="list-style-type: none"> ■ A rehabilitation plan must be developed and submitted to DEDTEA and Department of Water and Sanitation (DWS) for review before facility becomes operational. ■ The plan must be implemented to enable progressive rehabilitation during the operational lifecycle of the Shongweni site. 	Durban Solid Waste	Pre-Construction Phase
Community Engagement	<ul style="list-style-type: none"> ■ A landfill monitoring committee be formed which includes representatives from all interest groups and stakeholders (including DSW). ■ A grievance system must be developed whereby the community can express their complaints, fears, comments, problems, and questions. The system will be communicated to the community through the monitoring committee. ■ Any complaints or comments received from the community will be directed to the Site Manager. 	Durban Solid Waste	Pre-Construction Phase

	<ul style="list-style-type: none"> ■ Residents must be informed, ahead of time, about the duration and nature of the activities that will take place in their neighbourhood. This will ensure that the community do not develop feelings of fear or resentment due to (the perception of) information being withheld. 		
Monitoring and Performance Assessment	<ul style="list-style-type: none"> ■ Approved designs ■ Document control (as per Section 3.7) with specific reference to: <ul style="list-style-type: none"> - Updated and approved EMPr - Operational Plan - Emergency Preparedness Plan - Occupational, Health and Safety Plan - Rehabilitation Plan 	Project Manager	Pre-construction Phase

4.2 CONSTRUCTION AND OPERATIONAL PHASE MITIGATION AND MANAGEMENT MEASURES

4.2.1 SOCIAL ENVIRONMENT

(A) ACCESS ROADS AND SAFETY

Objectives:

- To minimise potential safety risks to public caused by construction vehicles, machinery and delivery of materials and equipment.
- To minimise congestion and potential safety risks to public caused by operational heavy vehicles on the roads.

Table 5: Construction Phase Issues and Management Actions

Aspect	Management Actions	Responsible Person	Timeframe
Construction vehicles and activities may obstruct access to roads and increase risk to communities	<ul style="list-style-type: none"> ■ Signage must be placed at relevant points along the access road to caution pedestrians of the movement of construction vehicles and machinery into the landfill site. ■ Vehicle drivers must be aware of the local residents using the existing road. ■ Ensure that unsafe areas are appropriately cordoned off /fenced off to prevent access by unauthorised persons and livestock. ■ Develop strict safety codes of conduct for employees operating vehicles/machinery. ■ Construction activities and storage facilities must not obstruct access to existing road. ■ Ensure vehicles and machinery is well maintained. ■ Designate certain areas beyond the boundary of the site as a “No Go” area for public surrounding communities. ■ Limit all construction related activities, including material and waste storage within the site boundary. ■ Prevent illegal access to the site by implementing appropriate security measures. ■ Ensure the site fencing is in working order. 	Contractor & HSE representative	Construction Phase
Monitoring and Performance Assessment	<ul style="list-style-type: none"> ■ Environmental training (as per Section 5.2). ■ Construction phase monitoring (as per Section 3.3) ■ Environmental incident management and reporting (as per Section 5.4) ■ Document control (as per Section 3.7) in particular: <ul style="list-style-type: none"> - Environmental audit reports - Emergency control systems 	HSE representative & ECO	On-going / monthly

Table 6: Operational Phase Issues and Management Actions

Aspect	Management Actions	Responsible Person	Timeframe
Risks associated with additional heavy traffic on the roads (road safety, pedestrians etc).	<ul style="list-style-type: none"> ■ Widening of the Mr 461 at the access to the site to include additional turning lanes ■ The access into the site must meet Provincial Road standards and will have separate auxiliary lanes as well as deceleration and acceleration lanes for vehicles entering and exiting the site. The layout will need to be confirmed by the KZN Department of Transport. ■ In terms of public transport provision, it is expected that a single taxi is required to service the needs of the proposed site. Therefore a public transport drop off area must be provided (See Traffic Impact Assessment- Appendix C) ■ A bypass lane is recommended at the Mr 559 (P559) and Mr 461 (P461) junction to allow for vehicles to pass the inbound heavy vehicles expected to turn right at this junction. ■ The following upgrades are recommended: <ul style="list-style-type: none"> - The hairpin bend on Mr 518 road requires widening. - The sight distance at the Mr 518 (D828) and Mr 559 (P559) is not adequate and road widening is recommended. ■ The access should preferably be directly opposite, otherwise at least 300m spaced from other access roads in the vicinity. ■ The minimum access width into the site is to be 8.7m to accommodate heavy vehicles and pedestrians entering and exiting the site. ■ The maximum grade allowed for the access is 1:10 to cater for heavy vehicles that will use this access. ■ The ingress and egress throat length should be at least 30m to allow for a queue of a “Hooklift” vehicle with a trailer entering or leaving the site. 	Site Manager & HSE representative	Operational Phase
Site boundary and access	<ul style="list-style-type: none"> ■ Designate certain areas beyond the boundary of the site as a “No Go” area for the public. ■ Ensure the site fencing is in working order. ■ Ensure that unsafe areas are appropriately cordoned off /fenced off to prevent access by unauthorised persons and livestock. ■ Develop strict safety codes of conduct for employees operating vehicles/machinery. ■ Recognise that the site may be of interest, at least in the beginning, and may draw people to the site. This should not be prohibited but rather managed so that local residents do not feel alienated, or excluded from activities taking place within their area. 	Site Manager & HSE representative	Operational Phase
Monitoring and Performance Assessment	<ul style="list-style-type: none"> ■ Environmental training (as per Section 5.2). ■ Environmental incident management and reporting (as per Section 5.4) ■ Document control (as per Section 3.7) 	Site Manager & HSE representative	On-going / monthly

(B) DISTURBANCE TO HERITAGE RESOURCES

Objectives:

- To minimise disturbance to or loss of cultural and heritage resources.

Table 6: Construction Phase Issues and Management Actions

Aspect	Management Actions	Responsible Person	Timeframe
Excavations and earthworks for landfill construction	<ul style="list-style-type: none"> ■ Ensure that employees and contractors are aware of requirements for heritage resource protection and communicate any findings immediately. ■ In the event that items of potential heritage or archaeological importance are discovered, activities should be halted immediately, AMAFA should be notified and a Heritage Impact Assessment undertaken to determine the necessary mitigation measures. ■ Should the contractor be unsure of the any of the above aspects, the ECO should be contacted immediately. 	Project Manager & HSE representative	Pre-construction and Construction Phase
Monitoring and Performance Assessment	<ul style="list-style-type: none"> ■ Environmental training (as per Section 3.2). ■ Visual inspections ■ Environmental incident management and reporting (as per Section 5.4) ■ Construction monitoring (as per Section 3.3) ■ Document control (as per Section 3.7) 	HSE representative & ECO	On-going

Table 7: Operational Phase Issues and Management Actions

Aspect	Management Actions	Responsible Person	Timeframe
Landfill operations	<ul style="list-style-type: none"> ■ Ensure that employees are aware of requirements for heritage resource protection and communicate any findings immediately. ■ In the event that items of potential heritage or archaeological importance are discovered, AMAFA should be notified immediately. These sites must not be disturbed until approval has been obtained from AMAFA. 	Site Manager & HSE representative	Operational Phase
Monitoring and Performance Assessment	<ul style="list-style-type: none"> ■ Environmental incident management and reporting (as per Section 3.4) ■ Visual inspections ■ Document control (as per Section 3.7) 	Site Manager & HSE representative	On-going

(C) AESTHETICS

Objectives

- To minimise visual disturbance to surrounding receptors during the construction and operational phase.

