

ENVIRONMENTAL MANAGEMENT PROGRAMME FOR ERF 9445 STELLENBOSCH October 2018

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COMMITMENT AND DECLARATION OF UNDERSTANDING BY CONTRACTOR AND DEVELOPER FOR THE PROPOSED IDAS VALLEY RESIDENTIAL DEVELOPMENT ON ERF 9445

I, the undersigned, as duly authorized by the Contractor, have studied and understand the contents of this document. On behalf of the Contractor, I confirm that the Contractor undertakes to adhere to the conditions as set out herein, unless specifically otherwise agreed to in writing.

Signed at on this Day of20.....

.....
For Contractor

I, the undersigned, as duly authorized by the Developer have studied and approve the contents of this document on behalf of the Developer, for implementation by all Contractors involved at the site.

Signed at on this day of20.....

.....
Developer's Representative

DEFINITIONS

Auditing:	A systematic and objective assessment of an organization's activities and services conducted and documented on a periodic basis based to a (e.g. ISO 19011:2003) standard.
Biodiversity:	The variety of life in an area, including the number of different species, the genetic wealth within each species, and the natural areas where they are found.
Contractor:	An employer, as defined in section 1 of the Occupational Health and Safety Act 85 of 1993, who performs construction work and includes principal contractors
Environment:	A place where living, non-living and man-made features interact, and where life and diversity is sustained over time.
Evaporation:	The change by which any substance (e.g. water) is converted from a liquid state into and carried off as vapour.
Developer:	One who builds on land or alters the use of an existing building for some new purpose
Independent:	Is independent and has no interest in any business related to the development site, nor will receive any payment or benefit other than fair remuneration for the task undertaken
Groundwater:	Subsurface water in the zone in which permeable rocks, and often the overlying soil, are saturated under pressure equal to or greater than atmospheric.
Landowner:	Holder of the estate in land with considerable rights of ownership or, simply put, an owner of land
Monitoring:	A systematic and objective observation of an organisation's activities and services conducted and reported on regularly.
Natural vegetation:	All existing vegetation species, indigenous or otherwise, of trees, shrubs, groundcover, grasses and all other plants found growing on a site.
Pollution:	The result of the release into air, water or soil from any process or of any substance, which is capable of causing harm to man or other living organisms supported by the environment.
Protected Plants:	Plant species officially listed under the Threatened or Protected Species regulations as well as on the Protected Plants List (each province has such a list), and which may not be removed or transported without a permit to do so from the relevant provincial authority.
Red Data Species:	Plant and animal species officially listed in the Red Data Lists as being rare, endangered or threatened.
Rehabilitation:	Making the land useful again after a disturbance. It involves the recovery of ecosystem functions and processes in a degraded habitat. Rehabilitation does not necessarily re-establish the pre-disturbance condition, but does involve establishing geological and hydro logically stable landscapes that support the natural ecosystem mosaic.
Site:	Property or area where the proposed development will take place

ACRONYMS

DEA&DP:	Department of Environmental Affairs and Development Planning
DWS:	Department of Water and Sanitation
ECO:	Environmental Control Officer
EA:	Environmental Authorisation
EIA:	Environmental Impact Assessment
EM:	Environmental Manager
EMP:	Environmental Management Programme
EO:	Environmental Officer
ER:	Engineer's Representative
I&AP:	Interested and Affected Party
IEM:	Integrated Environmental Management
PM:	Project Manager
SANS:	South African National Standards

TABLE OF CONTENTS

CHAPTER 1	7
1.1. Executive Summary.....	7
1.2. Project Description	7
CHAPTER 2	9
2.1 Organizational Structure.....	9
2.2 Responsibilities and Functions of the Environmental Control Officer	9
2.3 Agreed Work Plan and Site Visit Schedule of ECO	9
2.4 Site Manager	10
2.5 Contractors	10
2.6 Record keeping of activities, inclusive of recording of non-compliances and corrective actions	10
2.7 Compliance with other legislation	11
CHAPTER 3	11
3.1 Applicable Legislation Identified	11
CHAPTER 4	11
4.1 Monitoring and Auditing.....	11
4.1.1 Introduction.....	11
4.1.2. Roles and responsibilities.....	12
4.2 The Monitoring Procedure	12
4.3 The Auditing Procedure.....	13
4.4 Retentions and Penalties	13
4.4.1. The Retention System.....	14
4.4.2. Penalty System.....	14
4.5 Method Statements	14
CHAPTER 5	18
5.1. Good Housekeeping.....	18
5.2 Record Keeping.....	18
5.3 Document Control.....	18
5.4 Reporting Requirements	19
CHAPTER 6	19
6.1. Public Communication Protocols.....	19
CHAPTER 7	19
Operational Phase	37
CHAPTER 8	50
Environmental Reporting.....	51
CHAPTER 9	54
Decommissioning Phase.....	54
CHAPTER 10	55
Rehabilitation Specifications and Site Clean-Up	62
CHAPTER 11	63
Environmental Awareness Induction Course Material	63
CHAPTER 12	71
Compliance with the Environmental Authorisation	71
CHAPTER 13	71
Updating/Adapting the EMP	71
References	71

DEVELOPER'S COMMITMENT

The Stellenbosch Municipality ("SM") has committed itself to a set of values that include the maintenance of good relations and transparent communications with all stakeholders, and the dynamic engagement of the larger community.

SM undertakes to implement suitable management systems for all the areas and aspects of this operation. This will ensure that development itself and management of the project will comply with legal, technical, environmental and transformation policies and standards.

SM, in drafting this EMP for implementation, intends to enable continuous improvement in legal compliance and the sustainable operation of the site.

This EMP intends to further guide the achievement of the strategic objectives of the organization at the project site and seeks to ensure that the basic requirements of ISO 14001: 2015 are satisfactorily met.

The EMP intends to change the way in which the owners, the construction process they have commissioned and the contractor plan for and manage resources to achieve sustainability.

The satisfactory implementation of the EMP on site will require both the full support and commitment of all personnel.

CHAPTER 1

1.1. Executive Summary

This EMP has been prepared principally in compliance with the requirements of Section 24N and Section 34 of the National Environmental Management Act 107 of 1998. This document, together with the conditions in the Environmental Authorisation, must be adhered to.

The EMP must be included as part of all contract documentation for all contractors in the construction phase of the development.

The Author and Eco Impact Legal Consulting (Pty) Ltd ("Eco Impact")

Eco Impact is an independent consulting company and has no interest in any business related to the development site, nor will it receive any payment or benefit other than fair remuneration for the task undertaken, as required in terms of the NEMA Regulations.

This report has been prepared by Jessica Le Roux, of Eco Impact, an environmental consultancy, engaged in providing professional services in the field of environmental planning, -systems, -auditing and -biodiversity assessment and -management.

Jessica Hansen has completed her professional registration in terms of section 20(3) (b) of the Natural Scientific Professions Act, 2003 (Act 27 of 2003) as a Professional Natural Scientist in the field of practice Environmental Science (Registration number 400192/16). She obtained her BSc (Honours) in Environmental and Geographical Science in 2011 from the University of Cape Town and subsequently obtained her MSc in Zoology (Applied Marine Science) in 2013.

Jessica has trained as an Environmental Assessment Practitioner since August 2013 and has been involved in the compilation, coordination and management of Basic Assessment Reports, Environmental Impact Assessments, Environmental Management Programmes, Waste Licence Applications, Water Use Licence Applications and Baseline Biodiversity Surveys for numerous clients. refer to Appendix M3 for CV of the EAP.

1.2. Project Description

This section of the report is included in compliance with Section 24N (2) (e) of the National Environmental Management Act, 107 of 1998.

The Stellenbosch Municipality proposes a housing development which entails the following:

Work conducted to date:

- Gabions complete between CH 350 and CH 118.3
- Between CH 118.3 and CH 108.8 the gabions are halfway and needs to be completed.
- Between CH 108.8 and CH 38 the excavation is about complete but will need to be cleaned and inspected before gabions are constructed as per design.
- South river crossing: gabion mattress protection, 2 x1500 x 1200 rectangular portal culverts

Work still to be conducted:

- Between CH 80 and CH 60 a stabilizing layer of rock fill wrapped in geotextile is to be placed before the construction of the gabions as per design.
- Silt removal within the watercourse still to be conducted. The middle section of the water course has a built up of silt that affect the flow of the river and the silt in this area must be removed to reinstate the river flow channel which is prominent upstream and downstream. Silt is to be use to naturalise and stabilise the gabions as per the request of DWS.
- Portion A of the river: Embankment re-sloping, Portion B of the river: extensive re-sloping works and vegetation clearing and Portion C of the river: limited rehabilitation requirements other than vegetation control.
- Rehabilitation of the river and wetland as per the FRESHWATER RESOURCE REHABILITATION AND IMPLEMENTATION PLAN FOR THE PROPOSED IDAS VALLEY RESIDENTIAL DEVELOPMENT ON ERF 9445, STELLENBOSCH, WESTERN CAPE PROVINCE dated September 2018.
- 166 subsidy housing erven (single residential)
- 3 public open space erven
- 2 local authority erven (roads and substation)
- 600m² retention pond
- North river crossing: gabion mattress protection, 2 x1500 x 1200 rectangular portal culverts

See proposed layout map in Annexure C for the residential development:

CHAPTER 2

This section of the report is included in compliance with Section 24N (2) (e) of the National Environmental Management Act 107 of 1998.

