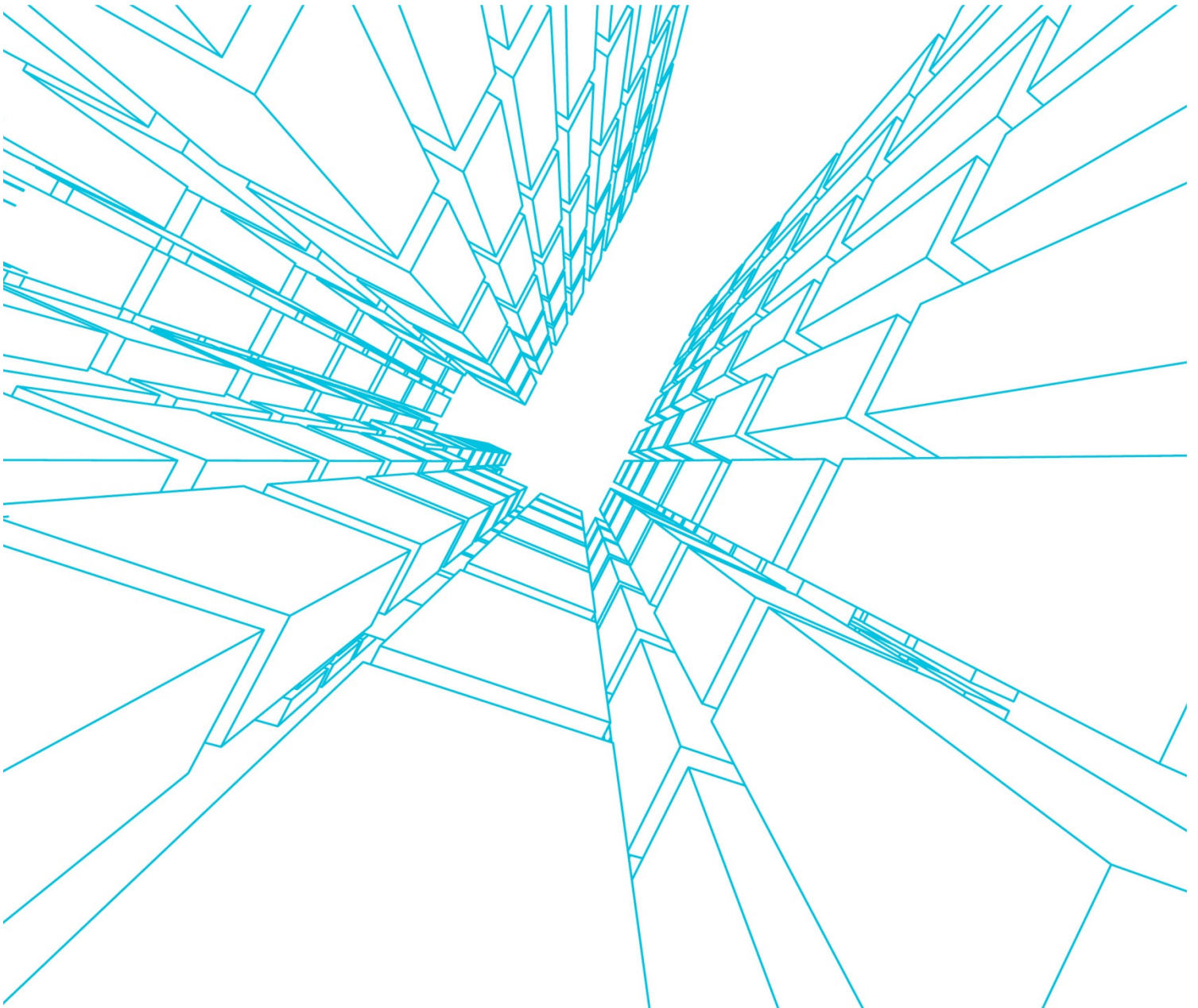

Appendix D: Environmental Management Programme

AECOM SA. 2014. Environmental Management Programme - Closure of Pearly Beach G: C: B+ Waste Disposal Facility (WDF), Overstrand Local Municipality, Western Cape.

Environmental Management Programme – Closure of Pearly Beach G: C: B+ Waste Disposal Facility



TITLE : *Environmental Management Programme – Closure of Pearly Beach G: C: B+ Waste Disposal Facility*

Project Team : *R Swanepoel, M Howard, R Pienaar*

Client : *Department of Environmental Affairs*

AECOM Project No : *14C00518*

Status of Report : *Draft*

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Key Words : *Environmental Management Programme, EMPr, Closure, Landfill.*

Date of this Issue : *08 July 2014*

For AECOM SA (Pty) Ltd

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Reviewed by	:	_____	_____	_____
		Initials & Surname	Signature	Date
Approved by	:	_____	_____	_____
		Initials & Surname	Signature	Date

The general content of this EMP remains the same as the Draft EMP; however certain sections have been restructured in order to render this plan easier to implement for each specific site. These changes are highlighted in green.

Since the issuing of the Final BAR EMP, further information has come to light which defines the end use for the site. These changes have been highlighted in purple.

Contents

1.	PURPOSE AND SCOPE OF THE ENVIRONMENTAL MANAGEMENT PROGRAMME FOR CLOSURE	8
1.1	Introduction	8
1.2	Details of the Authors	9
1.3	Project Description	10
1.3.1	Closure Authorisation Process.....	11
2.	BACKGROUND TO THE ENVIRONMENTAL MANAGEMENT PROGRAMME FOR CLOSURE	11
2.1	Purpose of this EMPr	11
2.2	Nature of the EMPr.....	11
2.3	Objectives of the EMPr	12
2.4	Scope of the EMPr.....	12
2.5	The Continuous Improvement Approach.....	12
2.5.1	Plan.....	13
2.5.2	Do	13
2.5.3	Check.....	13
2.5.4	Act.....	14
3.	LEGAL REQUIREMENTS.....	14
4.	EMPR ORGANISATION, RESPONSIBILITY AND AUTHORITY	17
4.1	Roles and responsibilities.....	17
4.1.1	Duties and Powers of the Municipal Manager.....	17
4.1.2	Duties and Powers of the Landfill Supervisor.....	17
4.1.3	Contractor	Error! Bookmark not defined.
4.1.4	Duties and Powers of the Environmental Control Officer	18
4.1.5	Duties of the Contractor	18
5.	SUMMARY OF IMPACTS / ASPECTS	19
6.	ENVIRONMENTAL DOCUMENTATION, REPORTING AND COMPLIANCE.....	21
6.1	Documentation	21
6.2	Responsibility Matrix and Organogram	21
6.3	Environmental Inspections and Audits	21
6.4	Non-Conformance Report	21
6.5	Environmental Emergency Response	22
6.6	Communications Register.....	22
6.7	Good Housekeeping	22
6.8	Management of Environmental Requirements	23
6.9	Management and Control	23
6.10	Recording and reporting	23

6.11	Monitoring.....	23
6.12	Analysis of Data	24
7.	TRAINING AND INDUCTION OF EMPLOYEES	24
8.	ASPECT AND ACTIVITIES MATRIX.....	25
9.	ENGINEERING CLOSURE METHODS FOR EXISTING COMMUNAL LANDFILL SITES	29
9.1	Aim and Objectives	29
9.2	Identification of End Land Use.....	30
9.3	Conceptual Closure Design and Proposals for Rehabilitation.....	31
9.4	Requirements for Closure Design	31
10.	TIMEFRAMES FOR REHABILITATION	35
11.	POST CLOSURE AND CONVERSION MONITORING, INSPECTIONS AND MAINTENANCE	36
12.	REFERENCES	37

List of Tables

Table 1: Terminology.....	3
Table 2: Acronyms	7
Table 3: Authors' Details.....	9
Table 4: Legislation applicable to waste management includes:.....	14
Table 5: Summary of Impacts	19
Table 6: Environmental Specifications – Operations	Error! Bookmark not defined.
Table 7: Environmental Specifications – Closure and Conversion to Transfer Station .	Error! Bookmark not defined.
Table 8: Environmental Specification – Rehabilitation.....	25
Table 9: Engineering Specifications – Closure Design	32
Table 10: Elements of a typical storm water management system.	33
Table 11: Engineering Specifications – Post Closure and Conversion Monitoring	36
Table 12: Elements to be Monitored.....	Error! Bookmark not defined.

List of Figures

Figure 1: The Continual Improvement Cycle.....	13
Figure 2: Typical capping detail for a Small or Communal Landfill	Error! Bookmark not defined.
Figure 3: Typical capping detail for a Small landfill in a high rainfall area.....	Error! Bookmark not defined.

Annexures

Annexure A: Locality Map

Table 1: Terminology

Terminology	Explanation
Activity	Any action needed for the design, physical investigations and rehabilitation associated with the landfill site.
Alien species	A species occurring in an area outside of its historically known natural range as a result of intentional or accidental dispersal by human activities.
Builder's rubble	Includes pieces of masonry, bricks, concrete, etc. resulting from construction, repair and demolition operations, without reinforcing steel, uncontaminated with general waste and with a maximum particle size of 300-mm.
Bulky Waste	Includes items, such as large tree trunks, large concrete blocks, etc., for which the large size precludes or complicates their handling by normal collection, processing or disposal methods.
Cell	A cell which is designed and engineered to contain waste. It is underlain by a liner to prevent the waste or the leachate from the waste coming into contact with the environment.
Clean Garden Waste	Compostable waste derived from garden waste (for instance gardens, parks and similar), which has not been mixed with other waste categories. This may include clippings, pruning and other discarded plant material.
Closure	The act of terminating the operation of a landfill. Closure is preceded by rehabilitation and followed by end-use and post-closure monitoring.
Commercial Waste	Solid waste generated by stores, offices and other activities not involved in manufacturing.
Communication register	A register aimed at tracking all communication activities in the project.
Compaction	The process whereby the volume of waste is reduced, using a purpose built compactor or other suitable machine.
Compaction Density	The mass of a body of solid waste divided by the volume (after compaction) occupied by that same body of waste.
Compaction Ratio	The ratio of the volume of loose waste to the volume of the same waste after placement and compaction.
Compost	Organic waste that has undergone microbial degradation, to produce a contaminant- and nuisance free product of potential value as a soil conditioner.
Contaminated water	Water contaminated by pollutants from on-site or off-site activities; for example, runoff from un-rehabilitated parts of the waste body or runoff from waste management vehicle or plant wash areas. Contaminated water must be treated to ensure water released into the receiving environment meets minimum standards and guidelines. Treated water should be recycled where possible.
Cover Material	Soil or other suitable material like builders' rubble or clinker ash that is used for enclosing a body of compacted waste.
Daily Cell	A body of waste which has been placed between berms covered with soil, soil berms or builder's rubble berms compacted and enclosed by cover material. The size being determined by the mass of waste disposed of in a single day, as well as by the number of vehicles delivering waste.
Department of Water Affairs (DWA)	The authority responsible for water management.
Development Plan	A plan indicating the phasing of the development of a landfill from the landfill preparation, through the operation (which is usually divided into phases), to the final closure, rehabilitation and end-use. The phasing, and hence the Development Plan, forms part of the design.
Domestic Waste	Solid waste that originates in a residential environment.
Engineer	A suitably qualified duly appointed natural or juristic person or partnership or any other engineer appointed from time to time by the Owner, to act on