Table 8: Construction Phase Issues and Management Actions

Aspect	Management Actions	Responsible Person	Timeframe
Visual disturbance to receptors located north east and south east of the landfill	<ul style="list-style-type: none"> ■ A minimum amount of existing vegetation and soil material must be removed from the active working area(s). Wherever possible, all existing natural vegetation should be retained and incorporated into the site design to act as a buffer/screen. Ensure that structures are designed and coloured to blend with the environment. ■ It is recommended that buildings/structures that are required to be built from steel or concrete must merge with the surrounding environment and landscape. ■ Where natural vegetation does not provide an adequate screen along the landfill's boundaries, rows and/or clumps of fast-growing, indigenous trees should be planted in these areas to act as visual screens. ■ The initial tree screens must be established in the most critical areas to the north-east and south-east. In time, the tree screens will be gradually extended along the northern boundary, and any other areas that may become visible as the size of the landfill grows. This will ensure that visual screens are well-established and sufficiently tall by the time Level 10 or more of the landfill is reached. ■ Unpaved access roads and active working areas require an effective dust suppression management programme, such as regular wetting and/or the use of non-polluting chemicals that will retain moisture in the road surface. Where a paved surface is required, dark paving materials should be used that complement the natural brown colours and textures of the soil and rock in the area rather than light coloured materials such as concrete. ■ Manage the landfill construction activities well to ensure that visual impacts are minimised (dust, litter etc). 	Contractor & Site Manager	Construction Phase
Monitoring and Performance Assessment	<ul style="list-style-type: none"> ■ Environmental training (as per Section 5.2) ■ Visual inspections ■ Construction monitoring (as per Section 3.3) ■ Environmental incident management and reporting (as per Section 3.4) 	Contractor & ECO	On-going
	Document control (as per Section 3.7) with specific reference to:	Contractor & ECO	Monthly / Weekly

	<ul style="list-style-type: none"> ■ Construction Method Statements ■ Landscape Plan 		
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Table 9: Operational Phase Issues and Management Actions

Aspect	Management Actions	Responsible Person	Timeframe
<p>There are likely to be visual impacts associated with landfill operations from the north east and south east of the site.</p>	<ul style="list-style-type: none"> ■ Plant additional vegetative screening near buildings and offices. ■ All berms and long-term stockpiles are to be re-vegetated. The completed waste cells must be continuously capped and re-vegetated. The post-landfill topography must be consistent with the topography of the surrounding landscape (within reason). ■ An ecological approach to rehabilitation and screening measures must be adopted. Communities of indigenous plants enhance biodiversity and blend well with existing vegetation ■ Lighting must be carefully planned and kept to a minimum to enable work to continue. Consideration is to be given to the fact that light at night travels great distances. <ul style="list-style-type: none"> - Security flood lighting and operational lighting must only be used where absolutely necessary and carefully directed, preferably away from sensitive viewing areas. - Wherever possible, lights should be directed downwards so as to avoid illuminating the sky. - Lighting equipment that minimises the spread of light near to or above the horizon must be used. - Lights must be positioned and aimed to ensure minimum light spill. ■ Good housekeeping and management of the landfill site will be critical to prevent waste being strewn across the site and entering adjacent land. A well-managed will lessen the visual impact and improve the visual perception of the site. 	Site Manager & HSE representative	Operational Phase
<p>Monitoring and Performance Assessment</p>	<ul style="list-style-type: none"> ■ Environmental incident management and reporting (as per Section 5.4) ■ Visual inspections ■ Document control (as per Section 3.7) in particular the Landscape Plan and the Operational Plan 	Site Manager & HSE representative	On-going (monthly/weekly)

(D) COMMUNITY HEALTH AND SAFETY

Objectives

- To minimise potential health risks to surrounding receptors during the construction and operational phase.

Table 10: Construction and Operational Phase Issues and Management Actions

Aspect	Management Actions	Responsible Person	Timeframe
Landfill operations has the potential to increase health risks of nearby receptors	<ul style="list-style-type: none"> ■ A buffer zone between the landfill perimeter and the nearest settlements is a recommendation of the Minimum Landfill Requirements. ■ A landfill monitoring committee must be formed which includes representatives from all interest groups and stakeholders (including DSW). Regular monitoring committee meetings must be held. ■ A comprehensive Occupational Health and Safety Plan which is in accordance with the Occupational Health and Safety Act (Act 95 of 1993) is essential. ■ Occupational health and safety monitoring programs should be developed to verify the effectiveness of prevention and control strategies. ■ Initially implementation of continuous dust fallout monitoring programme and seasonal benzene and hydrogen sulphide monitoring as per the Air Quality Management Plan (AQMP, Annexure 1). Frequency of monitoring to be reviewed on review of monitoring results. ■ Residents must be informed, ahead of time, about the duration and nature of the activities that will take place in their neighbourhood. This will ensure that the community do not develop feelings of fear or resentment due to (the perception of) information being withheld. ■ A grievance system must be developed whereby the community can express their complaints, fears, comments, problems, and questions. The system will be communicated to the community through the monitoring committee. ■ Any complaints or comments received from the community must be directed to the Site Manager. ■ Distribute information to local residents highlighting health and safety risks associated with landfill sites (particularly scavenging). Make use of posters with pictures to communicate the message and so cater for illiterate individuals. 	Project Manager & HSE representative	On-going
Landfill operation could increase rodents and	<ul style="list-style-type: none"> ■ Appointment of contractor to manage rodents and vectors. ■ The regular application of cover material and proper compaction of waste is required for effective for pest 	Site Manager	Ongoing

insects which could impact on health	<p>control.</p> <ul style="list-style-type: none"> ■ Regular site inspection should be carried out. If a significant number of pests are identified, an experienced pest control specialist should be employed to deal with the problem. 		
Monitoring and Performance Assessment	<ul style="list-style-type: none"> ■ Environmental training (as per Section 3.2). ■ Environmental incident management and reporting (as per Section 3.4) ■ Health and safety training ■ Pest Monitoring 	Site Manager & HSE representative	On-going
	<p>Document control (as per Section 3.7) in particular:</p> <ul style="list-style-type: none"> - Health, Security and Safety Plan - Occupational Health and Safety Plan - Air Quality Management Plan (Annexure 1) - Operational Plan 	Site Manager & HSE representative	Ongoing

(E) LAND USE

Objectives:

- To minimise potential land use conflicts during the construction and operational phase.

Table 11: Construction Phase Issues and Management Actions

Aspect	Management Actions	Responsible Person	Timeframe
Potential loss of agricultural and grazing land	<p>Appointment of a Community Liaison Officer (CLO) by DSW. The CLO will need to support DSW to:</p> <ul style="list-style-type: none"> ■ Identify alternative areas for those losing access to grazing land (important to verify the legitimacy of claims); ■ Identify the needs for the alternative land in terms of capacity to handle / requirements for grazing (number of head of livestock) in consideration of the agricultural potential of the land; ■ Actively involve host communities in discussions when identifying alternative land; ■ Identify and map when parcels of land will be absorbed into the landfill footprint and communicate this information to the affected persons so that they may plan accordingly. 	Project Manager & Site Manager	Pre-Construction Phase and Construction Phase

Potential for decline in property value.	<ul style="list-style-type: none"> ■ To reduce the potential impact on the local property market, the maintenance of high standards of management (through the creation of a buffer) is required. ■ Careful planning will be required to ensure that the surrounding land is developed in an informed manner. ■ Application of the EMPr and monitoring thereof to ensure nuisance factors such as dust and noise are managed and mitigated as far as possible. 	Project Manager & Site Manager	Construction Phase
Construction activities have the potential to interrupt access routes and tracks	<ul style="list-style-type: none"> ■ DSW must assist the community in identifying suitable alternative routes for the movement of persons and livestock. ■ The CLO, in consultation with the affected persons, is to identify the route requirements of the local community. ■ DSW must assist in creating alternative routes that are safe and are located an outside of the landfill footprint and any potentially dangerous areas. ■ Where necessary and if applicable, assistance should be provided in making formal stream crossings for livestock and humans (e.g. rock causeways or similar). 	Project Manager & Site Manager	On-going
Monitoring and Performance Assessment	<ul style="list-style-type: none"> ■ Environmental training (as per Section 3.2). ■ Environmental incident management and reporting (as per Section 3.4) ■ Construction monitoring (as per Section 3.3) ■ Document control (as per Section 3.7) in particular the Operational Plan. 	HSE representative & Site Manager	On-going