It deals with issues relating to the implementation of the EMP.

2.1 Organizational Structure

The organizational structure identifies and defines the responsibilities and authority of the various persons and organizations involved in the project. All instructions and official communications regarding environmental matters must follow the organizational structure.

The Environmental Official (EO), to whom the Engineer's Representative (ER) and/or Environmental Control Officer (ECO) must report and interact, must be the responsible client representative.

The EMP must be an agenda item at the monthly site and operations meetings and the responsible client representative(s) may attend these meetings in order to provide input with respect to compliance with the EMP.

2.2 Responsibilities and Functions of the Environmental Control Officer

The ECO will be responsible for monitoring, reviewing and verifying compliance with the EMP and/or EA by all contractors and site management during site visits.

The ECO duties in this regard will include the following:

With the assistance, where necessary of the ER, to ensure all necessary environmental authorizations and permits have been obtained and are available and visible on site at the ER offices.

- monitor and verify that the EMP and/or EA is adhered to at all times and by taking action if the specifications are not followed;
- monitor and verify that environmental impacts are kept to a minimum;
- review and approve construction method statements, with input as appropriate from the ER;
- assist the contractor in finding environmentally responsible solutions to problems;
- report on the environmental issues at the site meetings and other meetings that may be called regarding environmental matters, if requested by ER;
- inspect the site and surrounding areas regularly with regard to compliance with the EMP and/or EA;
- monitor the environmental awareness training for all personnel coming onto site;
- advise management on the removal of person(s) and/or equipment not complying with the specifications, after collaboration with the ER. Recommendations must be recorded by the ER in a Site Instruction Book;
- ensure that activities on site comply with known legislation of relevance to the environment;
- recommend the issuing of penalties via the developer for contraventions of the EMP and/or EA;
- keep a photographic record of progress on site from an environmental perspective; and
- undertake a continual internal review of the EMP and/or EA and submit a report to the developer and the responsible DEA&DP Environmental Official according to EA conditions.

2.3 Agreed Work Plan and Site Visit Schedule of ECO

After initial construction start-up site visit it is recommended that an ECO site visit be conducted once a month during construction.

Information recording activity on site, and any guidelines or instructions emanating from there will be routinely made available electronically to the developer and applicable contractors and a copy of the report must be available at the site office.

Clearly matters of urgency or immediate action may be channelled appropriately on an urgent basis.

2.4 Site Manager

The site manager will have the following environmental control responsibilities:

- In conjunction with the ECO will present the environmental education programs to all persons employed on site.
- Consult with the ECO, landowner, developer and any contractor to resolve all environmental issues.
- Issue any instructions from the ECO to the management team via a formal site instruction book or appropriate management tool used for the purpose.
- Take responsibility for the penalty system. The ECO and developer recommendations must be considered when deciding whether or not to impose a penalty.
- The engineer will, via the ECO actions, be accountable for the overall implementation of the Environmental Management Programme.
- Keep a site diary and complaints register.

2.5 Contractors

As part of any tender, the tendering contractor must submit a first draft of a contractor's programme, to the developer which must include the environmental considerations to be followed prior to appointment.

The appointed Contractor's representative will have the following responsibilities:

- Ensure that all staff is familiar with the Environmental Management Programme, which explains the environmental policy for the project.
- Allow for sufficient time between surveying the exact locations where services will be intended and actual construction, for the ECO to facilitate and instruct for the removal of plants, seeds and cuttings if necessary.
- The contractor must keep his personnel fully aware of environmental issues and ensure they show adequate consideration to all environmental aspects.
- Establish environmental signs to be erected on the construction site at locations identified by the ECO and approved by the engineer.
- Be responsible for the cost of the restoration of any damage caused, in environmentally sensitive areas, as a result of contractor responsibility regarding negligence. This must be done in accordance with the engineer / ECO's specifications.
- Take responsibility and active steps to avoid any increase in the fire hazard.
- The contractor must take responsibility for implementing all the relevant provisions of the EMP, or if he encounters difficulties with the specifications, he must discuss alternative approaches with the ECO and engineer prior to proceeding.

Failure to comply with the EMP may result in the application of fines as set out, and any reported non-compliance may result in the suspension of work or termination of a contract.

2.6 Record keeping of activities, inclusive of recording of non-compliances and corrective actions

The site must keep a record of all activities relating to environmental matters on site, including:

- meetings attended;
- method statements received and approved;
- issues arising on site;
- cases of non-compliance with the EMP;
- corrective actions taken and penalties issued.

This information will be recorded in an appropriate manner in a site diary, registers, issues/warning book, etc.

2.7 Compliance with other legislation

It is important that all on site staff are aware of other relevant legislation that may relate to the activities taking place on site, especially local authority required compliances.

CHAPTER 3

Applicable Legislation, Policy and Environmental Principles

3.1 Applicable Legislation Identified

1. ADVERTISING ON ROADS AND RIBBON DEVELOPMENT ACT, 21 OF 1940
2. BASIC CONDITIONS OF EMPLOYMENT ACT 75 OF 1997
3. COMPENSATION FOR OCCUPATIONAL INJURIES AND DISEASES ACT 130 OF 1993
4. CONSERVATION OF AGRICULTURAL RESOURCES ACT, 43 OF 1983
5. CONSTITUTION OF THE REPUBLIC OF SOUTH AFRICA, 1996
6. ENVIRONMENT CONSERVATION ACT, 73 OF 1989, WESTERN CAPE NOISE CONTROL REGULATIONS
7. EMPLOYMENT EQUITY ACT, 55 OF 1998
8. ENVIRONMENT CONSERVATION ACT, 73 OF 1989
9. FENCING ACT, 31 OF 1963
10. HAZARDOUS SUBSTANCES ACT, 15 OF 1973
11. LABOUR RELATIONS ACT 66 OF 1995
12. NATIONAL BUILDING REGULATIONS AND BUILDING STANDARDS ACT, 103 OF 1977
13. NATIONAL ENVIRONMENTAL MANAGEMENT ACT, 107 OF 1998
14. NATIONAL ENVIRONMENTAL MANAGEMENT: AIR QUALITY ACT 39 OF 2004
15. NATIONAL ENVIRONMENTAL MANAGEMENT: BIODIVERSITY ACT, 10 OF 2004
16. NATIONAL ENVIRONMENTAL MANAGEMENT: WASTE ACT, 59 OF 2008
17. NATIONAL FORESTS ACT, 84 OF 1998
18. NATIONAL HERITAGE RESOURCES ACT, 25 OF 1999
19. NATIONAL VELD AND FOREST FIRE ACT, 101 OF 1998
20. NATIONAL WATER ACT 36 OF 1998
21. OCCUPATIONAL HEALTH AND SAFETY ACT 85 OF 1993
22. TOBACCO PRODUCTS CONTROL ACT 83 OF 1993
23. WATER SERVICES ACT 108 OF 1997
24. STELLENBOSCH LOCAL MUNICIPALITY: BY-LAW RELATING TO THE CONTROL OF BOUNDARY WALLS AND FENCES
25. STELLENBOSCH LOCAL MUNICIPALITY: BY-LAW ON STREETS
26. STELLENBOSCH LOCAL MUNICIPALITY: COMMUNITY FIRE SERVICES BY-LAW
27. CAPE WINELANDS DISTRICT MUNICIPALITY: MUNICIPAL HEALTH BY-LAW
28. CAPE WINELANDS DISTRICT MUNICIPALITY: FIRE SAFETY BY-LAW

CHAPTER 4

This section of the report is included in compliance with Section 24N (2) (e) of the National Environmental Management Act, 107 of 1998.

Compliance

4.1 Monitoring and Auditing

4.1.1 Introduction

In keeping with current environmental and associated legislation, all environmental management procedures and actions must be reviewed and refined on an ongoing basis.

This is in accordance with the dynamic nature of environmental management and allows for the timely identification and mitigation of issues as they come to light.

The process of review and refinement, built into the requirements of the EMP, is known as monitoring and auditing.

4.1.2. Roles and responsibilities

Efficient implementation of the performance specifications, effective monitoring and auditing, as well as clear responsibility and accountability allocation requires that various role-players be defined for the construction implementation project.