Terminology	Explanation
	its behalf with regards to certain aspects of the administration and execution of the work.
Environment	The surroundings in which humans exist and which comprise: <ul style="list-style-type: none"> • the land, water and atmosphere of the earth; • micro-organisms and vegetation and animal life; • any part or combination and interrelationships; and • the physical, chemical, aesthetic, historical, cultural and economic properties and conditions of the foregoing that can influence human health and well-being.
Environmental aspect	A product's or production process's environmental impact or important issues in the environment that an organisation should take into consideration.
Environmental Audit	Systematic, documented, regular and objective evaluation to see how well an organisation or facility is operating in terms of the Environmental Management Programme and is complying with statutory requirements and the organisation's Environmental Policy.
Environmental Authorisation (EA)	The authorisation by a competent environmental authority for commencement of listed activities in terms of the National Environmental Management Act.
Environmental Control Officer (ECO)	An independent person, who is responsible for undertaking site inspections to audit and report on compliance with the environmental specifications contained within the Environmental Management Programme.
Environmental impact	Any change to the environment, whether adverse or beneficial, wholly or partially resulting from an organisation's environmental aspects.
Environmental Impact Assessment (EIA)	The process of collecting, organising, analysing, interpreting and communicating information in accordance with the environmental legal requirements set out in GNR. No 543, GNR. 544, GNR. 545 and GNR 546 as published in Government Gazette No. 33411 of 2 August 2010, promulgated in terms of Chapter 5 of the National Environmental Management Act, for the purposes of obtaining an Environmental Authorisation in accordance with Chapter 5 of the National Environmental Management Act.
Environmental Management Programme (EMPr)	A tool used to prescribe management mechanisms / methods for the prevention of undue or reasonably avoidable adverse environmental impacts and for the enhancement of the positive environmental benefits of a development.
Fauna	All species of animals found in a particular region or environment.
Fire Danger Index	A relative number denoting an evaluation of rate of spread, or suppression difficulty for specific combinations of fuel, fuel moisture and wind speed.
Fire hazard	The relative combination of fuel, oxygen and heat that will lead to the start and spread of a potential fire.
Flood line	The line or mark to which a flood could rise, every 50 (1:50 year flood line) or 100 (1:100 year flood line) years.
Flora	All species of vegetation found in a particular region or environment
General Waste	Waste that does not pose an immediate threat to man or the environment, i.e. house hold waste, builders' rubble, garden waste and certain dry industrial and commercial waste. It may, however, with decomposition, infiltration and percolation, produce leachate with an unacceptable pollution potential.
Groundwater	The water that fills the natural openings in below-surface rock or unconsolidated sands.
Hazardous waste	Waste that, because of its chemical reactivity, toxic, explosive, corrosive, radioactive or other characteristics, causes danger or is likely to cause danger to health or the environment.
Heritage resources	Any place or object of cultural, archaeological or paleontological

Terminology	Explanation
	significance in terms of the National Heritage Resources Act, 1999.
Induction training	The training provided to new / existing employees to (re)acquaint them with the company structure, their specific job requirements, practical and/or organisational issues and occupational health, safety and environmental considerations required on the project.
Industrial Waste	Non-toxic and non-hazardous solid waste resulting from industrial processes and manufacturing.
Interested and Affected Parties (I&AP)	Any person, group of persons or organisation interested in or affected by such operation or activity and any organ of state that may have jurisdiction over any aspect of the operation of activity.
Landfill (v)	To dispose of waste on land, whether by use of waste to fill in excavations or by creation of a landform above grade, where the term “fill” is used in the engineering sense.
Landfill (n)	The waste body created by landfilling. This may be above or below ground level, or both.
Landfill Gas	Typically malodorous gases generated during the decomposition of waste.
Landfill Operation Monitoring	The auditing and assessing of a waste disposal operation to determine whether it conforms to the Landfill design and to the Minimum Requirements.
Landfill Operator	The person, firm or company including the Landfill Operator’s heirs, executors, administrators, trustees, judicial managers or liquidators, as the case may be, responsible for maintenance and operational standards at the landfill. Depending on the circumstances, the Landfill Operator may also be the Landfill Owner.
Landfill Owner	The Landfill Owner will be deemed to be the local municipality.
Land use	Characterised by the arrangements, activities and inputs people undertake in a certain land cover type to produce, change or maintain it. The definition of land use in this way establishes a direct link between the land cover and the actions of people in their environment.
Leachate	An aqueous solution with a high pollution potential, arising when water is permitted to percolate through decomposing waste. It contains final and intermediate products of decomposition, various solutes and waste residues. It may also contain carcinogens and / or pathogens (Sporadic / Significant).
Leachate Detection System	A system for detecting leachate at landfills. It comprises rudimentary liners, sloped towards ‘finger drains’ at the lowest point of the landfill.
Leachate Management	The collection and drainage of leachate to a point where it can be extracted for treatment. This requires a system of under-drains and liners and, in certain instances, is synonymous with containment.
Lift	A series of adjoining cells of the same height, and at the same level, in a landfill.
Mitigate	The implementation of practical measures to reduce adverse impacts, or to enhance beneficial impacts, of an action.
No-go area	An area where physical activities are prohibited.
Non-compliance	Failure to comply with the requirements of the EMPr.
Non-conformance Report	A report outlining a deviation from process, procedure or compliance specifications.
Plant	The apparatus, machinery and vehicles used for the construction, operation and maintenance of the landfill.
Pollution	Any change in the environment caused by substances and/or noise, malodours, dust or heat emitted from any activity, including the storage or treatment of waste or substances and the provision of services, where that change has an adverse effect on human health or well-being or on the composition, resilience and productivity of natural or managed

Terminology	Explanation
	ecosystems, or on materials useful to people, or that will have such an effect in the future
Potentially hazardous substance	A substance that can have a deleterious effect on the environment. Hazardous chemical substances are defined in the Regulations for Hazardous Chemical Substances, published in terms of the Occupational Health and Safety Act, 1993 (Act 85 of 1993).
Quality management system	A set of interrelated or interacting elements that organisations use to direct and control how quality policies are implemented and quality objectives are achieved.
Radioactive Waste	Waste with a specific activity of more than 74 becquerels per gram (Bq/g) and total activity more than 3,7 kBq (0,1uCi). Disposal of radioactive wastes in a landfill is prohibited.
Red Data	A program by the International Union for Conservation of Nature (IUCN) for evaluating the conservation status of plant and animal species. This is represented as the Red List of Threatened Species.
Rehabilitation	To reinstate or restore to capacity or state similar or better than the state prior to the commencement of construction, operation and maintenance activities..
Resource recovery	Recycling of waste or the recovery of energy.
Response Action Plan	A plan intended to counter or minimise the adverse effects of any malfunction of a landfill design element with immediate effect.
Responsible Person	The Permit Holder or his / her legally appointed representative who takes responsibility for ensuring that all or some of the facets of any of the following are properly directed, guided and executed, in a professionally justifiable manner: investigatory work, design, preparation (construction), operation, closure and monitoring.
Safe Disposal	The process whereby spoiled foodstuff or condemned products may be disposed of on the landfill under supervision of the Environmental Health Officer and/or Landfill Supervisor.
Salvaging	The controlled and/or uncontrolled process of recovering any material, gas, compost, or other matter from the waste for benefit and for personal consumption.
Sanitary Landfilling	A method of disposing of waste on land without causing nuisances or hazards to public health or safety. Sanitary landfilling uses the principles of engineering to confine the waste to the smallest practical area, to reduce it to the smallest practical volume, and to cover it with a layer of earth at the conclusion of each day's operations or at such less frequent intervals as may be acceptable.
Sensitive receptors	Locations or areas that are likely to experience an impact greater than at other locations or areas; for example, schools and residential areas.
Ton	1000 kg
Waste	Means any substance, whether or not that substance can be reduced, re-used, recycled and recovered— (a) that is surplus, unwanted, rejected, discarded, abandoned or disposed of; (b) which the generator has no further use of for (he purposes of production; (c) that must be treated or disposed of; or (d) that is identified as a waste by the Minister by notice in the Gazette, and includes waste generated by the mining, medical or other sector, but— (i) a by-product is not considered waste; and 35 (ii) any portion of waste, once re-used, recycled and recovered, ceases to be waste.
Waste Body	This refers to the body of waste (and cover) that is contained in the landfill. Because it is subject to decomposition, it has the potential to

Terminology	Explanation
	generate leachate and must therefore be adequately separated from the water regime.
Waste minimisation	A programme that is intended to promote the reduced generation and disposal of waste.
Waste prevention	The prevention and avoidance of the production of waste.
Waste to Cover Ratio	The ratio of volume of compacted waste to volume of cover material used to cover the said volume of compacted waste.
Water resource	Includes a watercourse, surface water, estuary or aquifer.
Wetland	Means land, which is transitional between terrestrial and aquatic systems where the water table is usually at or near the surface, or the land is periodically covered with shallow water and which, in normal circumstances, supports or would support vegetation typically adapted to live in saturated soil (as defined in the National Water Act).
Working Face	The active part of the landfill; where waste is deposited by incoming vehicles, then spread and compacted on the sloped face of the cell by a compactor. The width of the working face is determined by manoeuvring requirements of the vehicles depositing waste.

Table 2: Acronyms

Acronym	Explanation
DEA	Department of Environmental Affairs
DWA	Department of Water Affairs
EA	Environmental Authorisation
ECO	Environmental Control Officer
EIA	Environmental Impact Assessment
EMPr	Environmental Management Programme
I&AP	Interested and Affected Parties
MSDS	Material Safety Data Sheet
NEMA	The National Environmental Management Act (Act 107 of 1998)
NEM:WA	The National Environmental Management: Waste Act (Act 59 of 2008)
NHRA	National Heritage Resources Act, 1999 (Act 25 of 1999)
QMS	Quality Management System
SAHRA	South African Heritage Resources Agency
TEM	Transport, earthmoving and materials handling equipment

1. PURPOSE AND SCOPE OF THE ENVIRONMENTAL MANAGEMENT PROGRAMME FOR CLOSURE

1.1 Introduction

The Environmental Management Programme for the closure of the landfill to transfer station is designed as an environmental management tool used to prescribe management mechanisms / methods for the prevention of undue or reasonably avoidable adverse environmental impacts and for the enhancement of the positive environmental benefits during the closure process.