Table 12: Operational Phase Issues and Management Actions

Aspect	Management Actions	Responsible Person	Timeframe
Landfill operations may generate some interest with local communities living near the site.	<ul style="list-style-type: none"> ■ Recognise that the site may be a novelty, at least in the beginning, and may draw people to the site. This should not be prohibited but rather managed so that local residents do not feel alienated, or excluded from activities taking place within their area. ■ Distribute information to local residents highlighting health and safety risks associated with landfill sites (particularly scavenging). Make use of posters with pictures to communicate the message and so cater for illiterate individuals. 	Site Manger & HSE Representative	Ongoing
Operation of landfill has the potential to decrease local tourism	<ul style="list-style-type: none"> ■ The landfill must be properly managed and operated in a manner that mitigates off-site impacts. ■ Ensure that the drivers of landfill-related transportation conduct themselves in a safe and responsible manner. 	Site Manger & HSE Representative	Ongoing
Monitoring and Performance Assessment	<ul style="list-style-type: none"> ■ Environmental training (as per Section 3.2). ■ Environmental incident management and reporting (as per Section 3.4) ■ Document Control (as per Section 3.7) with specific reference to: <ul style="list-style-type: none"> - Operational Plan - Air Quality Management Plan (Annexure 1) 	Site Manager & HSE representative	On-going

(F) EMPLOYMENT OPPORTUNITIES

Objectives:

- Promote employment and training opportunities at a local level as far as possible.

Table 13: Construction Phase Issues and Management Actions

Aspect	Management Actions	Responsible Person	Timeframe
Employment opportunities for local community	<ul style="list-style-type: none"> ■ Give priority to the local communities if and when employment opportunities arise, provided applicants have the necessary skills. ■ Notify the local community of employment opportunities prior to broader (public) advertisement. ■ Advertise employment opportunities adequately, so as not to limit application opportunities. ■ Implement a transparent process of contracting staff, following pre-established and accepted criteria. 	Project Manager & HSE representative	Pre-Construction Phase and Construction Phase
Monitoring and Performance Assessment	<ul style="list-style-type: none"> ■ Tender processes to demonstrate promotion and prioritisation of local contractors and labour (through advertisements, identification of local contractors etc.). ■ Appointment of local labour by appointed Contractors (where possible). ■ Proof of communication with local community regarding employment opportunities. 	General Manager (in conjunction with Procurement)	Prior to appointment of employees and Contractors

4.2.2 PHYSICAL ENVIRONMENT

(A) CLIMATE

Objectives:

- To minimise the potential climatic impacts during the construction phase.

Table 14: Construction Phase Issues and Management Actions

Potential Issues / Impacts	Management Actions	Responsible Person	Timeframe
Extreme Temperatures may result in germination failure.	<ul style="list-style-type: none"> ■ Avoid seeding during the summer months when very high surface temperatures are likely to occur and cause germination failure. ■ Use seed of indigenous species that are tolerant of high temperatures. ■ Where possible, use sods or seedlings instead of seed as they are more likely to survive. ■ Ensure that seedlings are adequately developed and established before the onset of winter. ■ Utilise well developed seedlings (more tolerant of extreme conditions). ■ Plan the rehabilitation process in conjunction with the landfill construction progress. ■ Plan construction/rehabilitation activities to: <ul style="list-style-type: none"> - Avoid months when weather is likely to cause problems; - Anticipate and plan for adverse conditions. 	Project Manager & HSE representative	On-going
Heavy rainfall has the potential to increase flood risks.	<ul style="list-style-type: none"> ■ The surface water diversion structures on site should be designed to cater for a 1 in 100 year storm event. ■ The evaporation pond (leachate collection facility) should be appropriately sized with sufficient freeboard. ■ The culvert, associated head wall and 'dam wall' should be designed for a peak design storm of 1 in 100 years. 	Project Manager & HSE representative	Pre-Construction and Construction Phase
Monitoring and Performance Assessment	<ul style="list-style-type: none"> ■ Environmental training (as per Section 3.2). ■ Environmental incident management and reporting (as per Section 3.4) ■ Construction monitoring (as per Section 3.3) ■ Document control (as per Section 3.7) with specific reference to: 	HSE representative & ECO	On-going

	<ul style="list-style-type: none"> - Construction Method Statements - Stormwater Management Plan 		
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(B) CHANGE IN AMBIENT AIR QUALITY

Objectives:

- To minimise air quality impacts associated with the construction and operational phases of the Shongweni Landfill development.
- To adequately control and monitor emissions emitted by waste bodies, leachate treatment systems and landfill operations.

Table 15: Construction Phase Issues and Management Actions

Aspect	Management Actions	Responsible Person	Timeframe
Construction activities resulting in release of airborne contaminants	<ul style="list-style-type: none"> ■ Implementation of the Air Quality Management Plan (AQMP) for the proposed DSW Shongweni Landfill Site (Annexure 1). The AQMP which includes an Air Quality Monitoring Plan must be adhered to in order to adequately mitigate air quality impacts. ■ Compliance with the National Environmental Management: Air Quality Act 39 of 2004 (NEM: AQA). ■ Compliance with the Occupational Health and Safety Act (Act 95 of 1993) is necessary. ■ Dust suppression measures through the use of e.g. water trucks to active earthwork areas, stockpiles, and road transportation of sediment bearing material should be implemented. ■ Cover and / or maintain appropriate freeboard on trucks hauling any loose material that could produce dust when travelling. ■ A single baseline (pre-construction) monitoring campaign should be conducted as per AQMP. ■ Excavation work should be limited during high wind conditions. ■ Early vegetation and stabilising of disturbed areas. ■ Reduction of unnecessary traffic and vehicles travelling on unpaved roads; and strict adherence to speed limits to ensure minimal dust entrainment. ■ Vehicles are to switch off engines during loading / unloading in order to minimise idling time. 	Project Manager & HSE representative	Pre-construction and Construction Phase
Monitoring and Performance Assessment	<ul style="list-style-type: none"> ■ Environmental training (as per Section 5.2). ■ Environmental incident management and reporting (as per Section 5.4) ■ Visual inspections ■ Construction monitoring (as per Section 3.3) 	HSE representative & ECO	On-going

	<ul style="list-style-type: none"> ■ Document Control (as per Section 3.7) with specific reference to: <ul style="list-style-type: none"> - Air Quality Management Plan (Annexure 1) - Occupational Health and Safety Plan - Air Quality Monitoring Reports 		
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Table 16: Operational Phase Issues and Management Actions

Aspect	Management Actions	Responsible Person	Timeframe
<p>Landfill operation will increase the risk of odours and dust in surrounding areas.</p>	<ul style="list-style-type: none"> ■ Daily cover of refuse at the active tipping face (workface); ■ Restrictions on the disposal of dusty wastes; ■ A vegetation barrier along the fenceline must be established to limit the transfer of dust offsite. Until shrubs and trees are established, on site dust management measures should be applied. ■ Plantation of scented plants trees along the buffer zone is recommended to act as an odour control. These plants/trees will break up odour plumes preventing them from reaching neighbouring communities. ■ Dust suppression by spraying and conditioning of waste loads and haul roads. ■ Install a dust fallout monitoring network to assess dust fallout during the operational phase. ■ Ongoing or continuous dust monitoring at an appropriately located on-site station; ■ Supervision of the tipping face operations by a competent person. ■ Intermediate covering of waste with a 150 mm layer of cover material once cells are completed and at the end of each work day. ■ Waste burning is prohibited; ■ Ensuring that emission controls on operational vehicles are acceptable; ■ DSW to encourage contractors to cover waste .loads specifically less dense (wind sensitive) wastes. ■ Imposing on-site vehicle speed limits; ■ Inspection of waste loads to ensure that dusty and odorous wastes have been pre-notified and that appropriate measures have been prepared at the disposal face; ■ Any complaints from the public etc. must be logged on the complaints register, which would also document the corrective actions to rectify the cause of the complaint. 	<p>Site Manager & HSE representative</p>	<p>Operational Phase</p>