Depending on the nature and scale of a project, implementing teams could be composed of any number of role-players, each with their own specified responsibilities.

Therefore, for the purpose of this document, the following role-players are defined, based purely on responsibility and accountability allocation. The actual designation of role-players may vary, but the responsibilities will largely remain as stated.

4.1.2.1. Developer/landowner or custodian of the land

The developer/landowner or custodian of the land is the person or organization with decision making capacity for the land in question, and thus ultimately accountable for what takes place on that land.

4.1.2.2. Contractor

Contractors are appointed to undertake the works as specified in the contract. It is the responsibility of the contractor to do whatever is necessary from their side to ensure that he or an appointed advisor is well versed in environmental studies, so that they may accurately and efficiently carry out the requirements of the environmental specification.

The contractor is liable for any and all remedial work required in terms of the environmental specification, resulting from his environmental negligence, mismanagement and / or non-compliance.

4.1.2.3. Environmental Control Officer

An environmental control officer will manage and undertake monthly environmental inspections for the duration of the construction phase of the project as required.

The contractors or line management are answerable to the ECO for non-compliance. Issues of non-compliance raised by the ECO/EO must be taken up by the project manager, and resolved as per the conditions of his contract.

Decisions regarding environmental procedures, specifications and requirements which have a cost implication (i.e. those that are deemed to be a variation and not allowed for in the performance specification) must be endorsed by the project manager.

4.2 The Monitoring Procedure

Environmental monitoring is the continuous evaluation of the status and condition of environmental elements. Its purpose is to detect change that takes place in the environment over time and involves the measuring and recording of physical, social and economic variables associated with development impacts.

Many techniques for environmental monitoring have been proposed, each detailing a specific protocol. Regardless of which technique is used, the ultimate aim is that each environmental management specification be checked by means of a system in which a score may be allocated for:

- Full compliance;
- Satisfactory performance;
- Unsatisfactory performance; and
- No action taken.

Completed monitoring reports will be submitted to the project engineer, developer/landowner and the contractor, who will attend to issues. These reports must be kept on file and be made available upon request by any environmental authority requesting such.

All persons employed, the contractor or his sub-contractors, must abide by the requirements of these performance specifications as they apply to the works. Any employees, the contractor or his sub-contractors found to be in breach of any of the environmental specifications, may be ordered to vacate the site forthwith and/or be subject to a disciplinary process.

The order may be given orally or in writing by the ECO. Confirmation of an oral order will be given as soon as practicable, but lack of confirmation in writing must not be a cause for the offender to remain on site, or not be subject to a disciplinary process. Supervisory staff, the contractor or his sub-contractor may not direct any person to undertake any activities which would place such person in contravention of the EMP, legislation and specifications.

The contractor and staff are deemed not to have complied with the performance specifications if:

- There is evidence of wilful or accidental contravention of any specification included in the specification;
- There is evidence of the contractor carrying out activities not permitted in terms of the EMP, contract and / or the specification;
- There is evidence of environmental negligence and / or mismanagement resulting in negative impacts on the environment;
- Has failed to meet with the requirements of the approved schedule.

The contractor and developer/landowner will be informed via ECO monthly reports, as well as by means of direct instruction (if necessary) as to what corrective actions are required in terms of environmental compliance.

Disregard for an instruction, and failure to respond adequately to complaints from the public will be construed as non-compliance. Non-compliance may lead to parties being penalised.

In more serious cases, the ECO may give notice, and halt operations until such a time that the corrective action is taken and the site complies with the performance specifications.

In cases of persistent non-compliance, the contractor or staff may be evicted from site after disciplinary process is followed. Only the developer/landowner may issue such instruction, retaining any costs required to remedy situations perpetuated by environmental negligence, mismanagement and / or non-compliance.

4.3 The Auditing Procedure

Environmental auditing is the process of comparing the impacts predicted with those which have actually occurred during implementation.

An environmental performance audit examines and assesses practices and procedures which, in the event of failure, would cause an environmental impact or result in an environmental risk. During each of the lifecycle phases, various issues will be monitored. The performance audit will ensure that the monitoring was correctly undertaken and that compliance was best achieved.

To these ends the project will be audited versus this EMP for effectiveness. ISO/SANS 19011:2011 auditing standards will be applied.

Audits will be undertaken at completion of the construction phases. Audit reports will be submitted to management, who will attend to all noted issues.

These reports must be kept on record and be made available upon request by the developer/landowner/custodian of the land and any environmental authority or I&AP requesting such.

4.4 Retentions and Penalties

It is recommended that a penalty retention system be combined with the penalty system to both motivate and compel the contractor to adhere to the EMP for the duration of the contract.

In this way incentives may be created to perform (i.e. in the form of the retention amounts that will only be paid to the contractor at the end of the contract), without creating the misunderstanding that adherence to the EMP is optional.

Persistent non-compliance will not only result in the contractor forfeiting any retention amount, but he will also be fined.

Of importance is that the contract specifies exactly how the penalty and retention system will operate, as well as how any funds resultant from retentions and penalties will be utilised.

All such funds must be used to improve environmental conditions on the site in general..

4.4.1. The Retention System

For this system, a percentage value for each of the sections priced for in the environmental bill of quantities is retained until the full completion of the contract works.

If the monitoring process reveals persistent and/or wilful non-compliance with any aspect of the environmental performance specifications, then the full retention associated with that particular item will be withheld.

The project may then apply these retained funds to rectify the problem on site possibly making use of other or alternate resources at his disposal.

At the end of the contract or action, all remaining environmental retention amounts will be paid out to the contractor or staff pending approval by the ECO, after having confirmed full compliance with the relevant performance and rehabilitation specifications.

4.4.2. Penalty System

A system of penalties will be introduced to reinforce environmentally sensitive and prudent behaviour. The maximum penalties that will be fined per incident that may be enforced are listed below. The penalty amount will be determined (inter alia) by the severity of the offence.

Non-compliance	R 5 000.00 (ex VAT) per non-compliant act, per day until compliance is achieved
Casual Litter on site resulting from operation	R250 / offence / day
Disposal of any litter or construction material in non-specified area or by non-compliant means	R5000 / m ³ / per day
Dumping of cement, concrete, fuel or oil in an area or other than that authorised and suitable	R10 000 per offence / day
Failure to use portable / toilets	R100 / observed incident or evidence of human excrement on site

In addition to the above, all costs incurred by the client / developer to remedy any damage will be the responsibility of the offender.

Should the monitoring process reveal acts of persistent and / or wilful non-compliance with the environmental performance specifications, then the contractor or staff member will be fined according to the specified value of that item.

4.5 Method Statements

Contractors must provide written statements for discussion with the ECO on environmentally sensitive aspects of the contract. Environmentally sensitive aspects include by example excavations, work close to sensitive areas, collection and storage of top soil and vegetation, erosion control, wash water control, waste control, etc.

Methods Statement (MS) Content

It is important to note that the ECO may request further methods specification, if it be deemed necessary in his view.

- MS to specify the fire drill procedure to be followed in the event of a fire.

- MS to state how pollution will be prevented from entering any environmental system. To include the methods of filtering out pollution such as oil, petrol and waste from any working areas or roads.
- MS to specify special measures that will be needed in the event of large pollution spills.
- MS to indicate the timing and sequence of events to follow in sensitive areas to give sufficient time for the ECO to survey these areas and remove plants.

The Method Statement must include a site plan, preparatory steps, materials, and supervision details.

Example of Environmental Method Statement Form:

METHOD STATEMENT

CONTRACT:..... **DATE:**.....

PROPOSED ACTIVITY (give title of method statement and reference number from the EMP):

WHAT WORK IS TO BE UNDERTAKEN (give a brief description of the works):

WHERE ARE THE WORKS TO BE UNDERTAKEN (where possible, provide an annotated plan and a full description of the extent of the works):

START AND END DATE OF THE WORKS FOR WHICH THE METHOD STATEMENT IS REQUIRED:

Start Date:

End Date:

HOW ARE THE WORKS TO BE UNDERTAKEN (provide as much detail as possible, including annotated maps and plans where possible):

Note: please attach extra pages if more space is required

DECLARATIONS

1) ENVIRONMENTAL SITE OFFICER/ ENGINEERS REPRESENTATIVE [select correct term]

The work described in this method statement, if carried out according to the methodology described, is satisfactorily mitigated to prevent avoidable environmental harm:

(signed)

(print name)

Dated: _____

2) PERSON UNDERTAKING THE WORKS

I understand the contents of this method statement and the scope of the works required of me. I further understand that this method statement may be amended on application to other signatories and that the ECO / EO and ER will audit my compliance with the contents of this method statement

(signed)

(print name)

Dated: _____

3) APPROVING AUTHORITY (Engineer)

The works described in this method statement are approved.

(signed)

(print name)

(designation)

Dated: _____

CHAPTER 5

This section of the report is included in compliance with Section 24N (2) (e) of the National Environmental Management Act 107 of 1998.