The plan has been developed to take cognisance of the National Environmental Management Act's (Act 107 of 1998) (NEMA) requirement for bestowing a 'Duty of Care' on those who cause, have caused or may in future cause pollution or degradation of the environment, as per Section 28 (1) of NEMA. Section 28 (1) has been amended to include significant pollution or degradation that occurred before the commencement of NEMA, that arises or is likely to arise at a different time from the actual activity that caused the contamination or that arises through an act or activity of a person that results in a change to pre-existing contamination. An EMPr is a stand-alone document that is typically used to guide and regulate environmental performance through all stages of development, including planning, design, construction, operation, closure, rehabilitation and post closure monitoring.

In furtherance to the EMPr, the National Environmental Management: Waste Act (Act 59 of 2008) (NEM:WA) also sets out key requirements for integrated waste management through the development of integrated waste management plans (IWMP). The IWMP's allow waste generators and managers to implement measures to ensure waste is managed in a sustainable manner. Local and District Municipalities are required to compile and implement IWMP's to allow for effective sector planning. Thereby ensuring waste management is undertaken in a sustainable and well planned manner. The outcomes of which, allow for improved planning and budgeting at municipal level.

The objectives (Chapter 2 of NEM:WA) of afore-mentioned outcomes are to protect health, well-being and the environment by implementing the following NEM:WA measures:

- minimising natural resource consumption;
- minimisation and avoidance of waste generation;
- reduction, re-use, recovery and recycling of waste;
- treating and safely disposing of waste;
- ecological degradation and pollution prevention;
- securing ecologically sustainable development while promoting justifiable economic and social development;
- ensuring the promotion of effective waste delivery services;
- to undertake remediation of land where contamination (may) present(s) a significant risk of harm to health or the environment; and
- to achieve integrated waste management reporting and planning.

An IWMP typically contains the following seven key requirements:

- situation analysis / status quo;
- gap analysis and needs assessment;
- development of objectives, targets and policies;
- development of programmes, projects and activities;
- implementation of projects and activities;

- monitoring and evaluation (auditing of IWMP); and
- final review of IWMP.

This EMPr is not intended to replace the local and district municipality IWMP, but to provide site specific management and mitigation directives. The EMPr will provide towards addressing some of the afore-mentioned requirements.

1.2 Details of the Authors

As per the requirements of the NEMA, the details and expertise levels of the persons who prepared the EMPr are provided below.

Table 3: Authors' Details

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Contact Person	Robin Swanepoel
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Qualifications	B. Tech Nature Conservation B. Tech Environmental Management
Expertise to carry out preparation of EMPr	Robin has 16 years of experience and has been involved in the compilation and implementation of various EMPr's during the construction of inter alia: <ul style="list-style-type: none"> • Transmission power lines (275 kV, 400 kV and 765 kV); • Substations; • Coal Fired Power Stations; • Hydro-electrical Power Station; • Open-Cycle gas Turbines; • Port and Container Terminal Refurbishment; • Pipelines (water and multi-purpose); • Dams; • Waste transfer Stations; • Landfill Sites; • Roads; • International Airport; • Railway Line upgrade; • Multi-Purpose Stadium; • Housing Estate; and • Renewable Energy.
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Expertise to	Mike has a BSc degree in Limnology. He is professional limnologist with over 30

carry out
review of EMPr

years' experience on multi-disciplinary projects in the fields of environmental management, water resource management, waste management, community development programmes, spatial planning and project management.

1.3 Project Description

It is the Overstrand Local Municipality's intention to apply for the closure of the Pearly Beach Waste Disposal Facility. The Waste Disposal Facility is situated on North Road, Pearly Beach (before Elhxolweny) and is owned by the Overstrand Local Municipality.

The Pearly Beach Waste Disposal Facility was established in approximately 1989 and was closed in 2011. Historically the site received building rubble and garden waste. The waste is disposed of in a open shaped depression and ranges from ± 0.5 meters at the sides to an estimated ± 3 meters in the centre. The was was covered with sand during operation.

The quantity of waste disposed at the facility is unknown. No buildings or infrastructure (i.e. offices, ablutions, weight bridges) remain on site. The Waste Disposal Facility is now overgrown and surrounded by alien invasive species.



A waste drop off site (waste transfer station) is in place close proximity to the facility for domestic waste collection, transportation and disposal at the licenced Gansbaai Waste Disposal Facility. Waste are temporarily stored in containers to a maximum volume of 90m^3 .

The Waste Disposal Facility is located on Portion 4 of the Farm Kleyn Hagel Kraal NR 321 and is approximately 14.2 ha in extent.

The Pearly Beach Waste Disposal Facility is situated approximately 1 km north from the town of Pearly Beach within the Overstrand Local Municipality. The GPS co-ordinates represent the corner points of the site:

1. S 34 38'59.19" E 19 29'32.54"
2. S 34 38'59.82" E 19 29'35.42"
3. S 34 39'01.43" E 19 29'35.65"
4. S 34 39'05.33" E 19 29'34.91"
5. S 34 39'05.28" E 19 29'34.26"
6. S 34 39'04.29" E 19 29'34.31"
7. S 34 39'02.35" E 19 29'32.05"
8. S 34 39'02.99" E 19 29'30.81"
9. S 34 39'02.03" E 19 29'28.84"
10. S 34 39'02.04" E 19 29'27.75"
11. S 34 39'00.23" E 19 29'27.5"
12. S 34 38'59.73" E 19 29'31.98"

The property is 14.2 ha in size with the actual WDF approximately 0.5 ha in extent. Please refer to Annexure 1: Locality Map.

1.3.1 Closure Authorisation Process

The application for closure required the submission of a basic assessment report to the competent authority, thereby ensuring compliance to section 24(5) of NEMA.

A pre-requisite for authorisation from the competent authority is the inclusion of a rehabilitation plan indicating best environmental management practises to be implemented during site closure.

2. BACKGROUND TO THE ENVIRONMENTAL MANAGEMENT PROGRAMME FOR CLOSURE

2.1 Purpose of this EMPr

The purpose of an EMPr is to provide an acceptable environmental framework and action plan to manage and control potential environmental impacts resulting from the closure and conversion of the waste disposal facility.

This EMPr is based on the principles of the NEMA. Such principles are:

- to avoid, minimise or correct the disturbance of ecosystems and loss of biodiversity;
- to avoid or minimise or correct pollution and degradation of the environment;
- to avoid or minimise waste and re-use or re-cycle waste where possible, disposing of it in a responsible manner;
- to apply a risk-averse and cautious approach; and
- to anticipate and to prevent negative impacts on the environment and on people's environmental rights. Where they cannot be prevented, such impacts must be minimised and remedied.

The EMPr provides guidelines and directions to ensure that the closure and conversion activities for the landfill are undertaken in such a way as to avoid, where possible, impacts on the biophysical and social environment.

2.2 Nature of the EMPr

The EMPr is a legally required document to ensure that compliance with the requirements of reasonable protection of the environment as imposed by NEMA, in particular Section 28, which refers to duty of care. The EIA Regulations, 2010, are used as a guideline for the content of the EMPr.

The mitigation measures required in terms of Section 28, subsection (1) may include measures to –

- inform and educate employees about the environmental risks of their work and the manner in which their tasks must be performed to avoid causing significant pollution or degradation of the environment;
- cease, modify or control any act, activity or process causing the pollution or degradation;
- contain or prevent the movement of pollutants or the cause of degradation;
- eliminate any source of the pollution or degradation; or
- remedy the effects of the pollution or degradation.

This EMPr, as a standalone document, shall be used to guide and regulate environmental performance during the closure of the waste disposal facility. It contains the following elements:

- goal setting and performance measurement;
- compliance management;
- an assessment and management system;
- community relations;

- roles, responsibilities and accountabilities;
- risk management;
- emergency preparedness and response; and
- incident reporting and investigation.

To achieve these environmental management requirements, a defined and implementable system must be in place. This system comprises the “what” and the “how”.

- The “what”: The EMP indicates to the Landfill Supervisor what is required by setting objectives with measurable targets in place for the successful management of the scheme.
- The “how”: The Landfill Supervisor is required to formulate procedures and/or guideline documents in compliance with its Quality Management System (QMS) requirements on how the objectives will be met.

2.3 Objectives of the EMPr

The main objective of the EMPr is to ensure the implementation of environmental practices that are aimed at the best form of environmental protection. The aim is to ensure that the Landfill Supervisor takes reasonable measures to protect the environment and to remedy impacts to the environment, as required by the Duty of Care introduced by the NEMA, Section 28. The EMPr draws the Landfill Supervisor’s attention to the monitoring, auditing and corrective actions that may be needed during closure operations at the Landfill Site. Therefore, the other objectives¹ of the EMP are to:

- avoid, minimise or correct the disturbance of ecosystems and loss of biodiversity;
- avoid, minimise or correct pollution and degradation of the environment;
- avoid or minimise waste, to reuse or recycle waste where possible and to dispose of waste in a responsible manner;
- apply a risk-averse and cautious approach; and
- anticipate and prevent negative impacts on the environment and on people’s environmental rights. Where impacts cannot be prevented, such impacts must be minimised and mitigated.

2.4 Scope of the EMPr

The EMPr outlines the impacts and mitigation measures associated with the closure (or decommissioning) of the waste disposal site. The roles, responsibilities and reporting procedures have been identified in the EMPr.

The EMPr also contains a series of environmental specifications designed to avoid, minimise and, ultimately, manage the potential environmental impacts associated with the closure of the waste disposal site.

2.5 The Continuous Improvement Approach

The approach adopted for this EMPr is derived from the Deming Cycle, a cycle of continuous improvement that entails the reiterative actions of plan, do, check and act.

¹ As defined by the National Environmental Management Act (No. 107 of 1998).

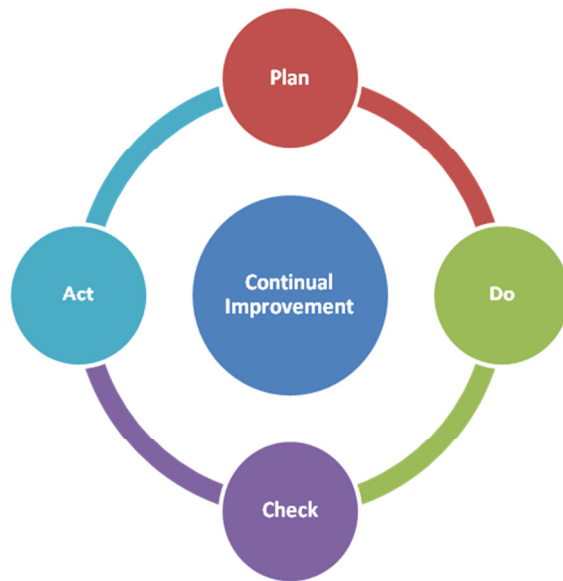


Figure 1: The Continual Improvement Cycle

2.5.1 Plan

Achieving the targets depends on compliance with this EMPr and the legislative requirements that underpin it.