<p>Gas fugitives resulting from the extraction and flaring of gas may impact on air quality.</p>	<ul style="list-style-type: none"> ■ A schedule maintenance plan must be prepared and the efficiency of the flaring system as well as details of the volume and types of gases that are flared must be maintained in accordance with the manufacturer specifications and in a manner that prevents or minimise the generation of environmental pollution. ■ Compliance with the Occupational Health and Safety Act (Act 95 of 1993) is necessary. ■ Gaseous emissions from the flaring and electricity generation process to comply with the requirements of the National Environmental Management: Air Quality Act, 2004 and the National Standards for the Extraction, Flaring or Recovery of Landfill Gas. ■ Gas extraction must be monitored for the duration of the project lifecycle. Landfill gas monitoring to be conducted throughout the landfill flaring period at the perimeter of the site. 	<p>Site Manager & HSE representative</p>	<p>Internal Audits</p>
<p>Methane concentrations may increase explosive risks.</p>	<ul style="list-style-type: none"> ■ Monitor methane levels at a frequency specified in the waste management licence and in accordance with relevant legislation. ■ Gas extraction will be undertaken on the site, where appropriate to reduce the risks of odour and explosion. ■ DSW to maintain a “green firebreak” around the perimeter of the landfill. ■ Landfill gas emissions to be monitored seasonally. If the monitored levels exceed the predicted emission rates, then a model must be rerun to determine whether the impacts have changed and appropriate mitigation measures must be implemented to remedy the impacts in an updated EMPr. ■ Methane concentrations within the atmosphere within the buildings on or near the site should not exceed 1%. If levels are found to be 0.1% to 1% in air then regular monitoring must be implemented. If levels above 1% are detected then the building must be evacuated and trained personnel consulted. ■ Establish and maintain designated smoking areas. ■ Develop an Emergency Preparedness Plan which includes fire safety measures. ■ Fire-fighting equipment must be available on site. ■ Provide appropriate safety signage and relevant emergency contact details on site and displayed outside the main administration building. ■ Prevent smoking in proximity to those areas that pose a fire hazard, such as fuel storage areas and areas where vegetation is such that a fire may spread rapidly. 	<p>Site Manager & HSE representative</p>	<p>Internal Audits</p>

Monitoring and Performance Assessment	<ul style="list-style-type: none"> ■ Environmental incident management and reporting (as per Section 3.4) ■ Safety, Health and Environmental Training ■ Fire Training ■ Visual Inspections ■ Document Control (as per Section 3.7) with specific reference to: <ul style="list-style-type: none"> - Air Quality Monitoring Reports - Occupational Health and Safety Plan - Landfill Gas Management Plan - MSDS data sheets 	Site Manager & HSE representative	On-going
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(C) CHANGE IN AMBIENT NOISE

Objectives:

- To minimise disturbance to receptors as a result of increased ambient noise.

Table 17: Construction Phase Issues and Management Actions

Potential Issues / Impacts	Management Actions	Responsible Person	Timeframe
Noise impacts on surrounding land users (particularly to the east and south east of the site).	<ul style="list-style-type: none"> ■ Avoid noisy activities at night-time and outside of normal weekend working hours where possible. ■ All equipment to be used on site is to be kept in a good working condition. This is of particular importance for the exhaust systems of the diesel earthmoving equipment. Regular checks on the noise emissions of equipment in operation should be performed. Equipment found to have noise emission changes should be withdrawn for maintenance purposes. Equipment with a lower noise output should be selected where practical (e.g. electronic powered equipment typically has lower noise levels than equivalent diesel equipment). ■ Equipment and machinery considered for use on site should comply with the regulations and standards pertaining to noise management prior to arrival. ■ Vehicles must not be left turned on or idling at the site for longer than minimum amount of time required to completing site activities. In addition, machines / equipment used intermittently during construction activities (i.e. excavators, TLB's, etc.) will be shut down, as practicably achievable, in the period between works activities rather than allowed to idle. 	Project Manager & HSE representative	Construction Phase

Monitoring and Performance Assessment	<ul style="list-style-type: none"> ■ Environmental training (as per Section 3.2). ■ Environmental incident management and reporting (as per Section 3.4) ■ Construction Monitoring (as per Section 3.3) ■ Document Control (as per Section 3.7) with specific reference to: <ul style="list-style-type: none"> - Vehicle and equipment maintenance reports - Public complaints records (as per Section 3.6) 	HSE representative & ECO	On-going
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Table 18: Operational Phase Issues and Management Actions

Potential Issues / Impacts	Management Actions	Responsible Person	Timeframe
Noise impacts on surrounding land users (particularly to the east and south east of the site).	<ul style="list-style-type: none"> ■ Avoid noisy activities at night-time and outside of normal weekend working hours where possible. ■ All equipment to be used on site is to be kept in a good working condition. ■ Vehicles must not be left turned on or idling at the site for longer than minimum amount of time required to completing site activities. ■ Vehicle and equipment maintenance reports must be kept on file. ■ Introduce corrective measures for continuous improvement 	Project Manager & HSE representative	Operational Phase
Monitoring and Performance Assessment	<ul style="list-style-type: none"> ■ Environmental training (as per Section 5.2). ■ Environmental incident reporting and recording (as per Section 5.4) ■ Document control (as per Section 3.7) with specific reference to: <ul style="list-style-type: none"> - Vehicle and equipment maintenance reports - Public complaints reports (as per Section 3.6) 	Site Manager & HSE representative	On-going

(D) SURFACE WATER QUALITY

Objectives:

- To manage any potentially contaminated stormwater from the site during the construction and operation phases.
- To ensure that surface water resources are adequately protected during construction and operation of the landfill site.

Table 19: Construction Phase Issues and Management Actions

Potential Issues / Impacts	Management Actions	Responsible Person	Timeframe
Excavations will increase total dissolved solids and suspended solids resulting in increased sedimentation in Mgoshongweni River	<ul style="list-style-type: none"> ■ Stormwater systems are to be designed for all areas of site: materials yards, site office, and the working front. ■ Any potentially contaminated stormwater / run-off is to be tested prior to discharge to 'clean' areas for, as a minimum, total solids / pH / oil and grease. ■ Stormwater runoff from site to adhere to SWMP. Best practice will be implemented to polish/ treat water leaving the site. Storm water outfalls should be designed to reduce flow velocity and avoid watercourse bank and soil erosion, or wetland siltation. 	Contractor & HSE representative	Construction Phase
Loss of access to Mgoshongweni River and other tributaries by communities.	<ul style="list-style-type: none"> ■ Community members utilising the Mgoshongweni River and associated tributaries (for domestic and/or livestock watering purposes) must be identified by the CLO in consultation with the affected community. ■ DSW to assist to provide once off access to alternative area if needed. 	Site Manager & HSE representative	On-going
Incorrect handling of hazardous substances can lead to pollution that has negative effects on surface water quality.	<ul style="list-style-type: none"> ■ Storage of all hazardous materials (oils, fuels etc.) should be undertaken within impermeable bunded, ventilated and covered storage areas, capable of containing 110% of total volume of the largest storage vessel within the storage area. All storage containers are to be labelled, sealed and stored in accordance with Material Safety Data Sheets (MSDS) requirements. ■ Minimise contamination risk using drip trays on vehicles and machinery, secondary containment, and training in correct use of chemicals. ■ Ensure that landfill construction activities are conducted in a manner that minimises the potential for spills or leaks, including the regular inspection and maintenance of equipment and vehicles. ■ All vehicles must be parked or serviced in the designated area of the site office. All vehicles are to be equipped with pans / drip trays for emergency repair on site, the contents of which are to be treated as liquid waste. ■ All spare parts for vehicles are to be stored in a manner preventing water contamination. ■ Any mixing of concrete must take place on an impermeable surface. 	Site Manager & HSE representative	On-going