5.1. Good Housekeeping

The developer/landowner will ensure the maintenance of “good housekeeping” practices during operations.

This will help avoid several disputes regarding responsibility and will allow for the smooth running of the operation as a whole.

Good housekeeping extends beyond the environmentally sensitive construction methods to include the care for and preservation of the surrounding environment.

5.2 Record Keeping

The developer/landowner will ensure that a filing system, identifying all documentation related to the EMP, is established.

A list of reports likely to be generated during the project is set out below.

All applicable documentation must be included in the environmental filing system catalogue or document retrieval index.

- Approved EMP, authorizations, licenses or permits;
- Final design documents and diagrams issued;
- All communications detailing changes of design/scope that may have environmental implications;
- Daily, weekly and monthly site monitoring reports;
- Complaints register;
- Environmental training manual;
- Environmental training attendance registers;
- Incident and accident reports;
- Emergency preparedness and response plans;
- Copies of all relevant environmental legislation;
- Permits and legal documents as part of emergency preparedness teams e.g. fire teams, etc.;
- Material data sheets of all chemicals utilised on site;
- Crisis communication manual;
- Disciplinary procedures;
- Monthly site meeting minutes during construction;
- All relevant permits;
- All method statements for all phases of the project.

All registers and records should be kept on site and must be made available to the department on request.

5.3 Document Control

The developer/landowner will be responsible for establishing a procedure for document control.

The document control procedure must comply with the following requirements:

Documents must be identifiable by organisation, division, function, activity and contact person; Every document must identify the person and their positions, responsible for drafting and compiling the document, for reviewing and recommending approval, and final approval of the document for distribution;

All documents must be dated, provided with a version number and reference number, filed systematically, and retained for a specified period.

The owner will ensure that documents are periodically reviewed and revised where necessary, and that current versions are available at all locations where operations essential to the functioning of the EMP are performed. All documents will be made available to the external auditor.

5.4 Reporting Requirements

All advice and recommendations made by the ECO must with the project engineer/engineers compliance be recorded on site in the site instruction book/ suitable register for his attention.

All spills will need to be documented and reported to DWS, DEADP: POLLUTION AND CHEMICALS and other relevant authorities.

CHAPTER 6

6.1. Public Communication Protocols

This section of the report is included in compliance with Section 24N (2) (e) of the National Environmental Management Act, 107 of 1998.

The developer/landowner must be responsible for regulating public access to information and compliance reporting.

The developer/landowner must respond to third party or public queries and complaints.

The developer/landowner must also be responsible for maintaining the compliance register to record complaints received and action taken. All complaints receive by the facility must be documented.

CHAPTER 7

This section of the report is included in compliance with Section 24 N 2 (d - g) and 3 (a - b) of the National Environmental Management Act, 107 of 1998.

Goal for Planning and Design (PD)

Overall Goal for Planning and Design: Undertake the planning and design phase of the Residential development in a way that:

- Ensures that the design of the residential development responds to the identified environmental constraints and opportunities.
- Ensures that pre-construction activities are undertaken in accordance with all relevant legislative requirements.
- Ensures that adequate regard has been taken of any landowner concerns and that these are appropriately addressed through design and planning (where appropriate).
- Ensures that the best environmental options are selected for the project.
- Enables the residential development construction activities to be undertaken without significant disruption to other land uses in the area.
- In order to meet this goal, the following objectives have been identified, together with necessary actions and monitoring requirements.

OBJECTIVE PD1: PRE-CONDITIONS

The following pre-conditions must be fully met before any construction activities commence.

A site meeting between the contractors and the representatives of the developer must take place at least 5 days prior to commencement of construction work to:

- Demarcate micro construction sites, services routes, access routes, working boundaries and no-go areas;
 - An adequate buffer should be established and maintained to protect the botanically sensitive area from impacts relating to the construction of this development.
- Discuss methods of stockpiling (vegetation, topsoil, sub-soil, shell-grit, etc);
- Check required toilets and fire-fighting facilities to be in place;
- Discuss and agree restricted access to construction site;
- Sign the Declaration of Understanding (Contractors);

- Discuss and agree communication channels including contact details;
- Discuss and agree areas of responsibility;
- Discuss and agree the demarcation and control of construction and building sites.

Minutes of this site meeting must be kept, and are to be distributed to all parties.

The following equipment must be on every micro or sub site before any construction work is due to start:

- Sufficient and suitable chemical toilet facilities.
- Sufficient refuse bins, which are weather and wind proof, with proper lids.
- 1 x type ABC (all purpose) 12.5 kg fire extinguisher

This will be monitored by the ECO during site visits and recorded, reported and proof included in the audit report to be submitted once construction is completed.

OBJECTIVE PD2: LAYOUT PLAN CONTROLS

The contractor must ensure that a copy of the signed approved layout plan is available at the office on site at all times for inspection by the developer or his representative(s). Any variation to the approved layout plan must be submitted to the developer for signed approval and may only be implemented once the approved variation is available to the contractor and available on site at the office. The variation of changes to the layout must be approved by the competent authority as per the EA conditions.

This will be monitored by the ECO during site visits and recorded, reported and proof included in the audit report to be submitted once construction is completed.

OBJECTIVE PD3: ADVERTISING

The contractors may place no advertising material on the property unless prior formal written permission has been obtained from the landowner.

This will be monitored by the ECO during site visits and recorded, reported and proof included in the audit report to be submitted once construction is completed.

OBJECTIVE PD4: METHOD STATEMENTS

To ensure all construction activities are undertaken with the appropriate level of environmental awareness to minimise environmental risk, in line with the specifications of the EMPr.

The environmental specifications are required to be underpinned by a series of Method Statements, within which the contractors and service providers are required to outline how any identified environmental risks will practically be mitigated and managed for the duration of the contract, and how specifications within this EMPr will be met. That is, the contractor will be required to describe how specified requirements will be achieved through the submission of written method statements to the site manager.

A method statement is defined as “a written submission by the contractor in response to the environmental specification or a request by the site manager, setting out the plant, materials, labour and method the contractor proposes using to conduct an activity, in such detail that the site manager is able to assess whether the contractor's proposal is in accordance with the specifications and/or will produce results in accordance with the specifications”.

The method statement must cover applicable details with regard to:

- Details of the responsible person/s
- Construction procedures
- Materials and equipment to be used
- Getting the equipment to and from site
- How the equipment/material will be moved while on-site
- How and where material will be stored

- The containment (or action to be taken if containment is not possible) of leaks or spills of any liquid or material that may occur
- Timing and location of activities
- Compliance/non-compliance with the specifications
- Any other information deemed necessary by the site manager

Method statements must be compiled for all activities which affect any aspect of the environment and should be applied consistently to all activities.

Specific areas to be addressed in the method statement pre, during and post construction include:

General Administration:

- Designation of access road and protocol to be followed whilst the road is in use;
- Site establishment (which explains all activities from induction training to offloading, construction sequence for site establishment and the different amenities and to be established etc. Including a site camp plan indicating all of these). Preparation of the site (i.e. clearing vegetation, compacting soils and removing existing infrastructure and waste).

Soil Management:

- Soil management/stockpiling and erosion control.
- Excavations and backfilling procedure.

Water Management:

- Stipulate norms and standards for water supply and usage (i.e.: comply strictly to licence and legislation requirements and restrictions)
- Stipulate the storm water management procedures recommended in the storm water management method statement.
- Ablution facilities (placement, maintenance, management and servicing)

Solid Waste Management:

- Description of the waste storage facilities (on site and accumulative).
- Placement of waste stored (on site and accumulative).
- Management and collection of waste process.
- Recycle, re-use and removal process and procedure.

Liquid Waste Management:

- The design, establish, maintain and operate suitable pollution control facilities necessary to prevent discharge of water containing polluting matter or visible suspended materials into rivers, streams or existing drainage systems.
- Should grey water (i.e. water from basins, showers, baths, kitchen sinks etc.) need to be disposed of, link into an existing facilities where possible. Where no facilities are available, grey water runoff must be controlled to ensure there is no seepage into wetlands or natural watercourses.

Dust and Noise Pollution

- Describe necessary measures to ensure that noise from construction activities is maintained within lawfully acceptable levels.
- Procedure to control dust at all times on the site, access roads, borrow pits and spoil sites (dust control shall be sufficient so as not to have significant impacts in terms of the biophysical and social environments). These impacts include visual pollution, decreased safety due to reduced visibility, negative effects on human health and the ecology due to dust particle accumulation.