2.5.2 Do

Throughout the life cycle of the waste disposal site, the Landfill Supervisor will be required to develop and maintain a QMS that is designed to ensure that best management practices are implemented in day-to-day management. Such a QMS should include at least the following information for each phase of the project:

- location and extent of associated infrastructure;
- associated activities, such as the transportation of people and equipment;
- materials and equipment to be used;
- management actions;
- human resources used;
- monitoring activities;
- emergency / disaster incident and reaction procedures; and
- rehabilitation procedures for the impacted environment.

Including these information topics into procedures and/or guideline documents will ensure that aspect-specific environmental management (based on this EMPr) forms an integral part of the closure of the site. It is, therefore, important to integrate the environmental management requirements into the day-to-day activities by way of set procedures that are set out in its QMS.

The incorporation of the “how” and “what” will ensure that the Landfill Supervisor understands what is required of it and that it allows systems to be put in place to ensure that the execution of the requirements is monitored. The Landfill Supervisor should also develop a programme for monitoring aspect-specific indicators in terms of the targets provided in the EMPr.

2.5.3 Check

A system of assessing monitoring results has been developed (Section 4.2) to check environmental management performance. Continuous assessment facilitates proactive management of environmental issues. Mitigation measures

can then be successfully implemented on an on-going basis to keep environmental indicators within their target thresholds. Moreover, the assessment system also enables the assessment of the efficacy of the EMPr. Regular auditing of environmental performance is prescribed to prove and preserve accountability in a legislative context.

2.5.4 Act

The assessments and monitoring of the results and findings of the regular audits must be documented within a reporting system. Precautionary mitigation measures and corrective actions will be prescribed and instructions will be given in order to implement these in the field.

The Landfill Supervisor shall in terms of the requirements of the QMS comply with the timeframes for dealing with implementing corrective actions:

- Acknowledge the finding – within 1 day of being informed of the finding.
- Rectify/mitigate finding – within 3 days of finding being raised.
- Respond in writing on “close out” of finding – within 5 days of finding being raised.

The findings of monitoring and auditing programmes can also be used to update the EMPr. Although the EMPr is a specific document, it is dynamic and should be updated regularly to address changing requirements, legislation, technologies, etc.

3. LEGAL REQUIREMENTS

The site closure and conversion must be implemented within the framework of the National Environmental Management Act (NEMA) and other relevant environmentally related legislation as well as the project specific conditions of the EA. Please refer to Table 4 below.

Table 4: Legislation applicable to waste management includes:

Legislation	Sections	Relates to
The Constitution (Act 108 of 1996)	Chapter 2	Bill of Rights
	Section 24	Environmental rights
	Section 25	Rights in property
	Section 32	Administrative justice
	Section 33	Access to information
National Environmental Management Act (Act 107 of 1998) as amended ²	Section 2	Defines the strategic environmental management goals, principles and objectives of the government. Applies throughout the country to the actions of all organs of state that may significantly affect the environment.
	Section 24	Provides for the prohibition, restriction and control of activities which are likely to have a detrimental effect on the environment.
	Section 28	Duty of care and remediation of environmental damage. The scheme owner has a general duty to care for the environment and to institute such measures as may be needed to demonstrate such care. The duty of care has been amended

² The NEMA 2010 EIA regulations R543, R544, R545, R546 may be relevant for certain construction and maintenance such as those that may need to take place in or close to water resources.

Legislation	Sections	Relates to
		to include significant pollution or degradation that occurred before the commencement of the NEMA that arises or is likely to arise at a different time from the actual activity that caused the contamination or that arises through an act or activity of a person that results in a change to pre-existing contamination.
	Section 30	Control of emergency incidents. Responsible person's duties relating to reporting and remediation actions regarding emergency incidents. A criminal sanction may be imposed on the responsible person for failure to comply with the reporting requirements and obligations to address any emergency incidents.
Environment Conservation Act (Act 73 of 1989) and regulations	The Act has been substantially repealed by the NEMA. However, there are certain regulations under the Act which are still in operation, such as the National Noise Control Regulations.	
National Environmental Management: Waste Act (Act 59 of 2008) (NEMWA) ³	Section 16	General duty in terms of waste management
	Section 17	Reduction, re-use, recycling and recovery of waste
	Section 26	Prohibition of unauthorised disposal of waste
	Section 27	Littering
National Environmental Management: Biodiversity Act (Act 10 of 2004) (NEMBA)	Sections 65-69	These sections deal with restricted activities involving alien species, restricted activities involving certain alien species totally prohibited, and duty of care relating to alien species.
	Sections 71 and 73	These sections deal with restricted activities involving listed invasive species and duty of care relating to listed invasive species.
National Environmental Management: Air Quality Act (Act 39 of 2004) ⁴	Section 32	Control of dust
	Section 34	Control of noise
	Section 35	Control of offensive odours
	Schedule 2	Ambient air quality standards
Fertilisers, Farm Feeds, Agricultural Remedies and Stock Remedies Act (Act 36 of 1947) and regulations	Sections 3 to 10	Control of the use of registered pesticides, herbicides (weed killers) and fertilisers. Special precautions must be taken to prevent workers from being exposed to chemical substances in this regard. Workers handling these remedies must also be registered in terms of the Act.
Conservation of Agricultural Resources Act (Act 43 of 1983) and regulations	Section 5, 6	Implementation of control measures for alien and invasive plant species

³ The Listed Activities in terms of the Waste Act should be included as R718 of GG32368 of 3 July 2009 as, depending on throughput, the effluent treatment plants may require waste licenses.

⁴ The National Ambient Air Quality Standards have been published and replace the SANS codes, R1210, GG 32816 of 24 December 2009.

Legislation	Sections	Relates to
National Heritage Resources Act (Act 25 of 1999)	Section 35	No person may, without a permit issued by the responsible heritage resources authority, destroy, damage, excavate, alter, deface or otherwise disturb any archaeological or paleontological site.
	Section 36	No person may, without a permit issued by the South African Heritage Resource Agency (SAHRA) or a provincial heritage resources authority, destroy, damage, alter, exhume, remove from its original position or otherwise disturb any grave or burial ground older than 60 years which is situated outside a formal cemetery administered by a local authority. "Grave" is widely defined in the Act to include the contents, headstone or other marker of such a place, and any other structure on or associated with such place.
	Section 38	This section provides for Heritage Impact Assessments (HIA), which are not covered under the NEMA. The HIA will be approved by the authorising body of the provincial directorate of environmental affairs, which is required to take the provincial heritage resources authorities' comments into account prior to making a decision on the HIA.
Occupational Health and Safety Act (Act 85 of 1993) and regulations	General Administration Regulations GN R1449 (Section 7)	Material Safety Data Sheets must be made available at the request of any interested or affected party.
	Section 8	General duties of employers to their employees
	Section 9	General duties of employers and self-employed persons to persons other than their employees
National Water Act (Act 36 of 1998) and regulations	Section 19	Prevention of and remedying the effects of pollution of a water body
	Section 20	Control of emergency incidents
	Chapter 4	Use of water and licensing
Hazardous Substances Act (Act 15 of 1973) and regulations	Provides for the definition, classification, use, operation, modification, disposal or dumping of hazardous substances.	
Minimum requirements for storage, handling and disposal of hazardous waste, DWAf guidelines, 1998	Section 10	Temporary hazardous waste storage: time, volume and other requirements
National Road Traffic Act (Act 93 of 1996) and regulations	Section 54	Transportation of dangerous goods
Fencing Act (Act 31 of 1963)	Section 17	Any person erecting a boundary fence may clean any bush along the line of the fence up to 1.5 metres on each side thereof and remove any tree standing in the immediate line of the fence. However, this provision must be read in conjunction with the environmental legal provisions relevant to the protection of flora.
National Veld and Forest Fires Act (Act	Chapter 2	Promotes and regulates the formation of fire protection associations which aim to manage and coordinate fire protection

Legislation	Sections	Relates to
101 of 1998)		and fire services in an area.
	Chapter 4, 5	Organisations are required to make and maintain firebreaks and fire-fighting equipment and personnel should there be a risk that a fire may start or spread from the premises.
DEA Integrated Environmental Management	DEA Integrated Environmental Management Information Series (2004): Environmental Management Plans: DEA Guideline on compiling EMPrs.	
SANS 1929	Ambient air quality – limits for common pollutants ⁵	
SANS 10103	The measurement and rating of environmental noise with respect to land use, health, annoyance and to speech communication.	
National Waste Policy	Provides for the identification of and governance arrangements for priority initiatives and measures for performance assessment. The National Waste Management Strategy (NWMS) seeks to systematically improve waste management in South Africa. Therefore, as a legislative requirement of the NEM:WA, the NWMS seeks to ensure sustainable design, resource efficiency and waste prevention practices are implemented (DEA, NWMS Draft, 2010).	

4. EMPr ORGANISATION, RESPONSIBILITY AND AUTHORITY

4.1 Roles and responsibilities

This section describes the key functionaries in the planning, implementation and monitoring of the EMPr.

4.1.1 Duties and Powers of the Municipal Manager

The Municipal Manager is ultimately responsible for:

- ensuring compliance with all the environmental requirements of the EMPr;
- ensuring that the EMPr has been made available to the staff, suppliers as well as subcontractors;
- reviewing all reports by the Landfill Supervisor;
- ensuring rectification on non-compliance issues raised by the Landfill Supervisor.

4.1.2 Duties and Powers of the Landfill Supervisor

The Landfill Supervisor is ultimately responsible for:

- ensuring that the EMPr has been made available to appointed Contractors, for review and distribution to its suppliers as well as subcontractors, and that the Contractor acknowledges and accepts the contents therein, also on behalf of any parties reporting to the Contractor;
- assessing the Contractor's environmental performance during project life-cycle in consultation with the ECO, to whom a brief monthly statement of environmental performance will be submitted; and
- maintaining a register of complaints and queries made by members of the public.