	<ul style="list-style-type: none"> ■ Contaminated soil polluted by fuel, oils and other hydrocarbon pollutants should be removed as soon as possible and disposed of appropriately as hazardous waste. ■ Adequate ablutions (such as chemical toilets) must be located away from water resources. Preferably, existing facilities should be utilised to remove the requirement for on-site chemical toilets. ■ In the event that soil is contaminated during construction, remedial measures to be taken to dispose correctly. Dispose of hazardous waste at a licensed hazardous waste disposal facility or certified recycling facility. <p>Spill and Incident Management:</p> <ul style="list-style-type: none"> ■ Spill and response equipment must be accessible on-site. ■ Cover the spill with absorbent material. ■ Dispose of the clean-up material in line with MSDS requirements of spilled material. ■ Staff handling hazardous substances / materials must be aware of the potential impacts and follow appropriate safety measures. Appropriate PPE must be made available. ■ Any contaminated soil must be removed to depth of contamination and disposed in line with existing hazardous waste stream. ■ Method statements and contingency / emergency response plans should be prepared for management of hazardous materials on-site. 		
Monitoring and Performance Assessment	<ul style="list-style-type: none"> ■ Environmental training (as per Section 3.2). ■ Environmental incident management and reporting (as per Section 3.4) ■ Construction Monitoring (as per Section 3.3) ■ Document control (as per Section 3.7) with specific relevance to: <ul style="list-style-type: none"> - Construction Method Statements - Water Quality Monitoring Reports - Vehicle and equipment maintenance reports - Monthly inspection reports - MSDS data sheets 	Contractor & ECO	On-going / monthly

Table 20: Operational Phase Issues and Management Actions

Potential Issues / Impacts	Management Actions	Responsible Person	Timeframe
<p>Surface runoff originating directly from the landfill can result in contamination of surface water resources.</p>	<ul style="list-style-type: none"> ■ A culvert must be constructed of either portal culverts or in situ cast concrete. The construction of the culvert must be totally impervious to prevent cross contamination from the landfill to the stream or vice versa. The cast in situ culvert option is preferable, as the potential for leachate contamination to the stream via the culvert will be greatly reduced. ■ The potential for cross contamination between the landfill and the stream will be reduced by the landfill liner, which will be designed to DWS's Minimum Requirements which will pass over the culvert. ■ The culvert must be constructed to allow for inspections to be carried out during dry periods. Inspection runs will be conducted on a bi-annual basis. If the surface water monitoring indicates potential cross contamination the culvert must be inspected at more frequent intervals. ■ An upstream non-permeable headwall ('dam wall') must be constructed above the entrance of the culvert to prevent surface water originating in the stream passing over the landfill site. This upstream headwall must be constructed in such a manner as to contain the 100 year storm event. ■ Stormwater diversion channels will divert clean runoff that originates from the valley slopes adjacent to the landfill site. The runoff diverted around the landfill will be discharged into the natural environment downstream of the site. ■ Contaminated runoff will be contained and managed in accordance with the SWMP design. All temporary and final covered areas within the waste area will be maintained to ensure that runoff does not result in excessive scouring thereby increasing the potential of percolation. ■ Proper management of waste water from vehicle washing areas as leachate. ■ Surface water monitoring network and protocol must be established. 	<p>Site Manager & HSE representative</p>	<p>Operational Phase</p>
<p>Leachate ponds have the potential to contaminate surface water resources</p>	<ul style="list-style-type: none"> ■ A storage dam of adequate capacity must be constructed in the lower reaches of the drainage feature, off the valley-axis line, to collect all surface water runoff generated within individual cells ■ Water collected in this dam must only be released to the environment if EC levels are less than 100 mS/m. Addition of low conductivity dilution water derived from Borehole SS4 may be necessary on occasion to achieve this. ■ Surface water and groundwater monitoring must be undertaken throughout landfill operation for the following analysis: <ul style="list-style-type: none"> - pH Value - Conductivity (EC) 	<p>Site Manager & HSE representative</p>	<p>Ongoing</p>

	<ul style="list-style-type: none"> - Cations (Na, K, Ca, Mg) - COD (Chemical Oxygen Demand) ■ Segregate stormwater, leachate and groundwater. ■ Identify potential leachate pathways and establish monitoring points to ensure that leachate does not escape from the site. ■ In the event of accidental or catastrophic release of leachate into the vadose zone, relevant boreholes must be activated to act as scavenger wells to 'reverse' the natural groundwater gradient and contain the contaminant within the landfill area. ■ Ensure all stormwater from the site is directed away from the landfill cells. ■ Ensure that stormwater management system operates reliably and as designed and is suitably maintained. ■ Development of, and adherence to, the Water Quality Management Plan. ■ Collect and analyse samples from surface monitoring points on a monthly basis. Data must be evaluated by a hydrologist. ■ Direct run-off from areas with a high risk of accidental releases of oil or hazardous materials into containment basins or conservancy tanks. ■ Keep all stormwater drains/channels clear of litter. ■ Discharge (contaminated) waste water from wash water systems to an approved location ■ Implementation of a leak detection and monitoring system 		
Monitoring and Performance Assessment	<ul style="list-style-type: none"> ■ Environmental training (as per Section 3.2). ■ Environmental incident management and reporting (as per Section 3.4) ■ Document Control (as per Section 3.7) with particularly relevance to: <ul style="list-style-type: none"> - Water Quality Management Plan - Water Quality Monitoring Reports - Surface Water Monitoring Reports - Leachate Management Plan 	HSE representative & Site Manager	On-going

(E) GROUNDWATER QUALITY

Objectives:

- To minimise potential contamination of groundwater resources during the construction and operational phases.
- To adequately manage leachate ponds to prevent adverse impacts on water resources.

Table 21: Construction Phase Issues and Management Actions

Potential Issues / Impacts	Management Actions	Responsible Person	Timeframe
Incorrect handling of hazardous substances can lead to pollution that has serious negative effects on groundwater quality.	<p><u>Above Ground Storage / Handling of Hazardous Substances</u></p> <ul style="list-style-type: none"> ■ Storage of all hazardous materials (oils, fuels etc.) should be undertaken within impermeable bunded, ventilated and covered storage areas, capable of containing 110% of total volume of the largest storage vessel within the storage area. All storage containers are to be labelled, sealed and stored in accordance with Material Safety Data Sheets (MSDS) requirements. ■ Minimise contamination risk using drip trays on vehicles and machinery, secondary containment, and training in correct use of chemicals. ■ Ensure that construction activities are conducted in a manner that minimises the potential for spills or leaks, including the regular inspection and maintenance of equipment. ■ Any mixing of concrete must take place on an impermeable surface. ■ Contaminated soil polluted by fuel, oils and other hydrocarbon pollutants should be removed as soon as possible and deposited in a designated area for disposal. ■ Adequate ablutions (such as chemical toilets) must be located away from water resources. Preferably, existing facilities should be utilised to remove the requirement for on-site chemical toilets. ■ In the event that soil is contaminated during construction, works are to stop and an investigation for removal / remediation initiated. ■ Dispose of hazardous waste at a licensed hazardous waste disposal facility or certified recycling facility. ■ All vehicles shall be maintained in good working order and vehicle service histories are to be kept up to date. All vehicles are to be provided with a service pan / spill tray which must be used to trap fuel leaks in the event of a breakdown. ■ All spare parts for vehicles are to be stored in a manner preventing water contamination. <p>Spill and Incident Management:</p>	Contractor & HSE Representative	Construction Phase