Hazardous Substance Storage:

- Ensure compliance with all national, regional and local legislation with regard to the storage of oils, fuels, lubricants, solvents, wood treatments, bitumen, cement, pesticides and any other harmful and hazardous substances and materials (South African National Standards apply).
- Lists of all potentially hazardous substances to be used. Appropriate handling, storage and disposal procedures.
- Prevention protocol of accidental contamination of soil at storage and handling areas. All storage areas, (i.e.: for harmful substances appropriately banded with a suitable collection point for

accidental spills must be implemented and drip trays underneath dispensing mechanisms including leaking engines/machinery).

Fire Prevention and Management:

- Fire management protocols and procedures to be put in place in accordance with relevant legislature.

Environmental Reporting:

- Incident and accident reporting protocol and procedures to be put in place on site in accordance with relevant legislature.

The contractor may not commence the activity covered by the method statement until it has been approved by the site manager, except in the case of emergency activities and then only with the consent of the site manager. Approval of the method statement will not absolve the contractor from their obligations or responsibilities in terms of their contract.

Failure to submit a method statement may result in suspension of the activity concerned until such time as a method statement has been submitted and approved.

This will be monitored by the ECO during site visits and recorded, reported and proof included in the audit report to be submitted once construction is completed.

OBJECTIVE PD5: ENSURE THE DESIGN OF THE RESIDENTIAL DEVELOPMENT RESPONDS TO THE IDENTIFIED ENVIRONMENTAL CONSTRAINTS AND OPPORTUNITIES

Considering the natural slope of the development site, certain areas would be more susceptible to erosion. Access roads and construction camp areas should be placed so as to minimise the impacted area. Engineers should pay special attention to the planning and design of storm water and drainage structures for the development site, so as to minimise the effect of potential erosion and storm water or ground water contamination.

Project Component/s	Storm water structures; Bulk services and network services infrastructure; Access roads; Laydown areas and construction camp area.
Potential Impact	Design fails to respond optimally to the environmental consideration.
Activities/Risk Sources	Poor planning and design of storm water and drainage structures. Poor consideration of the natural landscape features.
Mitigation: Target/Objective	Ensure that the design of the residential development responds to the identified environmental constraints and opportunities.

Mitigation: Action/Control	Responsibility	Timeframe
Plan and conduct pre-construction activities in an environmentally acceptable manner.	Developer	Pre-construction
Access roads to be carefully planned to minimise the impacted area and prevent unnecessary over compaction of soil.	Developer	Design phase
As far as possible, existing roads must be used.	Developer	Design phase
Develop a site specific waste management plan for the construction phase.	Developer	Pre-construction
The holder of an environmental authorisation has the responsibility to notify the competent authority of any alienation, transfer and, change of ownership rights in the property on which the activity is to take place.	Developer	Pre-construction
Fourteen (14) days written notice must be given to the Department that the activity will commence. The notification must include a date on which the activity will commence as well as the reference number.	Developer	Pre-construction
ECO to be appointed prior to the commencement of any authorised activities. Once appointed the name and	Developer	Pre-construction

contact details of the ECO must be submitted to the DEA&DP.		
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Performance indicator	Design meets objectives and does not degrade the environment. Design responds to the mitigation measures and recommendations in the application. Minimal impact on the surrounding agricultural land and residential development.
Monitoring	Ensure that the design implemented meets the objectives and mitigation measures in the application through review of the design by the Project Manager, Developer and the Contract or prior to the commencement of construction.

OBJECTIVE PD6: ENSURE EFFECTIVE COMMUNICATION MECHANISMS WITH THE VARIOUS STAKEHOLDERS

On-going communication with affected and surrounding landowners and key departments is important to maintain during the construction and operational phases of the housing development. Any issues and concerns raised should be addressed as far as possible in as short a timeframe as possible.

Project Component/s	Development area/site; Access roads; Adjacent landowners / occupiers of land adjacent to the development.
Potential Impact	Impacts on affected and surrounding landowners/occupiers and land uses.
Activities/Risk Sources	Activities associated with facility construction; Activities associated with facility operation.
Mitigation: Target/Objective	Effective communication with affected and surrounding landowners; Addressing of any issues and concerns raised as far as possible in as short a timeframe as possible.

Mitigation: Action/Control	Responsibility	Timeframe
Compile and implement a grievance mechanism procedure for the public to be implemented during both the construction and operational phases of the facility. This procedure should include details of the contact person who will be receiving issues raised by interested and affected parties, and the process that will be followed to address issues.	Developer	Pre-construction, construction and operational phase
Performance indicator	Effective communication procedures in place.	
Monitoring	An incident must be reported in the site book and monitored by the ECO.	

**CONSTRUCTION AND REHABILITATION PHASE
CIVIL CONTRACTOR**

Goal for Construction Phase

Overall Goal for Construction (C):

Undertake the construction of the residential development infrastructure in a way that:

- Ensures that construction activities are properly managed in respect of environmental aspects and impacts;
- Enables construction activities to be undertaken without significant disruption to other land uses in the area, in particular concerning noise impacts, dust, farming practices, traffic and road use, and effects on local residents;
- Minimises the impact on the surrounding area;
- Minimises impacts on avifauna and other fauna using the site;
- Minimises the impact on the heritage and historical value of the site; and
- Minimise possible health impacts.

Objectives

In order to meet this goal, the following objectives have been identified, together with the necessary actions and monitoring requirements.

OBJECTIVE C1: WORKING HOURS

Civil & Construction Sites	
Mondays to Fridays	06h00 – 19h00
Saturdays & Public Holidays	06h00 – 17h00

Project Component/s	Development site; Access roads.
Potential Impact	Surrounding landowners/occupiers and residents are exposed to noise generated from the development site.
Activities/Risk Sources	Activities associated with facility construction that creates disturbing noises.
Mitigation: Target/Objective	Effective communication with affected and surrounding landowners/occupiers; Addressing of any issues and concerns raised as far as possible in as short a timeframe as possible.

Mitigation: Action/Control	Responsibility	Timeframe
Contractors may only be present on the site during the public time hours.	Developer and contractor.	Construction phase.

Performance indicator	Effective communication and procedures in place.
Monitoring	This will be monitored by the ECO during site visits and recorded, reported and proof included in the audit report to be submitted once construction is completed.

OBJECTIVE C2: SAFETY

Project Component/s	Development site; Access roads; Adjacent residential, informal and recreational areas.
Potential Impact	Impacts on affected and surrounding landowners/occupiers and land uses such as crime, violence, accidents and incidents.
Activities/Risk Sources	The proposed development may result in an increase in crime levels in the surrounding community.
Mitigation: Target/Objective	To protect all involved from incidents and injury.

Mitigation: Action/Control	Responsibility	Timeframe
Telephone numbers of emergency services, including the local fire-fighting services, must be posted conspicuously in the contractor's office and near the telephone. No firearms are permitted on the construction site, other than those authorised by the developer for the property security service provider if needed. Notices should be displayed at all public entrances to the property, warning visitors that they are entering a construction site.	Contractor	Construction phase

Performance indicator	Effective communication and procedures in place.
Monitoring	This will be monitored by the ECO during site visits and recorded, reported and proof included in the audit report to be submitted once construction is completed.

OBJECTIVE C3: SPEED LIMIT

Project Component/s	Development site; Access roads.
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Potential Impact	Speeding motorists and construction vehicles could injure personnel, members of the public or cause damage to property/infrastructure.
Activities/Risk Sources	Activities associated with facility construction such as transport of construction material, rubble and contractors.
Mitigation: Target/Objective	To protect all involved from incidents and injury.

Mitigation: Action/Control	Responsibility	Timeframe
For security and safety reasons the speed limit on the property for all contractors' vehicles is 30 km per hour. The contractor is responsible for ensuring that all his employees, sub-contractors and delivery vehicles adhere to this rule.	Contractor	Construction phase

Performance indicator	Effective communication and procedures in place.
Monitoring	This will be monitored by the ECO during site visits and recorded, reported and proof included in the audit report to be submitted once construction is completed.

OBJECTIVE C4: CONTRACTOR'S CAMP

Project Component/s	Development site; Access roads.
Potential Impact	Degradation of the natural environment inside/outside of the development area.
Activities/Risk Sources	Setting up and operation of the contractor's camp.
Mitigation: Target/Objective	Construction camp must be neatly fenced and construction site must be neat and tidy.

Mitigation: Action/Control	Responsibility	Timeframe
The contractor's camp will be indicated by and to landowner management and the ECO on the site. The final location of the contractor's camp will be authorized by the ECO and landowner.	Developer / Contractor	Construction phase

Performance indicator	ECO in conjunction with the landowner will approve construction camp area.
Monitoring	This will be monitored by the ECO during site visits and recorded, reported and proof included in the audit report to be submitted once construction is completed.

OBJECTIVE C5: DELIVERIES TO CONTRACTORS

Project Component/s	Access roads.
Potential Impact	Increased traffic, congestion and noise for surrounding landowners / residents and other road users. Impact on the natural environment.
Activities/Risk Sources	Vehicles on site transporting material to contractors.
Mitigation: Target/Objective	To protect and mitigate impacts on the environment, surrounding land uses, landowners, and personnel working on site.