⁵ Replaced by R1210

4.1.3 Duties and Powers of the Environmental Control Officer

In terms of the Environmental Authorisation, the closure related activities must be monitored by an independent Environmental Control Officer (ECO). The ECO must be well versed in environmental matters and have a minimum of two years of relevant on-site construction related experience. The ECO should have a relevant environmental degree or other relevant tertiary qualification.

The ECO's responsibilities include:

- ensure compliance with all the environmental requirements set in the EMPr (photographs will be taken of any transgressions and will be presented to the Landfill Supervisor, who will be responsible for ensuring rectification of non-compliance issues);
- be familiar with relevant legislation and regulations;
- brief the various Landfill Supervisor's / Contractor's foremen about the requirements of the EMPr for at least one hour (where after environmental training will be provided by the Environmental Officer to the workforce);
- undertaking bi-weekly site visits;
- advise the Landfill Supervisor about the interpretation, implementation and enforcement of the EMPr;
- attend site meetings, as and where required;
- oversee implementation of corrective action with regard to the EMPr;
- issue a list of transgressions / non-conformance reports to the Landfill Supervisor at monthly intervals for dissemination to the various responsible parties;
- undertake monthly audits of adherence to the EMPr;
- Oversee response by the task specific contractor to any project-related complaints from the public; and

The ECO is responsible for providing an independent evaluation of compliance with the EMPr and not for enforcement of conditions of the EMPr. The Applicant is responsible for enforcement of the conditions of the EMPr.

The closure teams are accountable to the ECO for non-compliance with the EMPr. The ECO provides feedback to the Landfill Supervisor who, in turn, reports to the Municipal Manager, as required. Issues of non-compliance raised by the ECO must be taken up by the Landfill Supervisor and resolved with the construction teams in a timely manner.

The ECO will remain employed for the full duration of the closure phase.

4.1.4 Duties of the Contractor

All Contractors (including staff, suppliers, sub-contractors and casual labour) are ultimately responsible for:

- be responsible for the task specific activities for the duration of their appointment (so will Sub-Contractors and contract workers);
- be responsible for ensuring work conducted is done within the framework of the EA, EMPr and applicable legislation;
- ensure that all suppliers and Sub-Contractors have a copy of and are fully conversant with the contents of the EMPr;
- be required to provide Method Statements setting out, in detail, how management actions contained in the EMPr will be implemented;
- be required to monitor task specific impacts upon the surrounding environment as per the Environmental Monitoring Method Statement; and
- submit environmental monitoring data to the Landfill Supervisor on a monthly basis.

The Contractor(s) must arrange for all his/her employees and those of his/her sub-contractors to be made aware of the requirements of the EMPr to ensure:

- a basic understanding of the key environmental features of the work site and environments, and
- familiarity with the requirements of this EMPr.

Suppliers, sub-contractors with their employees and casual labour must comply with all the requirements of this EMPr and supporting documents in terms of NEMA Sec 28 Duty of Care. The absence of specific reference to the supplier, the sub-contractor or casual labour in any specification does not imply that the supplier, sub-contractor, casual labour or is not bound by this EMPr.

The Contractor shall clearly describe the overall methodology proposed for the task specific related activities in particular method statements. All method statements must take environmental requirements into account.

5. SUMMARY OF IMPACTS / ASPECTS

All closure activities will be limited to the landfill site, lay-down areas and site office / yard. All activities outside these areas need to be approved by the landfill Supervisor prior to the commencement of works.

All interactions between the Landfill Supervisor and I&APs will be via the Municipal Manager. The Landfill Supervisor may not enter into agreements with I&APs or undertake work on private property in lieu of favours, payment or any other means where either party may benefit from the activities / permissions of the other party.

The identification and summarisation of impacts and risks associated with construction related activities are set out in this section.

Table 5: Summary of Impacts

Impact	Nature of Impact	Mitigation
Soil Pollution	Soil and water resource pollution resulting from the discharge of waste disposal site leachate discharge after closure into the environment negatively impacting other water users and ecosystems. Leachate is generated as a result of: 1. Liquids within the wastes deposited; 2. Rainfall; 3. Surface water inflow; and 4. Groundwater intrusion.	Final shaping for closure and capping the site will reduce the potential for soils pollution. The latent contamination from historic waste activities will remain but the extent is small. As long as the capping remains intact, there will be little further impact.
Water Pollution	Possible contamination of the surface and groundwater systems due to infiltration of water into the landfill. The consequent generation of leachate may also increase the rate of leaching of waste in the site as the chemical composition changes, to low pH and high metals. The actual volume of leachate however is expected to be small because of the size of the facility and the overall nature of the waste.	Final shaping for closure and capping the site will reduce the potential for water pollution. The latent contamination from historic waste activities will remain but the extent is small. As long as the capping remains intact, there will be little further impact.

Impact	Nature of Impact	Mitigation
Air Emissions	Landfill gas composed of methane, carbon dioxide and water vapour as a result of the commencement of anaerobic decomposition of the filled material can give rise to flammability, toxicity, asphyxiation and other hazards.	No specific gas monitoring or management is required for communal landfills, and the potential generation volumes are small
Health and Safety	During closure operations there will be an increase in the number of people on site, so an increase in safety issues	Refer to the Municipal Health and Safety Management Plan
Ecological	During closure operations there may be impacts on fauna and flora in the adjacent environment.	Movement of people and vehicles/machinery must be limited to within the boundaries of the site. No open fires. No person is permitted to hunt/kill and living animal. General housekeeping and prevention of wastes or construction materials getting into the surrounding environment.
Dust Outfall	During closure operations, dust will be generated by vehicles and bulk earth moving equipment. Some dust will also be generated bringing final cover material onto site. Dust will also be generated during vegetation establishment.	Dust suppression will be implemented during closure. The final closure action is to hydroseed the site with a site specific seed mix, which will decrease the time for vegetation establishment and reduce the time for dust generation.
Social Impacts (Sensitive Receptors – Visual)	Visual impacts resulting from the waste disposal facility, decommissioning and littering adversely impacting identified sensitive receptors.	Visual impacts will be reduced on closure. Once the vegetation has re-established itself, there will be no visual impact. Visual impacts as a result of littering and illegal dumping will be managed by litter pickers until such time as the site is no longer perceived to be a landfill
Disruption of soil profiles	Disruption of soil profiles – topsoil will be required subsequent to covering the site. Topsoil has not been stockpiled for rehabilitation and may have to be sourced from another suitable source. The rehabilitation of the landfill may contribute to the loss of topsoil at another source	The amount of topsoil required for rehabilitation is minimal and due to the hardy nature of the Karoo vegetation and ability to re-establish naturally. <ul style="list-style-type: none"> • Limit vegetation clearance at source of topsoil removal • Limit vehicle movement at source of topsoil removal
Fire Hazard	Risk of fire during closure activities impacting on fauna and flora. the environmental may be altered and vegetation and animals permanently destroyed	Ensure fires are not made for any purposes during closure activities.
Social Impacts (Community)	Positive - There were no permanent staff employed at the landfill facility. Employment opportunities may however be created during the closure and rehabilitation of the landfill site	Staff employed on landfill sites that close can be re-deployed as there will always be a requirement for waste collection, transport and disposal services. Trained and capable staff are an asset to the municipality
Social Impacts (Sensitive Receptors – Noise)	Noise impacts will occur during the closure and rehabilitation of the site, but is considered negligible	During closure operations, all vehicle will be equipped with correct sound controlling equipment such as exhaust systems.

Impact	Nature of Impact	Mitigation
Illegal dumping	Once the site is closed there is an increased risk of illegal dumping in the area. People will still be used to disposing of their waste at the site and may be of the view that the municipality will clean the areas regularly.	Illegal dumping will be managed as follows: Education and awareness (impacts, alternative sites, degraded environment, health). Policing. Provision of alternative disposal means. Employment of litter pickers

6. ENVIRONMENTAL DOCUMENTATION, REPORTING AND COMPLIANCE

6.1 Documentation

The following documentation must be kept on the project site for the full duration of closure and conversion:

- Environmental Management Programme;
- Environmental Authorisation;
- Waste License ;
- environmental monitoring reports;
- environmental incident book;
- communications Register;
- register of audits;
- non-conformance reports

6.2 Responsibility Matrix and Organogram

The Landfill Supervisor has in terms of its environmental management system, a Responsibility Matrix and Organogram. This shall be displayed in an appropriate location. This identifies responsible parties, their contact details, and highlights their roles and responsibilities. This document must be updated on a regular basis to ensure that information is correct.

6.3 Environmental Inspections and Audits

Audits will be conducted to monitor compliance with the EMPr and EA conditions. Photographic records will support the visual assessment. External auditing may take place at unspecified times.

6.4 Non-Conformance Report

The Non-Conformance Report (NCR) process shall be in terms of the Landfill Site's environmental management system. The following information is typically recorded in the NCR:

- details of non-conformance;
- any plant or equipment involved;
- any chemicals or hazardous substances involved;
- work procedures not followed;
- any other physical aspects;
- nature of the risk;
- actions agreed to by all parties following consultation that should adequately address the identified non-conformance. This may take the form of specific control measures and should take the hierarchy of controls into account. This must accompany the NCR for filing purposes;
- the agreed timeframe by which corrective actions should be completed;

- the Landfill Site representative should verify that the agreed actions have been taken on or soon after the agreed completion date. Where the actions are complete, the Landfill Site representative should sign the Close-Out portion of the Non-Conformance Form and file it; and
- the measures put in place to prevent any future reoccurrence of the problem.

6.5 Environmental Emergency Response

The Landfill Site environmental emergency procedures must ensure that there will be an appropriate response to unexpected or accidental actions or incidents that could cause environmental impacts. Such incidents may include:

- accidental discharges to water (i.e. into a water resource) and land;
- accidental spillage of hazardous substances (typically oil, petrol, and diesel);
- accidental toxic emissions into the air; and
- specific environmental and ecosystem effects from accidental releases or incidents.

The Environmental Emergency Response Plan is separate to the Health and Safety Plan as it is aimed at responding to environmental incidents and must ensure to include the following:

- all employees shall be adequately trained in terms of incidents and emergency situations;
- details of the organisation (manpower) and responsibilities, accountability and liability of personnel;
- a list of key personnel and contact numbers;
- details of emergency services (e.g. the fire department, spill clean-up services) shall be listed;
- internal and external communication plans, including prescribed reporting procedures;
- actions to be taken in the event of different types of emergencies;
- incident recording, progress reporting and remediation measures to be implemented;
- information on hazardous materials, including the potential impact associated with each, and measures to be taken in the event of accidental release; and
- preventative measures to be taken in future.

6.6 Communications Register

All complaints or communications that are received from I&APs or any other stakeholder must be recorded in a Communications Register. These complaints and communications will be investigated and a response to the Complainant, I&APs or stakeholder will be given within 10 days.