	<ul style="list-style-type: none"> ■ Spill and response equipment must be accessible on-site. ■ Cover the spill with absorbent material. ■ Dispose of the clean-up material in line with MSDS requirements of spilled material. ■ Staff handling hazardous substances / materials must be aware of the potential impacts and follow appropriate safety measures. Appropriate PPE must be made available. ■ Any contaminated soil must be removed to depth of contamination and disposed with existing hazardous waste stream. ■ Method statements and contingency / emergency response plans should be prepared for management of hazardous materials on-site. 		
Monitoring and Performance Assessment	<ul style="list-style-type: none"> ■ Environmental training (as per Section 3.2). ■ Environmental incident management and reporting (as per Section 3.4) ■ Construction Monitoring (as per Section 3.3) ■ Document control (as per Section 3.7) with specific reference to: <ul style="list-style-type: none"> - Construction method statement - Spill prevention and response plan - Vehicle and equipment maintenance reports - Monthly inspection reports 	Contractor & ECO	On-going

Table 22: Operational Phase Issues and Management Actions

Potential Issues / Management Actions Impacts		Responsible Person	Timeframe
Leachate ponds have the potential to contaminate ground water resources	<ul style="list-style-type: none"> ■ A herringbone subsoil drainage system should be installed in the natural drainage features below the formation levels of individual cells to collect any subsurface seepage water derived from exposed areas within the landfill footprint. Each system should be kept separate and these drains should discharge into a temporary impoundment, down-gradient of the culvert, prior to releasing the water into the stream. ■ Each cell 'floor' or formation level should be graded to ensure an even and positive fall into the leachate detection and leachate collection systems. Leachate detection collector pipe alignment must not coincide with subsoil drainage collector pipe routes. ■ Identify potential leachate pathways and establish monitoring points to ensure that leachate does not 	Site Manager & HSE representative	Operational Phase

	<p>escape from the site.</p> <ul style="list-style-type: none"> ■ If required, permanent abstraction systems can be installed in Borehole SS4 and subsequent groundwater exploration/monitoring boreholes, which yield in excess of 2 l/s to meet the development and normal operations. ■ Temperature monitoring of the liner as directed by DWS to be installed and monitored in accordance with cell specific requirements set out by DWS. ■ The quality of the water discharged from each individual system must be monitored regularly before the water held in the temporary storage facility is released into the environment ■ In the event of accidental or catastrophic release of leachate into the vadose zone, relevant boreholes must be activated to act as scavenger wells to 'reverse' the natural groundwater gradient and contain the contaminant within the landfill area. ■ Groundwater monitoring must be undertaken on a quarterly basis through site development and operation for the following analysis: <ul style="list-style-type: none"> - pH Value - Conductivity (EC) - Cations (Na, K, Ca, Mg) - COD (Chemical Oxygen Demand) 		
<p>Monitoring and Performance Assessment</p>	<ul style="list-style-type: none"> ■ Environmental training (as per Section 3.2). ■ Environmental incident management and reporting (as per Section 3.4) ■ Water quality monitoring ■ Document control (as per Section 3.7) with specific reference to: <ul style="list-style-type: none"> - Water Quality Management Plan - Stormwater management plan - Groundwater Monitoring Reports - Leachate management plan 	<p>HSE representative & Site Manager</p>	<p>On-going</p>

(F) WASTE MANAGEMENT

Objectives:

- To ensure waste generation is minimised (i.e. avoided, reduced, re-used and recycled) and / or disposed of responsibly.
- To ensure no direct or indirect environmental impacts as a result of waste management, handling or disposal.

Table 23: Construction Phase Issues and Management Actions

Aspect	Management Actions	Responsible Person	Timeframe
Waste generation from the construction activities may result in localised soil and stormwater contamination	<ul style="list-style-type: none"> ■ Waste should be stored in separate and secure skips / containers depending on management options – opportunities should be determined, in consultation with waste service providers, for re-use, recycle, or disposal options. ■ Hazardous waste storage (including used oils and material containing oils, solvents etc.) should be undertaken within impermeable bunded, ventilated and covered storage areas, capable of containing 110% of total volume. All storage containers are to be labelled, sealed and stored in accordance with MSDS requirements. ■ General waste should be stored within containers in a designated area with consideration to stormwater management. Waste containers should be covered to prevent windblown waste. ■ Working areas are to be cleared of litter on a daily basis. No litter / waste may be burnt on-site. 	Project Manager & HSE representative	On-going
Monitoring and Performance Assessment	<ul style="list-style-type: none"> ■ Environmental training (as per Section 5.2). ■ Environmental incident management and reporting (as per Section 5.4) ■ Construction monitoring (as per Section 3.3) ■ Document control (as per Section 3.7) with specific reference to: <ul style="list-style-type: none"> - Waste Management Plan - MSDS data sheets - Safe disposal certificates 	Contractor & ECO	Ongoing monthly

Table 24: Operational Phase Issues and Management Actions

Aspect	Management Actions	Responsible Person	Timeframe
Landfill operations have the potential to generate waste	<ul style="list-style-type: none"> ■ Hazardous waste storage (including used oils and material containing oils, solvents etc.) should be undertaken within impermeable bunded, ventilated and covered storage areas, capable of containing 110% of total volume. All storage containers are to be labelled, sealed and stored in accordance with MSDS requirements. ■ Undertake waste disposal in accordance with the NEM: WA Standard for Disposal of Waste to Landfill. ■ Ensure transport vehicles are suitable to transport the class and type of waste. ■ General waste should be stored within waste skips within a designated area with consideration to stormwater management. Waste skips should be covered to prevent windblown waste. ■ Treated leachate from the site can be utilised for irrigation of fire breaks and rehabilitation activities within the buffer zone and within the footprint of the site if salt levels comply with the WULA guidelines. ■ Waste generated during the maintenance of the emergency generator and flaring unit must be handled and disposed appropriately. 	Site Manager & HSE representative	On-going
Monitoring and Performance Assessment	<ul style="list-style-type: none"> ■ Environmental incident management and reporting (as per Section 3.4) ■ Internal Audits ■ Document Control (as per Section 3.7) with specific reference to: <ul style="list-style-type: none"> - Waste Management Plan - Leachate Management Plan - Safe disposal certificates 	Site Manager & HSE Representative	On-going Monthly

(G) TOPOGRAPHY AND GEOLOGY

Objectives:

- To ensure that the site geology and topography are adequately protected during construction and operational phase.

Table 25: Construction Phase Issues and Management Actions

Potential Issues / Impacts	Management Actions	Responsible Person	Timeframe
Excavations to obtain fill material will impact on the topography and drainage	<ul style="list-style-type: none"> ■ Ensure that areas are shaped to merge/blend with the surrounding topography as far as possible. ■ Capped and shaped areas must be slightly convex so as to encourage runoff and minimise infiltration. The convex shape should not be visually obtrusive. Slopes should not to exceed a gradient of 1 in 3. ■ Even out mounds and hollows during the contouring and shaping process to avoid the creation of low points in which the ponding of water can occur. ■ Place surface water diversion structures immediately upslope of active and previously landfilled areas so as to keep the affected drainage area to a minimum at all times. 	Project Manager & HSE representative	Construction phase
Installation of surface water management system will alter the drainage	<ul style="list-style-type: none"> ■ Structures must be stable and the slopes must not exceed 1 in 3, where possible. Suitable erosion and scour protection measures are to be installed at the base (e.g. rip-rap or gabions). The structures should be re-vegetated with a suitable grass / plant species mix. 	Project Manager & HSE representative	Construction phase
Monitoring and Performance Assessment	<ul style="list-style-type: none"> ■ Environmental training (as per Section 3.2). ■ Environmental incident management and reporting (as per Section 3.4) ■ Construction monitoring (as per Section 3.3) ■ Document control (as per Section 3.7) with particular reference to: <ul style="list-style-type: none"> - Spoil Management Plan (included in Operational Plan) - Emergency Preparedness Plan - Construction Method Statement 	Contractor & ECO	On-going