Mitigation: Action/Control	Responsibility	Timeframe
Contractors will at all times be responsible for compliance by their delivery service providers as engaged. Delivery times will be limited to working times as defined in this document. Contractors have the responsibility of advising the property security staff of deliveries expected and to be executed. Contractors shall further ensure that drivers of service providers are informed of all procedures and restrictions e.g. which access road to use, speed limits,	Contractor	Construction phase

no-go areas, demarcated construction areas, and maximum allowed vehicle mass etc., as applicable before their first visit to site. Washing of service provider delivery vehicles and equipment will not be allowed on the property and must be carried out elsewhere.		
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Performance indicator	Site is secure and there is no unauthorised entry. No members of the public/ landowners injured.
Monitoring	This will be monitored by the ECO during site visits and recorded, reported and proof included in the audit report to be submitted once construction is completed.

OBJECTIVE C6: ALIEN/INVASIVE PLANTS

Project Component/s	Development site.
Potential Impact	Alien/invasive plant species are allowed to spread into natural/indigenous vegetation areas.
Activities/Risk Sources	Activities associated with facility construction.
Mitigation: Target/Objective	To protect and mitigate impacts on the environment.

Mitigation: Action/Control	Responsibility	Timeframe
No on-site burying, dumping or stockpiling of any weeds and aliens or invasive species shall occur. Such should be removed from the site to a suitable dumping site from which seed cannot escape. Removal of aliens must be done in accordance with the rehabilitation plan below.	Contractor	Construction phase

Performance indicator	All possible introduction and spreading of alien invasive plant species are controlled.
Monitoring	This will be monitored by the ECO during site visits and recorded, reported and proof included in the audit report to be submitted once construction is completed.

OBJECTIVE C7: STORM WATER MANAGEMENT

Considering the fact that rivers and wetlands are located on site, special attention must be paid to the storm water infrastructure to ensure adequate drainage of the development area.

Project Component/s	Storm water infrastructure.
Potential Impact	Erosion due to poor storm water infrastructure. Pooling and ponding of water / flooding in portions of the development site due to poor storm water infrastructure design and engineering. Polluted runoff contaminating groundwater resources / streams due poor storm water infrastructure design and implementation.
Activities/Risk Sources	Activities associated with facility construction, poor storm water infrastructure.
Mitigation: Target/Objective	To manage storm water effectively and prevent erosion and the pollution of surface and ground water resources.

Mitigation: Action/Control	Responsibility	Timeframe
Areas disturbed during construction must be re-vegetated as soon as possible. All roads need to be maintained and monitored and visible signs of possible erosion immediately rehabilitated. Construction of storm water infrastructure to ensure that rain/storm water does not pool or accumulate. Undertake storm water management measures as required. Rehabilitate or stabilise eroded areas immediately to prevent any increase in erosion.	Contractor	Construction phase

Performance indicator	All possible erosion impacts are controlled. No signs of storm water pollution or accumulation that will result in a nuisance. No surface, ground or storm water may be polluted as a result of any activities on the site.
Monitoring	This will be monitored by the ECO during site visits and recorded, reported and proof included in the audit report to be submitted once construction is completed.

*see SWMP in appendix B.

OBJECTIVE C8: ARCHAEOLOGY AND PALAEOLOGY MANAGEMENT

Project Component/s	Development site; Access roads.
Potential Impact	The loss of cultural or heritage resources.
Activities/Risk Sources	Activities associated with facility construction such as excavation.
Mitigation: Target/Objective	To protect and mitigate the potential loss of cultural and heritage resources.

Mitigation: Action/Control	Responsibility	Timeframe
Should any heritage or fossil remains be exposed during any excavation or related activities, these must immediately be reported to the provincial heritage resource authority of the Western Cape, Heritage Western Cape (in terms of the National Heritage Resources Act, 1999 (Act No.25 of 1999) via the ECO. Heritage remains uncovered or disturbed during earthworks must not be disturbed until inspection and verified by the professional.	Contractor	Construction phase

Performance indicator	Protection of heritage resources.
Monitoring	This will be monitored by the ECO during site visits and recorded, reported and proof included in the audit report to be submitted once construction is completed.

OBJECTIVE C9: SERVICES

Project Component/s	Development site; Associated services infrastructure; Access roads.
Potential Impact	Damage/loss of services infrastructure or supply.
Activities/Risk Sources	Activities associated with facility construction.
Mitigation: Target/Objective	To protect and mitigate impacts on the surrounding land uses; landowners and residents/occupiers.

Mitigation: Action/Control	Responsibility	Timeframe
Care and due cognisance must be taken of existing services, service routes and services restrictions. The developer and landowners shall not be liable for damages, expenses or costs incurred for any interruption in supply, variation, frequency, or failure of any utility provider to supply service.	Contractor	Construction phase

Performance indicator	Protection of existing services and infrastructure.
Monitoring	This will be monitored by the ECO during site visits and recorded, reported and proof included in the audit report to be submitted once construction is completed.

OBJECTIVE C10: ROADS

Project Component/s	Access roads.
Potential Impact	Increased traffic/congestion. Construction vehicles pose a potential risk to other road uses and the natural environment if they do not use designated routes.
Activities/Risk Sources	Activities associated with facility construction, receiving of goods by road.
Mitigation: Target/Objective	Designation of specific routes for construction vehicles to reduce impact on the environment and other road users.

Mitigation: Action/Control	Responsibility	Timeframe
Only existing access routes to the property will be used during construction work, so as to control the movement of construction vehicles. The contractor shall ensure that access to construction sites and associated infrastructure and equipment is designated off-limits to the public at all times during construction. Traffic safety measures shall be considered in determining entry or exit points to public roads.	Contractor	Construction phase

Performance indicator	To minimise the impacts on road users and the environment.
Monitoring	This will be monitored by the ECO during site visits and recorded, reported and proof included in the audit report to be submitted once construction is completed.

OBJECTIVE C11: ANTI-EROSION MEASURES

Project Component/s	Development site; Infrastructure; Access roads.
Potential Impact	Wind/water erosion as a result of construction/operation activities.
Activities/Risk Sources	Activities associated with facility construction such as excavation, removal of vegetation, etc.
Mitigation: Target/Objective	Reduce the impact of erosion by implementing anti-erosion measures.

Mitigation: Action/Control	Responsibility	Timeframe
The contractor shall take all appropriate and active measures to prevent erosion, especially wind and water erosion, resulting from operations and activities, specifically of storm water control measures to the satisfaction of the ECO/ER. During construction the contractor shall protect areas susceptible to wind and water erosion, by installing all the necessary temporary and permanent works. Measures can include brush packing, anchovy net stabilisation, etc. Where required erosion protection measures must be installed. Aspects normally covered in construction contracts in terms of protection of works are standard and are not to be confused with those under environmental legislation.	Contractor	Construction and operational phase

Performance indicator	All possible erosion impacts are controlled and rehabilitated.
Monitoring	This will be monitored by the ECO during site visits and recorded, reported and proof included in the audit report to be submitted once construction is completed.

OBJECTIVE C12: CONSTRUCTION MATERIAL

Project Component/s	Development site; Infrastructure; Access roads.
Potential Impact	Aesthetically displeasing/ visual impacts and causing a nuisance to surrounding landowners/residents.
Activities/Risk Sources	Activities associated with facility construction such as the storage of construction material.
Mitigation: Target/Objective	Reduce the visual impact or nuisance to the surrounding landowners/residents.

Mitigation: Action/Control	Responsibility	Timeframe
Construction material will be stored at the contractor's camp, as well as on the construction site within the demarcated working areas at each construction point. Special permission may be obtained from the ECO/ER to store material on suitable substitute or ancillary locations should the need arise, and as communicated by the project engineer.	Contractor	Construction phase

Performance indicator	To minimise the impact on the surrounding land users.
Monitoring	This will be monitored by the ECO during site visits and recorded, reported and proof included in the audit report to be submitted once construction is completed.

OBJECTIVE C13: FIRES

Project Component/s	Development site; Infrastructure; Construction camps.
Potential Impact	Uncontrolled fire on/off site, resulting in damage to the environment, property, injuries/death to personnel on site, or injuries/death to the public.
Activities/Risk Sources	Activities associated with facility construction.
Mitigation: Target/Objective	To protect and mitigate the safety of people, property, and the environment on and off site by preventing uncontrolled fires.

Mitigation: Action/Control	Responsibility	Timeframe
No open fires will be allowed on site and adequate fire-fighting equipment should be available on site in good working order at all times as prescribed by the fire management protocols.	Contractor	Construction phase

Performance indicator	No fire occurred to damage the surrounding environment and land uses and management actions are in place should a fire occur.
Monitoring	This will be monitored by the ECO during site visits and recorded, reported and proof included in the audit report to be submitted once construction is completed.