The Communications Register shall include the following information:

- record the time and date of the complaint/communication;
- a detailed description of the complaint/communication;
- findings from investigation into the cause of the problem;
- action and resources used to correct the problem;
- action taken to prevent a reoccurrence of the problem;
- photographic evidence of the problem (where possible);
- a written response to the Complainant indicating rectification of the problem; and
- information regarding the relevant authority that was contacted or notified in writing (person, time and date).

6.7 Good Housekeeping

The Landfill Site is to practice good housekeeping throughout the closure and conversion life-cycle. This should eliminate disputes about responsibility and facilitate efficiency. Records of such actions taken to ensure the maintenance and management of housekeeping must be recorded.

6.8 Management of Environmental Requirements

The Landfill Supervisor shall record and report upon environmental management measures undertaken to mitigate assessed impacts upon the environment.

6.9 Management and Control

The Landfill Supervisor is to implement environmental management in terms of its environmental management system. Appropriate measures shall include:

- appointment of necessary resources to monitor and manage environmental requirements;
- implement aspect specific method statements to deal with emergency situations;
- provision of adequate emergency response equipment to mitigate and manage an incident or emergency; and
- provision of specific training related to implementation of environmental management requirements.

6.10 Recording and reporting

The Landfill Supervisor shall maintain detailed records of parameters monitored. These detailed records shall demonstrate the effectiveness of the management actions implemented to mitigate potential impacts.

The Landfill Supervisor shall compile a database/report of management works implemented in terms of and at the frequencies stipulated by the environmental management system requirements.

6.11 Monitoring

The Landfill Supervisor shall compile an Environmental Monitoring procedure which details the scope, nature, process, schedule and templates for environmental monitoring. The procedure shall in be in line with the environmental management system requirements.

The monitoring results shall be used to determine the effectiveness of the management programme.

All complaints, compliments or other comments relating to environmental management parameters are to be recorded in the site issues register for inclusion in the project issues register held by the Landfill Supervisor.

Monitoring results and the associated required management and mitigation actions for the coming monitoring period are to be presented in the monitoring section of the Monthly Report.

The Landfill Supervisor shall monitor and maintain the following on an on-going basis **if applicable**:

- re-growth of alien invasive vegetation;
- validity of the pest control officer certificate;
- fire break requirements;
- storm water systems;
- topsoil and backfill volumes;
- access road condition;
- noise;
- erosion prevention;
- landscaping requirements;
- spoil management;
- surface water sampling schedule;
- air monitoring sampling schedule;
- borehole monitoring sampling schedule;
- leachate monitoring sampling schedule;
- landfill gas monitoring schedule;
- dust control operating log;
- lime stabilisation analysis; and

- KPI monitoring schedule.

The Landfill Supervisor shall maintain a monthly database of inter alia the following works. This data base is to include as a minimum:

The Landfill Supervisor must submit detailed terms of reference for the appointment of a professional service provider (PSP) to undertake the environmental monitoring programme for leachate, water quality, gas, dust and noise monitoring. The PSP must meet minimum professional requirements for:

- qualifications;
- professional registration;
- experience and track record;
- demonstrated proficiency in use of relevant monitoring and sampling equipment;
- equipment requirements and tolerances for detection limits;
- reporting and analysis;
- confirmation of laboratory accreditation, capacity, delivery and performance within reasonable timeframes

All monitoring equipment shall be calibrated as per the manufacturers specifications.

6.12 Analysis of Data

Decisions shall be based on analysis of data obtained from measurements and information collected, thereby requiring effective actions such as:

- valid analysis methods;
- appropriate statistical techniques; and
- making decisions and taking actions based on results of logical analyses, as balanced with experience and intuition.

Analysis of data can help to determine the root cause of existing or potential problems, and therefore guide decisions about the corrective and preventive actions needed for improvement. For an effective evaluation by management of the total performance of the Landfill Site, data and information analysed. The results of this analysis are used by the Landfill Supervisor to determine:

- trends;
- customer satisfaction;
- satisfaction of other interested parties;
- effectiveness and efficiency of our processes;
- supplier contribution;
- success of our performance improvement objectives;
- economics of quality, financial and market-related performance;
- benchmarking of our performance; and
- competitiveness.

7. TRAINING AND INDUCTION OF EMPLOYEES

The Landfill Supervisor is to take responsibility for the management of staff on the Landfill Site during operations and supervise them closely at all times. The onus is on to make sure that all staff and Sub-Contractors fully comprehend the

contents of the EMPr. The environmental awareness training programmes should, therefore, be targeted at the two levels of employment: management and labour. Environmental awareness training programmes need to be formulated for these levels and must comprise:

- a record of all names, positions and duties of staff to be trained;
- a framework for the training programmes;
- a summarised version of the training course(s);
- an agenda for the delivery of the training courses.
- such programmes will set out the training requirements, which need to be conducted prior to any construction works occurring and will include:
 - acceptable behaviour with regard to flora and fauna;
 - maintenance of equipment to prevent the accidental discharge or spill of fuel, oil, lubricants, cement, mortar and other chemicals;
 - responsible handling of chemicals and spills;
 - environmental emergency procedures and incident reporting; and
 - general code of conduct towards I&APs.

8. ASPECT AND ACTIVITIES MATRIX

Environmental aspects identified, as well as aspects generally associated with landfill closure activities and conversion to transfer station have been identified and listed in the following table.

Table 6: Environmental Specification – Rehabilitation

Activity / Issue	Action required
Closure	
Environmental Acceptability	The site shall be rehabilitated to ensure there are no adverse effects on the surrounding environment.
End use suitability	A new waste water treatment works (WWTW) facility is planned on the site. During the planning stage of the WWTW, the information contained in this document must be taken into account. Financial provision should be made for additional waste material that has to be taken to landfill and disposed of properly and responsibly. Waste material might be encountered during the construction of the new stabilization ponds.
Heritage Sites	<p>Should a find of heritage importance be unearthed, construction activities will stop immediately at the site of discovery. The area will be fenced off with a radius of 20m around the unearthed item, demarcated as a no-go area and access will be prohibited. Should there a risk of the find being violated, whether intentionally or inadvertently, the Contractor shall be required to appoint a guard to enforce the no-go area policy.</p> <p>The ECO and Municipal Manager shall be notified immediately.</p> <p>The ECO will contact an archaeologist to undertake further studies and determine the importance of such a find. All related activities will be undertaken by the archaeologist, or under his/her supervision, to ensure no unnecessary damage takes place on the site.</p> <p>During this period, work will not take place in the demarcated area. Work will be continued further along the site at a distance which is clearly well out of the area that may be affected by the</p>

Activity /Issue	Action required
<p>Closure</p>	<p>findings. Should the findings be clearly limited to a particular area the ECO and Municipal Manager, in consultation with the archaeologist, will be free to determine what can reasonably be deemed a safe no-work distance, which will be kept clear of activities.</p> <p>Work will only recommence on the written consent of the archaeologist and/or the Heritage Western Cape.</p> <p>Finds containing human remains shall immediately be reported by the Municipal Manager to the South African Police Services (SAPS).</p> <p>All parties concerned shall respect the potentially sensitive and confidential nature of the heritage resource, particularly human remains.</p> <p>Under no circumstances shall any artefacts be removed, destroyed or interfered with by anyone on site.</p> <p>The Contractor and workers shall be advised of the penalties associated with the unlawful removal of cultural, historical, archaeological or paleontological artefacts, as set out in Section 51(1) of the NHRA.</p>
<p>Regulatory Requirements for Closure and conversion</p>	<p>A closure application is submitted to the Department of Environmental Affairs and Development Planning, Western Cape, in accordance to the regulatory requirements for site closure for non-permitted sites. The application covers site investigations to determine closure requirements prior to the commencement of rehabilitation.</p>
<p>Demolition and Site Clean Up</p>	<p>The remaining waste from the site and surrounding areas shall be collected for transfer to the nearest appropriate landfill site.</p> <p>Re-contouring:</p> <p>The profile, soil condition and landform of the waste site shall be restored to a similar state to the surrounding landscape to provide for homogenous representivity.</p> <p>Areas requiring re-contouring shall be stripped of the top 150 mm of topsoil and this shall be stockpiled separately from other soil stockpiles.</p> <p>Scarification and ripping:</p> <p>All areas where re-contouring interventions are required shall be cross-ripped before topsoil placement. Topsoil shall be uniformly scarified to allow for vegetation growth.</p> <p>Ripping depths shall be determined by the depths identified for the soil profiles during the pre-construction survey.</p> <p>Topsoil placement:</p> <p>Topsoil shall be uniformly replaced to a depth of 150 mm within areas where previously removed for re-contouring purposes.</p>

Activity /Issue	Action required
Closure	
Soil Remediation	<p data-bbox="384 456 448 483">Mulch</p> <p data-bbox="384 521 1422 611">Herbaceous garden waste shall be chipped and rotavated into the top 100mm of topsoil at a rate of 4 tons per hectare. No material bearing fruit or seed and/or capable of vegetative reproduction shall be chipped and used as mulch.</p> <p data-bbox="384 645 512 672">Composting</p> <p data-bbox="384 707 839 734">Organic garden waste shall be composted.</p> <p data-bbox="384 770 488 797">Fertilising</p> <p data-bbox="384 833 1422 1072">Soil analysis tests on the top 75 mm of prepared surface shall be performed prior to revegetation/seeding to determine the required fertiliser levels for vegetative cover. These levels should be in line with the following used for dry land production of pasture grasses: Nitrogen at 70kg/ha-1, Potassium at 40kg/ha-1 and Phosphorus at 20kg/ha-1. The fertiliser application rate will be dependent on the fertiliser mix and application rates as identified during soil analysis. These requirements will be determined from findings following tests done on adjacent lands or prior to decommissioning and rehabilitation activities commencing. The nutrient levels of the soil, after fertiliser application within the site, shall be similar to nutrient levels in adjacent lands.</p> <p data-bbox="384 1108 979 1135">Fertilisers shall contain both macro and micro elements.</p> <p data-bbox="384 1171 1374 1198">All soil analyses tests must be done by an AgriLASA and SANS 17025 accredited laboratory.</p>
Hydro seeding	<p data-bbox="384 1234 560 1261">Seed acquisition</p> <p data-bbox="384 1296 1430 1447">Seed shall be purchased from a South African National Seed Organization (SANSOR) accredited dealer. Seed used for rehabilitation shall not be older than one season. Purchased seed must be of the correct species and of known origin, dried and packed, conforming to all legal requirements for seed. Proof of compliance must be provided to the Municipal Manager prior to commencement of works.</p> <p data-bbox="384 1482 783 1509">Hydro seeding/Conventional Seeding</p> <p data-bbox="384 1545 1430 1664">The Municipal Manager shall appoint a reputable hydro seeding/conventional seeding company to undertake the hydro seeding/conventional seeding. The appointed Contractor shall ensure that an approved hydro seeding machine is used capable of dispensing a uniform solution of seed, anti-erosion compound, fertiliser and water.</p> <p data-bbox="384 1700 1422 1796">The seed mix required for re-vegetation will be dispensed at a rate of not less than 20 kilolitres of water per hectare. This mixture will comprise a selection of species that are indigenous and locally occurring, and capable of growing under natural conditions (see Appendix 1).</p> <p data-bbox="384 1832 1402 1921">The hydro seeding machine shall be thoroughly cleaned after each application and before a different seed mix is introduced into it. This is to prevent contamination of the specific seed mix with alien seed stock that could potentially become invasive.</p> <p data-bbox="384 1957 1406 1998">Hydro seeding/conventional seeding shall only be carried out after the first good rains (minimum of 5 mm) have fallen during the summer rainfall period. All hydro seeding/conventional seeding</p>