Table 26: Operational Phase Issues and Management Actions

Potential Issues / Impacts	Management Actions	Responsible Person	Timeframe
<p>Deposition of waste into waste cells will impact on topography</p>	<ul style="list-style-type: none"> ■ Cap and shape all waste cells on completion.. ■ Ensure that areas are shaped to merge/blend with the surrounding topography as far as possible. ■ Capped and shaped areas must be slightly convex or with adequate fall so as to encourage runoff and minimise infiltration. The convex shape should not be visually obtrusive. Slopes should not to exceed a gradient of 1 in 3, where practical. <ul style="list-style-type: none"> • Even out mounds and hollows during the contouring and shaping process to avoid the creation of low points in which the ponding of water can occur. ■ Place surface water diversion structures immediately upslope of active and previously landfilled areas so as to keep the affected drainage area to a minimum at all times. 	<p>Site Manager & HSE representative</p>	<p>Operational Phase</p>
<p>Monitoring and Performance Assessment</p>	<ul style="list-style-type: none"> ■ Environmental training (as per Section 3.2). ■ Environmental incident management and reporting (as per Section 3.4) ■ Document control (as per Section 3.7) with specific reference to: <ul style="list-style-type: none"> - Rehabilitation Plan - Spoil Management Plan (included in Operational Plan) 	<p>Site Manager & HSE representative</p>	<p>On-going Weekly Monthly</p>

(H) SOILS AND STABILITY

Objectives:

- To ensure that soils and water resources are adequately protected from erosion and sedimentation during the construction and operational phase.

Table 27: Construction Phase Issues and Management Actions

Potential Issues / Impacts	Management Actions	Responsible Person	Timeframe
Soil erosion resulting from pre-construction ground preparation	<ul style="list-style-type: none"> ■ Phase construction work to limit the extent of denuded areas at any given time. ■ To ensure that the soil material is suitable for use in the rehabilitation, it will be necessary to manage the stripping, handling and stockpiling of soils so as to minimise damage to soil structure, minimise the occurrence of compaction, clodding and sodicity, and, reduce cementing, crusting and leaching. ■ Confine works to within acceptable construction boundary. ■ Rehabilitate denuded areas with soil-binding vegetation. ■ Erosion will be controlled by ongoing rehabilitation with appropriate species and careful monitoring and management of erosion or potential erosion sites. ■ Access roads must be carefully planned and constructed to reduce erosion risks. 	Contractor & ECO	Pre-construction and Construction Phase
Soil and slope instability resulting from construction activities	<ul style="list-style-type: none"> ■ The necessary geotechnical investigations are to be undertaken in order to determine the required design for slope stabilisation techniques and infrastructure. ■ Protect areas of slope instability and bare ground with gabion walls or retaining walls. ■ Employ recognised geotechnical techniques for founding and measures to prevent dispersion of unconsolidated material during construction and halt slope failure. 	Project Manager & Geotechnical Specialist	Pre-construction and Construction Phase
Disturbance of soils due to stormwater run-off and subsequent erosion risk, contamination, and sedimentation	<p><u>Stormwater Management</u></p> <ul style="list-style-type: none"> ■ Minimise clearing and grading - where possible, the time that areas are left exposed must be minimal. ■ Routine inspection of stormwater mitigation measures should be undertaken on a daily basis. The site should be inspected to ensure the stormwater management mitigation measure are implemented; this includes inspection to ensure proper waste management in terms of location and storage, container integrity, and that spill management has been implemented and no spills are present on-site etc. ■ Materials management and storage (includes <i>inter alia</i> excavated and fill material, and waste): <ul style="list-style-type: none"> - Materials, prior to removal, should be stored within the development footprint away from drainage lines. Where this is not possible, an adjacent impermeable area should be identified and managed as 	Contractor & ECO	On-going

	<p>per the stormwater mitigation measures.</p> <ul style="list-style-type: none"> - Ensure separation of any contaminated soil (due to <i>inter alia</i> spillages) and fill material– use containment (e.g. membranes) to eliminate cross contamination as required. 		
Monitoring and Performance Assessment	<ul style="list-style-type: none"> ■ Environmental training (as per Section 3.2). ■ Environmental incident management and reporting (as per Section 3.4) ■ Construction Monitoring (as per Section 3.3) ■ Document control (as per Section 3.7) with specific reference to: <ul style="list-style-type: none"> - Emergency Preparedness Plan - Construction Method Statement - Stormwater Management Plan - Spoil Management Plan (included in Operational Plan) 	Contractor & ECO	On-going

Table 28: Operational Phase Issues and Management Actions

Potential Issues / Impacts	Management Actions	Responsible Person	Timeframe
Disturbance of soils due to stormwater run-off and subsequent erosion risk, contamination, and sedimentation	<ul style="list-style-type: none"> ■ See mitigations measures above. 	Site Manager & HSE representative	Operational Phase
Incorrect placement and locations of stockpiles resulting in impacts to sensitive environments, site safety and	<ul style="list-style-type: none"> ■ Stockpiles shall not be placed in a manner that obstructs vehicle visibility or drivers' line of site ■ Soils replacement should emulate the pre-stripping catenary location i.e. soils should be replaced in a position very close to that from which they were taken (bottomland in a bottomland position; midslope in a midslope position). ■ Soils should be replaced as soon as possible after stripping. Soils which cannot be replaced immediately must be stockpiled properly. The stockpiling requirements are as follows: 	Site Manager & HSE representative	Operational Phase

site aesthetics	<ul style="list-style-type: none"> - separate stockpiling of different soil types and layers as far as practically possible; - away from watercourses or areas where they will not be prone to erosion; - upslope of the operational area. ■ Soils should be replaced in sequence (subsoil below topsoil). ■ Stockpiles are to be protected from wind and water erosion: <ul style="list-style-type: none"> - for short-term stockpiling erosion control measures will not need to be implemented; - for long-term stockpiling the stockpiles must be revegetated by sowing with a suitable grass / plant mix. ■ The colonisation of stockpiles by invasive plants must be controlled by removing the plants when they germinate. The purpose of this is to reduce the risk of developing a weedy seedbank within the stockpiled soil. ■ Stockpiles shall not be placed in a manner that is visually displeasing. Where possible, stockpiles should be created in areas out of view of neighbouring residents or passing traffic. Where this is not possible, unsightly stockpiles should be screened. ■ Stockpiles shall not be situated such that they obstruct natural water pathways, in the direct flow path of surface water, near streams, rivers or wetlands. Materials must not be stored in unstable / high risk areas e.g. floodplains or on steep slopes. ■ Stockpiles must not be placed in road or municipal drainage systems. 		
Monitoring and Performance Assessment	<ul style="list-style-type: none"> ■ Environmental training (as per Section 3.2). ■ Environmental incident reporting and recording (as per Section 3.4) ■ Document control (as per Section 3.7) with specific reference to: <ul style="list-style-type: none"> - Emergency Preparedness Plan - Spoil Management Plan (included in Operational Plan) 	Site Manager & HSE representative	On-going

4.2.3 BIOTIC ENVIRONMENT

Objective

- Minimise loss of indigenous vegetation during the construction and operational phase.
- To conserve or protect natural habitats and species where possible, and to establish new areas for these species where on-site preservation is not possible.