OBJECTIVE C14: MEASURES TO PROTECT RIVERS AND WETLANDS AND THEIR CATCHMENTS FROM CONSTRUCTION IMPACTS.

Project Component/s	Adjacent natural environments/features.
Potential Impact	Destruction of natural hydrological systems and the pollution of surface and ground water resources.
Activities/Risk Sources	Activities associated with facility construction.
Mitigation: Target/Objective	To protect and mitigate impacts on the environment and hydrological features.

Mitigation: Action/Control	Responsibility	Timeframe
<p>The open spaces must be demarcated as no-go areas (with the exception of rehabilitation required in these areas).</p> <p>Polluted runoff must be prevented from entering streams close to the site or the contamination of groundwater resources.</p> <p>Undertake storm water management measures as required.</p> <p>All spillage incidents and actions taken consequent thereto must be reported to the ECO and recorded in the site register.</p>	Contractor	Construction phase

Performance indicator	Impacts on hydrological features minimized and mitigated.
Monitoring	This will be monitored by the ECO during site visits and recorded, reported and proof included in the audit report to be submitted once construction is completed.

OBJECTIVE C15: AN EFFECTIVE MONITORING SYSTEM TO DETECT ANY LEAKAGE OR SPILLAGE OF ALL HAZARDOUS SUBSTANCES DURING THEIR TRANSPORT, HANDLING USAGE AND STORAGE. THIS MUST INCLUDE PRECAUTIONARY MEASURES TO LIMIT THE POSSIBILITY OF OIL AND OTHER TOXIC LIQUIDS FROM ENTERING THE RIVERS, WETLANDS, SOIL OR STORM WATER SYSTEMS.

Project Component/s	Development site; Access roads.
Potential Impact	Contamination of soil, storm water and ground water resources by hazardous substances.
Activities/Risk Sources	The handling, storage and use of hazardous substances.
Mitigation: Target/Objective	Prevention and mitigation of the environment contaminated as a result of exposure to hazardous substances.

Mitigation: Action/Control	Responsibility	Timeframe
<p>The EA holder, Land Owner, Site Environmental Officer and Environmental Control officer will do daily, weekly and monthly inspections and report and monitor compliance with the management actions included in the EMPr and EA conditions. These monitoring and reporting requirements are recorded in several sections of the EMPr. Monitoring will focus on signs of spillages and procedures during handling and storage of dangerous goods as described in the EMPr. The section on storage and handling of dangerous goods in the EMPr will be enforced.</p>	Contractor	Construction phase

Performance indicator	Impacts on hydrological features minimized and mitigated. Handling, storage and use of hazardous substances in accordance with relevant legislation.
Monitoring	This will be monitored by the ECO during site visits and recorded, reported and proof included in the audit report to be submitted once construction is completed.

OBJECTIVE C16: DIESEL FUEL AND LUBRICANT HANDLING PROGRAMME

Project Component/s	Development site; Access roads.
Potential Impact	Contamination of soil, storm and ground water resources as a result of an oil/diesel/lubricant spill/leak.

Activities/Risk Sources	Diesel fuel/lubricant use, handling, transportation and storage on site.		
Mitigation: Target/Objective	To protect and mitigate impacts of contaminants on the environment and hydrological features.		
Mitigation: Action/Control	Responsibility	Timeframe	
<p>Servicing of construction vehicles and machinery to take place of site. All vehicles must be in a good condition with no leakages leading to possible contamination of soil or water supplies. The following conditions related to the temporary fuel tanks must be implemented:</p> <p>The fuel tanks must be designed and installed in accordance with relevant Oil Industry standards and SANS codes where applicable for the aboveground storage tanks. The tanks must be located within a bund (110 % of the tanks capacity) in order to contain potential spills.</p> <p>During fuel tanker delivery, the tanker driver must be present at all times during product offloading. Should an incident occur the supply vehicle emergency cut-off switch must be activated to immediately stop fuel delivery. Flexible hoses with dry-break couplings and emergency isolation must be used. All spillage incidences and actions taken consequent thereto must be reported to the ECO and recorded in the site register.</p> <p>All fuel and flammable liquids should be stored under secure and fenced conditions and in a bunded site with the volume of the bunding capable of holding 110% of the liquid.</p> <p>The applicant must ensure that effective stock inventory monitoring and regular auditing take place for the early identification of possible leaks.</p> <p>The requirements of the Occupational Health and Safety Act, 1993 (Act No. 85 of 1993), must be adhered to. Within three months of the tanks ceasing to be used the tanks must be removed at the expense of the applicant, and the site, including all associated infrastructure must be rehabilitated to the satisfaction of the relevant authority.</p> <p>Refuelling:</p> <p>Refuelling of equipment must be conducted from the bunded fuel tank and pump at the contractor's camp. Fuel tanks must be bunded and supplied with a concrete apron. The concreted refuelling apron will be constructed with a drain along its extremities to collect any diesel contaminated run-off and channel it to the oil trap where separated oil will be collected and disposed of in the oil recycling container and process. Any spills on the concrete apron of floor below the tank are to be treated with OT8 or Spillsolve or equivalent as per the product instructions.</p> <p>A 500 litre drawn trailer to convey diesel to the equipment for re-fuelling may also be used. Such trailer will be drawn by a specified vehicle and driver, with alternate nominated as approved by the Project Engineer. Such tow vehicle may travel at 20kms per hour maximum at any time, be clearly identifiable as such, and may only tow the diesel</p>	Contractor	Construction phase	

<p>cart should the pre requisite drip trays and emergency equipment be on the vehicle at the time. In situ refuelling activity may only take place during a standard specified daily time slot as displayed in the construction office, unless specific per day permission has been given to refuel at any other time by the ECO. This must be pre-recorded in the site record book. Staff will require instruction in the identification of diesel and oil leaks and the use of Spillsolve (or equivalent) products.</p> <p>On-Site emergency repairs: Only small mobile plant and emergency repairs are to take place on site. These will require the provision of drip trays and funnels to ensure that no oil or fuel leakages occur onto the ground. Should such spill take place, then the oil saturated soil is to be placed in suitable containers and disposed of at a hazardous waste disposal site. Any contamination of soil is to be treated with Spillsolve or similar product. Contaminated water as a result of an oil or fuel spillage on the area should similarly be treated in appropriate way, and the polluted water should not be specifically removed and not allowed to merge with run-off water collected in the trap collecting all run offs from the slab.</p> <p>Collection of contaminated spares and waste oils: Contaminated spares, oil filters, gaskets, water, etc. will be collected in separate holders at the designated storage facility for disposal at a licensed H:h site. Staff will require instruction in:</p> <ul style="list-style-type: none"> • Deleterious effects of oil / fuel on the environment • Identification of oil leaks • Handling of oil / fuel leaks into soil • Location and method in storage of contaminated spares • Fire prevention and emergency drills in case of an accident 		
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Performance indicator	Ensure that no spillages occur and if it does occur that it is handled and cleaned up accordingly. Ensure that the storage, use, handling and transportation of diesel fuel and lubricants is in accordance with relevant legislation.
Monitoring	This will be monitored by the ECO during site visits and recorded, reported and proof included in the audit report to be submitted once construction is completed.

OBJECTIVE C17: APPROPRIATE HANDLING AND STORAGE OF CHEMICALS, HAZARDOUS SUBSTANCES AND WASTE (WASTE MANAGEMENT PLAN)

The construction phase will involve the storage and handling of a variety of chemicals including adhesives, abrasives, oils and lubricants, paints and solvents. The main wastes expected to be generated by the construction of the facility will include general solid waste and liquid waste, and may include hazardous waste.

Project Component/s	Access roads; Construction camp; Storage areas.
Potential Impact	<ul style="list-style-type: none"> • Release of contaminated water from contact with spilled chemicals. • Generation of contaminated wastes from used chemical containers. • Inefficient use of resources resulting in excessive waste generation. • Litter or contamination of the site or water through poor waste

	<p>management practices.</p> <ul style="list-style-type: none"> • Pollution of surface, groundwater and soil resources.
Activities/Risk Sources	<ul style="list-style-type: none"> • Vehicles associated with site preparation and earthworks. • Packaging and other construction wastes. • Hydrocarbon use and storage. • Spoil material from excavation, earthworks and site preparation.
Mitigation: Target/Objective	<ul style="list-style-type: none"> • To ensure that the storage and handling of chemicals and hydrocarbons on-site does not cause pollution to the environment or harm to persons. • To ensure that the storage and maintenance of machinery on-site does not cause pollution of the environment or harm to persons. • To comply with waste management guidelines. • To minimise production of waste. • To ensure appropriate waste storage and disposal. • To avoid environmental harm from waste disposal.