Activity /Issue	Action required
Closure	<p>activities shall be completed one month before the end of the growing season.</p> <p>The mixture of species, appropriate for the site, is recommended in Annexure 2.</p> <p>The grass cover requirements at the end of the growing seasons following the rehabilitation work and hydro seeding are:</p> <p>60% cover of the approved seed mix species diversity after the first growing season.</p> <p>80% cover of the approved seed mix species diversity after the second growing season.</p> <p>The appointed Contractor shall be held liable during the Defects Notification Period applicable to rehabilitation will commence when the 60% grass cover is achieved and end when 80% grass cover is achieved.</p>
Alien Vegetation Control	<p>The rehabilitated areas shall be maintained weed and invader plant free. An active programme must be implemented to ensure no further spread of these plants in adjacent areas occurs.</p> <p>Control of weeds and invader plants must be done in accordance with accepted control measures implementable for each species.</p> <p>The Municipal Manager shall identify and manage invasive and other noxious plants as per the requirements of the Conservation of Agricultural Resources Act's (Act 43 of 1983) Regulations (Notice No. R. 1048 of 25 May 1984, as amended by Government Notice No. R. 2687 of 6 December 1985) pertaining to weeds and invader plants control. As such, the following measures shall apply:</p> <ul style="list-style-type: none"> • Category 1 weeds and invader plants: the Municipal Manager shall actively remove all growth forms of Category 1 weeds from all works areas, at all times; and • Category 2 and 3 weeds and invader plants: the Municipal Manager shall actively remove all Category 2 and 3 plants prior to flowering. <p>The National Environmental Management: Biodiversity Act's (Act 10 of 2004) Regulation (Notice No. R. 507 of 19 July 2013) pertaining to invasive species control shall also apply.</p> <p>All weeds and invader plants shall be controlled before the setting of seeds. All such material must be removed to a registered landfill site. The transportation of such material must not result in the spread of weeds and invader plant species along public or private roads.</p>
Reinstatement of Infrastructure	<p>Roads</p> <p>Roads and kerbing impacted upon by the garden waste site shall be reinstated.</p> <p>Fences</p> <p>All existing fencing removed or damaged during the operation of the site must be replaced with new fencing of the same or upgraded standard.</p> <p>The Municipal Manager must ensure all fence lines and gates are protected from damage as a result of activities associated with the decommissioning and rehabilitation phase.</p>

Activity /Issue	Action required
Closure	Access to the site must be restricted to prevent illegal access and dumping.
Prevention of Further Illegal Dumping	<p>Fencing</p> <p>All existing fencing shall be repaired and maintained to prevent access for illegal dumping.</p> <p>Awareness</p> <p>The local community shall be informed of the site closure and conversion and made aware of further alternatives through public meetings, the placement of notices in local newspapers and other advertisements.</p> <p>Signage</p> <p>The Municipal Manager shall ensure placement of signage close to the road informing the public of site closure and conversion and providing details on alternative transfer sites.</p> <p>Security</p> <p>Maintain security at the site for a short period after closure to prevent potential illegal dumping and / or vandalism.</p>
Vermin Control	Ensure adequate vermin control to prevent migration of vermin into residential areas after removal of suitable habitat and food source.

9. Engineering Closure Methods for Existing Communal Landfill Sites

9.1 Aim and Objectives

The aim is to provide guidelines for closure of the existing communal landfill site. The Pearly Beach landfill site is un-licensed and pre-date the Minimum Requirements for Waste Disposal by Landfill (DWAF, 1998). Consequently the planning, engineering and operations were not implemented at the sites.

All waste disposal facilities need to be closed and rehabilitated after their intended design life. Closure plans are best developed before a landfill is put into service, but in this case, no proposed closure plan was ever prepared. Thus a rehabilitation plan is required to close the site and to monitor the effectiveness of the closure into the future.

The Department of Water Affairs and Forestry (DWAF), Minimum Requirements for Waste Disposal by Landfill (Second Edition, 1998); Table 12; summarizes the requirements for the closure of a landfill site. In terms of the Minimum Requirements, the closure and end use plan must include the following:

- Evaluation of the current status of the landfill.

- Comparison of the current status of the landfill with the closure design including end use requirements.
- Recommendations for upgrading the existing condition of the landfill to that desired.
- Detailed plans for management, monitoring, inspection and maintenance of the site once it has been closed.

The current status of the landfill is detailed in the main Basic Assessment Report, of which this is an Appendix. This report is structured as follows:

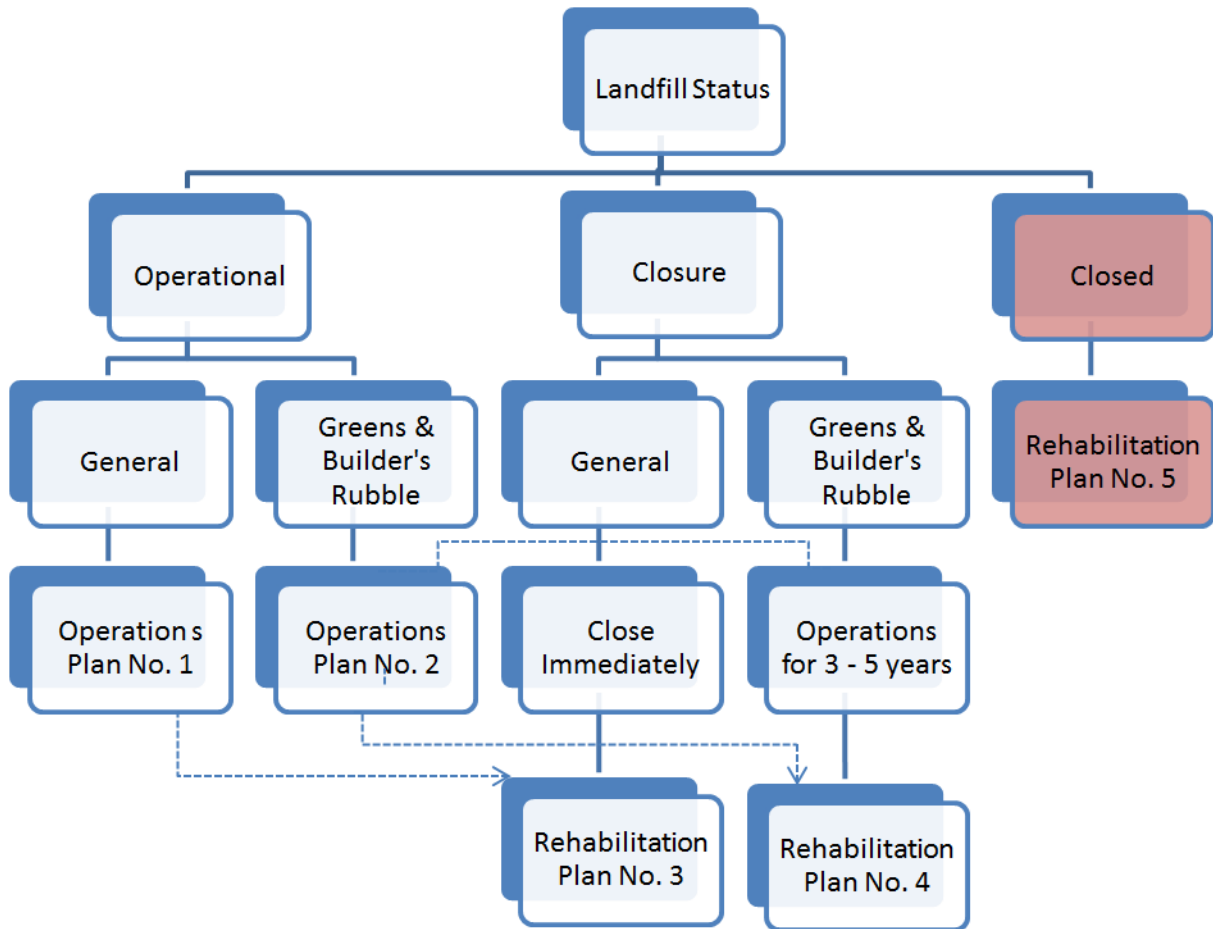
- Identification of end land use
- Conceptual Closure Design and Proposals for Rehabilitation
- Closure Design
- Monitoring and auditing

9.2 Identification of End Land Use

A new waste water treatment works (WWTW) facility is planned on the site. During the planning stage of the WWTW, the information contained in this document must be taken into account. Financial provision should be made for additional waste material that has to be taken to landfill and disposed of properly and responsibly. Waste material might be encountered during the construction of the new stabilization ponds. A geotechnical investigation is required before detailed design and construction of the WWTW.

The site in question needs to be closed and rehabilitated to prevent any further disposal of waste and contamination of land. The closure will entail earthworks and capping as described hereafter. Final end use of the site will then be open field where natural vegetation will be re-introduced and the site could be used for grazing or other agricultural uses at a later stage.

The appropriate route for rehabilitation of the landfill can be shown in the figure below.



9.3 Conceptual Closure Design and Proposals for Rehabilitation

The Closure design and proposals for rehabilitation made under this section of the Report address the requirements as per the Minimum Requirements for Waste Disposal by Landfill (Second Edition, 1998).

The following recommendations are made in order to prevent or reduce the impact of the landfill on the geohydrology by:

- Minimising the ingress of rain and stormwater into the waste material by diverting the stormwater around the site.
- It is recommended that the site be isolated and that no further development or dumping of additional waste of any kind be carried out.