Table 29: Construction Phase Issues and Management Actions

Aspect	Management Actions	Responsible Person	Timeframe
Excavation and clearing of terrestrial vegetation may impact on flora and fauna	<ul style="list-style-type: none"> ■ Only the minimum area of vegetation is to be cleared to enable landfill construction activities to take place. ■ In grassland areas, the vegetation should be stripped together with the topsoil – this incorporates both seeds and mulch into the topsoil. ■ Appointment of a suitably qualified individual for appropriate environmental asset identification and management if required. ■ Larger trees and shrubs should not be wasted, potential wood to be made available to the surrounding community for firewood or building material. ■ The PRUNIT (Plant Rescue Unit system) should be implemented where propagules of indigenous plants are removed from the site on a cell by cell basis, and used to stock a nursery or planted directly on capped parts of the site. Indigenous plants from the nursery will be used in re-vegetation as each cell reaches final closure level. ■ Identify suitable methods for removal and relocation to ensure that plants which are relocated have the highest possible chance of survival. ■ Minimise the disturbance of vegetation pockets that lie beyond the landfill footprint by maintaining the buffer zone around these areas. ■ Re-vegetate the disturbed areas as quickly as possible. ■ As far as possible, use plant species endemic to the site for rehabilitation purposes in order to recreate the pre-landfill animal habitats - using other species may alter the habitat, especially for birds, and render it unsuitable. ■ Where possible and practical, 'islands' of vegetation should be allowed to remain undisturbed within the landfill footprint prior to development. ■ Incorporate tree planting into the rehabilitation programme in order to re-create favourable fauna habitat. 	Contractor & ECO	Pre-Construction / Construction Phase

	<p>In time, the growth and expansion of thicket/forest pockets should also assist with reversing the dispersal corridor impacts to a degree.</p> <ul style="list-style-type: none"> ■ Control the invasion of alien plants which could out-compete the indigenous vegetation that is favoured as a faunal habitat. ■ Monitor rehabilitation in the long-term to ensure that the desired habitat is created for the re-colonisation by fauna. ■ Work towards conservation status for the buffer zone and associated landfill footprint. ■ If such sites or taxa are found, a live capture and relocation policy is to be adopted so that affected fauna can be relocated to an alternative site once this site has been identified. ■ The relevant authorities will need to be contacted to obtain permits and, if applicable, provide assistance. 		
Monitoring and Performance Assessment	<ul style="list-style-type: none"> ■ Environmental training (as per Section 3.2). ■ Environmental incident reporting and recording (as per Section 3.4) ■ Construction monitoring (as per Section 3.3) ■ Document control (as per Section 3.7) with specific reference to: <ul style="list-style-type: none"> - Construction Method Statements - Landscape Plans - Rehabilitation Plan 	Contractor & ECO	On-going Monthly

Table 30: Operational Phase Issues and Management Actions

Aspect	Management Actions	Responsible Person	Timeframe
Landfill operations have the potential to impact on flora and fauna	<ul style="list-style-type: none"> ■ Steps must be taken to ensure that workers do not poach animals and birds. No employees will be permitted to: <ul style="list-style-type: none"> - hunt, kill, set devices to trap, tamper with or harass wild animals and livestock or destroy any form of animal shelter; - feed indigenous animals; - bring his/her own pets to the site. ■ Incorporate fauna protection into the environmental awareness programme to ensure that all personnel are aware of the requirements. ■ Livestock must be protected from potential harm by fencing off / cordoning off the active working areas 	Site Manager & HSE Representative	Operational Phase

	<p>or any dangerous excavations that could result in the death of or injury to local livestock.</p> <ul style="list-style-type: none"> ■ Where possible and practical, 'islands' of vegetation should be allowed to remain undisturbed within the landfill footprint to serve as habitat for small mammals and reptiles. ■ Control the invasion of alien plants which could out-compete the indigenous vegetation that is favoured as a faunal habitat. ■ Monitor rehabilitation in the long-term to ensure that the desired habitat is created for the re-colonisation by fauna. ■ Work towards conservation status for the buffer zone and associated landfill footprint. ■ If such sites or taxa are found, a live capture and relocation policy is to be adopted so that affected fauna can be relocated to an alternative site once this site has been identified. ■ The relevant authorities will need to be contacted to obtain permits and, if applicable, provide assistance. 		
Monitoring and Performance Assessment	<ul style="list-style-type: none"> ■ Environmental training (as per Section 3.2). ■ Environmental incident reporting and recording (as per Section 3.4) ■ Document control (as per Section 3.7) with specific reference to: <ul style="list-style-type: none"> - Rehabilitation Plan - Operational Plan 	Site Manager & HSE Representative	On-going

4.3 REHABILITATION

Objectives

- To ensure that disturbed areas are returned to an acceptable state post landfill activities.

Table 31: Rehabilitation Phase Issues and Management Actions

Potential Issues / Impacts	Management Actions	Responsible Person	Timeframe
Cell Rehabilitation	<ul style="list-style-type: none"> ■ Use plant species endemic to the site for rehabilitation purposes in order to recreate the pre-landfill animal habitats. ■ Incorporate tree planting into the rehabilitation programme in order to re-create favourable fauna habitat. In time, the growth and expansion of thicket/forest pockets should also assist with reversing the dispersal corridor impacts to a degree. ■ An ecological approach to rehabilitation and screening measures should be adopted. Rescue and rehabilitation is to be undertaken by a suitably qualified professional appointed by DSW. ■ Rehabilitation to commence as soon as each cell is filled. ■ Landfill cell must be covered and revegetated to its natural state as possible. ■ Post environmental monitoring is required for the following aspects: <ul style="list-style-type: none"> - Leachate monitoring - Landfill gas monitoring - Surface and groundwater monitoring 	Site Manager & HSE Representative	Closure Phase
Site Closure	<ul style="list-style-type: none"> ■ Any areas affected by construction/operational activities or storage are to be reinstated to a status equivalent to before construction. ■ On closure the landfill site is to be rehabilitated in accordance with the approved rehabilitation plan. 	Site Manager & HSE representative	Closure Phase
Monitoring and Performance Assessment	<ul style="list-style-type: none"> ■ Environmental incident reporting and recording (as per Section 5.4) ■ Visual inspections ■ Document control (as per Section 3.7) with specific reference to: <ul style="list-style-type: none"> - Rehabilitation Plan - Closure Plan - Monitoring reports 	Site Manger & HSE Representative	Ongoing

4.4 CLOSURE PHASE

Given the extended time period expected before the decommissioning phase, it is recommended that the requirements for the decommissioning mitigation measures be revised and updated where necessary to reflect current site conditions and statutory requirements. The following generic aspects and impacts are anticipated and are not considered exhaustive. The onus remains with DSW (or appropriate responsible party to be confirmed with the DEDTEA) to prepare a decommissioning EMPr to be submitted prior to decommissioning.

Table 32: EMPr (Closure Phase)

Aspect	Potential Issues and Impacts
Hazardous Waste	<ul style="list-style-type: none"> Waste water generation from the decommissioning activities (leachate generation by water infiltration) may result in localised soil and / or stormwater contamination.
Water Quality	<ul style="list-style-type: none"> Decommissioning activities may have detrimental impacts on surface and groundwater water quality.
Air quality	<ul style="list-style-type: none"> Landfill gas emissions have the potential to impact on the ambient air quality during decommissioning activities.

5 CONCLUSION

In terms of NEMA, everyone is required to take reasonable measures to ensure that they do not pollute the environment. Reasonable measures include informing and educating employees about the environmental risks of their work and training them to operate in an environmentally responsible manner. Furthermore, in terms of NEMA, the cost to repair any environmental damage shall be borne by the person responsible for the damage.

By means of effectively implementing the recommended actions and mitigation measures referred to in this document at the correct timeframes listed, the maximum protection of social, physical and biotic environment will be realised. An appointed ECO will need to monitor the site throughout construction to ensure that the required environmental controls are in place and working effectively.

ANNEXURE 1: AIR QUALITY MANAGEMENT PLAN