9.4 Requirements for Closure Design

The final closure design:

- Ensures that any identified pollution risk is mitigated and managed. Pollution control is the primary function of the closure design;
- Reduces the infiltration of precipitation into the landfill to control leachate generation;
- Separates the waste in the landfill from its surrounding environment; and
- Minimises fugitive emissions of landfill gas through the surface of the cap

Table 7: Engineering Specifications – Closure Design

Activity /Issue	Action required
Closure	
Closure Methodology	<p>The following steps are envisaged in the closure design:</p> <ul style="list-style-type: none"> • Consolidate the waste that has been illegally dumped on site and take to a legal landfill. This includes waste that has a thin layer of cover. • Repair the erosion gullies by filling them.
Surveying	<p>The site must be surveyed by a professional land surveyor to determine the shape of the waste body, the general sloping of the ground within the site, the boundary of the property concerned and location of site infrastructure. The survey informs the infrastructure that has to be in place and the way it fits into the terrain. An exercise to quantify the amount of waste within the landfill cells and the remaining airspace can also be done via survey data and DTM modelling.</p>
Storm Water Management System	<p>Storm water management and drainage planning are critical components on waste management sites during operations and after closure of the site. Therefore the storm water management infrastructure should be designed to comply with Government Notice 704 of the National Water Act of 1998.</p> <p><u>Objectives</u></p> <p>The design focuses on mitigating potential adverse effects of inadequate storm water management at the site. The objectives of a Storm Water Management Plan (SWMP) can be summarised as:</p> <ul style="list-style-type: none"> • to protect water resources from pollution by separating and collecting all storm water that has a poor quality into dirty water ‘storage’ facilities for treatment before discharging into the environment or reuse within the site operations where applicable. • to ensure that all storm water management infrastructure is designed to handle a 1 in 50 year storm event and is not adversely affected by a 1 in 100 year storm event. • to maintain downstream water quantity and quality requirements by ensuring that the maximum volume of clean water runoff is diverted directly to the natural watercourses and the minimum amount of clean storm water is contaminated and thus enhancing the overall catchment yield. <p>All the storm water that falls on part of the landfill cell which is not operational (and probably capped) will not be allowed to get mixed with the dirty water and will be diverted to natural water courses around the site.</p> <p>In addition to meeting the fore mentioned objectives, the storm water management system will ensure that:-</p> <ul style="list-style-type: none"> • contaminated areas will be minimized and remain isolated from clean areas • clean storm water may be reused in the site operations • seepage losses from waste management facilities are minimized and overflows are prevented. <p><u>Classification of Areas according to land use</u></p> <p>Good storm water management is based on separating clean and dirty water and therefore incorporates the fundamental principle of pollution prevention. The site should be divided into dirty and clean areas. The storm water that fall on these areas shall be classified as dirty storm water</p>

Activity /Issue	Action required																																																									
Closure	<p>and clean storm water respectively.</p> <p><u>Hydrology</u></p> <p>Hydrological investigations were completed at desktop level for the site to determine the amount of stormwater to be diverted away from the landfill using drains. The Rational Method was used to determine the flows. The flows obtained are indicative of the expected values. The following inputs were used for the calculations:</p> <ul style="list-style-type: none"> • length of the longest water course for the sub catchment being drained • difference in elevation between the highest point and the lowest point in the catchment • the catchment area contributing to the runoff . • the general permeability of the soils • vegetation cover and • the general distribution of the sloped and flat areas. <p>After runoff quantities have been calculated, storm water drains will be designed to cater for the flows. The table below shows a summary of the hydrological output.</p> <table border="1" data-bbox="395 1066 1442 1368"> <thead> <tr> <th colspan="2" data-bbox="395 1066 683 1133">Name of the Site</th> <th colspan="7" data-bbox="683 1066 1442 1133">Pearly Beach</th> </tr> <tr> <th colspan="2" data-bbox="395 1133 683 1178">Site Data</th> <th colspan="7" data-bbox="683 1133 1442 1178">Estimated Peak Discharges (m³/s)</th> </tr> <tr> <th data-bbox="395 1178 564 1267">Catchment Area (km²)</th> <td data-bbox="564 1178 683 1267">0.0201</td> <th data-bbox="683 1178 791 1267">1:2 year</th> <th data-bbox="791 1178 900 1267">1:5 year</th> <th data-bbox="900 1178 1008 1267">1:10 year</th> <th data-bbox="1008 1178 1117 1267">1:20 year</th> <th data-bbox="1117 1178 1225 1267">1:50 year</th> <th data-bbox="1225 1178 1334 1267">1:100 year</th> <th data-bbox="1334 1178 1442 1267">1:200 year</th> </tr> <tr> <th data-bbox="395 1267 564 1323">Estimated MAP (mm)</th> <td data-bbox="564 1267 683 1323">487</td> <td data-bbox="683 1267 791 1323">0.0215</td> <td data-bbox="791 1267 900 1323">0.0311</td> <td data-bbox="900 1267 1008 1323">0.0418</td> <td data-bbox="1008 1267 1117 1323">0.0574</td> <td data-bbox="1117 1267 1225 1323">0.0937</td> <td data-bbox="1225 1267 1334 1323">0.1389</td> <td data-bbox="1334 1267 1442 1323">0.1710</td> </tr> <tr> <th data-bbox="395 1323 564 1368">Region</th> <td data-bbox="564 1323 683 1368">Coastal</td> <td colspan="7"></td> </tr> </thead></table> <p>The typical section for drain construction is shown in the site layout below. The drains will have a depth ranging from 300mm to 800mm and the width ranging from 800mm to 1500mm.</p> <p><u>Storm Water Management Infrastructure</u></p> <p>The table below shows some elements that may be incorporated into the storm water management systems on sites and the respective purposes.</p> <p>Table 6: Elements of a typical storm water management system.</p> <table border="1" data-bbox="383 1816 1246 1991"> <thead> <tr> <th data-bbox="383 1816 818 1883">Element</th> <th data-bbox="818 1816 911 1883">Supply</th> <th data-bbox="911 1816 1046 1883">Convey</th> <th data-bbox="1046 1816 1246 1883">Store/other</th> </tr> </thead> <tbody> <tr> <td data-bbox="383 1883 818 1951">Storm water drains (usually trapezoidal in shape)</td> <td data-bbox="818 1883 911 1951"></td> <td data-bbox="911 1883 1046 1951">√</td> <td data-bbox="1046 1883 1246 1951"></td> </tr> <tr> <td data-bbox="383 1951 818 1991">Diversion Berms</td> <td data-bbox="818 1951 911 1991"></td> <td data-bbox="911 1951 1046 1991">√</td> <td data-bbox="1046 1951 1246 1991"></td> </tr> </tbody> </table>	Name of the Site		Pearly Beach							Site Data		Estimated Peak Discharges (m ³ /s)							Catchment Area (km ²)	0.0201	1:2 year	1:5 year	1:10 year	1:20 year	1:50 year	1:100 year	1:200 year	Estimated MAP (mm)	487	0.0215	0.0311	0.0418	0.0574	0.0937	0.1389	0.1710	Region	Coastal								Element	Supply	Convey	Store/other	Storm water drains (usually trapezoidal in shape)		√		Diversion Berms		√	
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Activity /Issue	Action required
Closure	
	<p data-bbox="379 461 635 490"><u>Design of the Elements</u></p> <p data-bbox="379 521 1437 640">The storm water flowing towards the site will be collected away from the waste facilities in drains or will be diverted by berms to the downstream side of the facilities. After capping of the landfill all the water falling on top of the landfill is considered clean therefore it can be released directly to the water courses downstream of the landfill.</p>

The general layout of the proposed infrastructure is shown in the figure below.



10. TIMEFRAMES FOR REHABILITATION

Rehabilitation works shall proceed after the first good rains (minimum of 5 mm) have fallen during the rainfall period. All hydro seeding/conventional seeding activities shall be completed one month before the end of the growing season.

11. POST CLOSURE AND CONVERSION MONITORING, INSPECTIONS AND MAINTENANCE

The appointed Contractor will be responsible for environmental control on site during rehabilitation and the maintenance period. During rehabilitation, activities will be monitored and recorded by an ECO and audited against the EMPr. Photographic records of the site will support the visual assessment. Monitoring and incident information will be communicated to the Municipal Manager. Any complaints will be recorded and investigated.

After rehabilitation, the site needs to be inspected and monitored to ensure that the rehabilitation activities have been successful and maintained. The monitoring actions are:

- Inspection of all erosion and sediment control devices on a regular basis, particularly after heavy rains.
- Inspection of the site to check for soils compaction and contamination.
- Water control drains and channels will be checked regularly and after each heavy rainfall to ensure they are functioning correctly.
- General housekeeping will be examined regularly to ensure stormwater runoff does not contain refuse or contaminants.
- Noise generated on site will be subjectively assessed during site inspections.
- An audit (summer) of rehabilitated areas will be undertaken to record species composition and cover.
- Ongoing assessment of unsuccessful areas and erosion, stability and drainage re-establishment.
- Adequacy of bunding will be assessed.
- Records of spills will be examined in the environmental incident register.
- Staff will be questioned regarding their understanding of chemical management.

Incident reports will be checked to ensure that appropriate follow-up actions were taken.

The specifications made under this section address the requirements as per the Minimum Requirements for Waste Disposal by Landfill (Second Edition, 1998).

Table 9: Engineering Specifications – Post Closure Monitoring

Activity / Issue	Action required
Closure	
On-going Monitoring	<p data-bbox="379 1727 903 1760"><u>Site Inspections, maintenance and management</u></p> <p data-bbox="379 1789 1436 1852">The following specifications are important in order to meet the requirements on-going site inspections, maintenance and management.</p> <ul style="list-style-type: none"> <li data-bbox="435 1883 1436 1946">• The fence must be regularly inspected so that no further development or dumping of additional waste of any kind can be carried out after the closure of the site. <li data-bbox="435 1948 1436 2007">• The security of the site should be maintained at all times to prevent illegal access and dumping.

Activity /Issue	Action required
Closure	<ul style="list-style-type: none"> • The site must be inspected at 3 monthly intervals. Once the stability of the site has been established, the inspection interval can be extended in consultation with the Department. • Inspection of the cover integrity must include the following: the presence of any depressions, evidence of ponding, evidence of erosion. • Any breach in cover integrity needs to be reported, the cause identified and the situation restored by infilling. • Any areas of subsidence must be filled. • Evidence of ponding or poor drainage must be corrected. • Fires need to be identified, exposed and covered with soil. • The vegetation that has been established on the landfill needs to be maintained in order to prevent erosion. • Alien vegetation must be removed.

12. REFERENCES

Aecom. 2014. Basic Assessment Report. Licence for Closure of Pearly Beach G: C: B+ Waste Disposal Facility (WDF), Overstrand Local Municipality, Western Cape.

ANNEXURE A

Locality Map

ANNEXURE B

Seed Mix