Mitigation: Action/Control	Responsibility	Timeframe
<ul style="list-style-type: none"> • Implement a site specific waste management plan during the construction phase. • Spill kits must be made available on-site for the clean-up of spills and leaks of contaminants. • Corrective action must be undertaken immediately if a complaint is received, or potential/actual leak or spill of polluting substance identified. This includes stopping the contaminant from further escaping, cleaning up the affected environment as much as practically possible and implementing preventive measures. • Implement an effective monitoring system to detect any leakage or spillage of all hazardous substances during their transportation, handling, use and storage. This must include precautionary measures to limit the possibility of oil and other toxic liquids from entering the soil or storm water systems. • Leakage of fuels must be avoided at all times and if spillage occurs, it must be remediated immediately. • In the event of a major spill or leak of contaminants, the relevant administering authority must be immediately notified as per the notification of emergencies/incidents. • Spilled cement, fly ash and concrete must be cleaned up as soon as possible and disposed of at a suitably licensed waste disposal site. • Any contaminated/polluted soil removed from the site must be disposed of at a licensed hazardous waste disposal facility. • All stored fuels to be maintained within a sealed bund and on a sealed surface. The bund must be at least 110% of the volume of the total containers. • Adjacent fuelling areas situated around fuel tanks must be provided with an impervious layer or drip trays must be used during refuelling. • Areas around fuel tanks must be appropriately banded or contained in an appropriate manner as per the requirements of SABS 089:1999 Part 1. • Fuel storage areas must be inspected regularly to ensure bund stability, integrity, and function. • Oily water from bunds at the substations must be removed from site by licensed contractors. 	Contractor	Construction phase

- The storage of flammable and combustible liquids such as oils will be in designated areas which are appropriately bunded, and stored in compliance with MSDS files.
- Any storage and disposal permits/approvals which may be required must be obtained, and the conditions attached to such permits and approvals will be compiled with and copies kept on site in the environmental file.
- Transport of all hazardous substances must be in accordance with the relevant legislation and regulations.
- Construction sub-contractors must provide specific detailed waste management plans to deal with all waste streams.
- Specific areas must be designated on-site for the temporary management of various waste streams, i.e. general refuse, construction waste (wood and metal scrap) and contaminated waste as required. Location of such areas must seek to minimise the potential for impact on the surrounding environment, including prevention of contaminated runoff, seepage and vermin control.
- Where practically possible, construction and general wastes on-site must be reused or recycled. Bins and skips must be available on-site for collection, separation, and storage of waste streams (such as wood, metals, general refuse etc.).
- Disposal of waste must be in accordance with relevant legislative requirements, including the use of licensed contractors and disposal at appropriately licensed waste disposal sites.
- Hydrocarbon waste must be contained and stored in sealed containers within an appropriately bunded area.
- Waste and surplus dangerous goods must be kept to a minimum and must be transported by approved waste transporters to sites designated for their disposal and copies of the safe disposal slips must be kept in the environment file on site.
- Documentation (waste manifest) must be maintained detailing the quantity, nature, and fate of any regulated waste. Waste disposal records must be available for review at any time.
- An incident/complaints register must be established and maintained on-site.
- The sediment control and water quality structures used on-site must be monitored and maintained in a fully operational state at all times.
- An integrated waste management approach that is based on waste minimisation must be used and must incorporate reduction, recycling, re-use and disposal where appropriate
- Upon the completion of construction, the area must be cleared of potentially polluting materials.
- Dispose of all solid waste collected at an appropriately registered waste disposal site. Waste disposal shall be in accordance with all relevant legislation and under no circumstances may waste be burnt on site.

<ul style="list-style-type: none"> • Where a registered waste site is not available close to the construction site, provide a method statement with regard to waste management. • The storage of waste must comply with the National Environmental Management: Waste Act, (Act No. 59 of 2008) National Norms and Standards for Storage of Waste, 2013. 		
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Performance indicator	<ul style="list-style-type: none"> • Limited chemical spills outside of designated storage areas; • No water or soil contamination by spills; • No complaints received regarding waste on site or indiscriminate dumping; • Internal site audits ensuring that waste segregation, recycling and reuse is occurring appropriately; • Provision of all appropriate waste manifests for all waste streams.
Monitoring	<ul style="list-style-type: none"> • Observation and supervision of chemical storage and handling practices and vehicle maintenance throughout construction phase; • A complaints register must be maintained, in which any complaints from the community will be logged; • Observation and supervision of waste management practices throughout construction phase; • Waste collection will be monitored on a regular basis; • Waste documentation completed; • A complaints register will be maintained, in which any complaints from the community will be logged; • Complaints will be investigated and, if appropriate, acted upon; • An incident reporting system will be used to record non-conformances to the EMP;. <p>This will be monitored by the ECO during site visits and recorded, reported and proof included in the audit report to be submitted once construction is completed.</p>

OBJECTIVE C18: EFFECTIVE MANAGEMENT OF CONCRETE BATCHING AREA

Project Component/s	Concrete batching area.
Potential Impact	<ul style="list-style-type: none"> • Dust emissions. • Release of contaminated water, pollution of ground water resources. • Ground, soil pollution. • Generation of contaminated wastes from used chemical containers. • Inefficient use of resources resulting in excessive waste generation.
Activities/Risk Sources	<ul style="list-style-type: none"> • Operation of the batching area. • Packaging and other construction wastes. • Hydrocarbon use and storage. • Spoil material from excavation, earthworks and site preparation.
Mitigation: Target/Objective	To ensure that the operation of the batching area does not cause pollution to the environment or harm to persons.

Mitigation: Action/Control	Responsibility	Timeframe
<ul style="list-style-type: none"> • Concrete batching areas to be sited such that impacts on the environment or the amenity of the local community from noise, odour or polluting emissions are minimised; • Access and exit routes for heavy transport vehicles should be planned to minimise noise and dust impacts on the environment; • The concrete batching area should demonstrate good 	Contractor	Construction phase

<p>maintenance practices, including regular sweeping to prevent dust build-up;</p> <ul style="list-style-type: none"> • The prevailing wind direction should be considered to ensure that bunkers and conveyors are sited in a sheltered position to minimise the effects of the wind; • Aggregate material should be delivered in a damp condition, and water sprays or a dust suppression agent should be correctly applied to reduce dust emissions and reduce water usage; • The site should be designed and constructed such that clean storm water, including roof runoff, is diverted away from contaminated areas and directed to the storm water discharge system; • Any liquids stored on site, including admixtures, fuels and lubricants, should be stored in accordance with applicable legislation; • Contaminated storm water and process wastewater should be captured and recycled where possible. A wastewater collection and recycling system should be designed to collect and filter contaminated water; • Process waste water and contaminated storm water collected from the entire site should be diverted to a settling pond, or series of ponds, such that the water can be reused in the concrete batching process. The settling pond or series of ponds should be lined with an impervious liner capable of containing all contaminants found within the water they are designed to collect; • Areas where spills of oils and chemicals may occur should be equipped with easily accessible spill control kits to assist in prompt and effective spill control; • Ensure that all practicable steps are taken to minimise the adverse effect that noise emissions. This responsibility includes not only the noise emitted from the plant and equipment but also associated noise sources, such as radios, loudspeakers and alarms; • Where possible, waste concrete should be used for construction purposes at the batching area or project site; • The batching area to be monitored by the ECO to ensure that the plant is operating according to its environmental objectives and within legislative requirements. 		
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Performance indicator	<ul style="list-style-type: none"> • No complaints regarding dust or contamination; • No water or soil contamination by chemical spills; • No complaints received regarding waste on site or indiscriminate dumping.
Monitoring	<p>Observation and supervision of chemical storage and handling practices and vehicle maintenance throughout construction phase. A complaints register will be maintained, in which any complaints from the community will be logged. Complaints will be investigated and, if appropriate, acted upon. A complaints register will be maintained, in which any complaints from the community will be logged. Complaints will be investigated and, if appropriate, acted upon.</p> <p>An incident reporting system will be used to record non-conformances to the EMP. Developer or appointed ECO must monitor indicators listed above to ensure that they have been met for the construction phase.</p>

OPERATIONAL PHASE

This following section defines the management programme for each of the identified goals during the operational phase. The programme is presented in the form of a table, which includes the components described. This programme consists of the following components:

Goals

Over-arching environmental goals for the management phase.

Objectives

The objectives are in place in order to meet these goals. These take into account the findings from existing studies and monitoring programmes.

Management Actions

The actions needed to achieve the objectives, taking into consideration factors such as responsibility, methods, frequency, resources required and prioritisation.

Monitoring

Key actions to verify that objectives are being achieved, taking into consideration responsibility, frequency, methods, and reporting.

Criteria/ Targets

The criteria or targets indicate the efficacy of the management programme. The targets should be readily measurable, understandable to the layperson, cost-effective to monitor, and meet legal requirements.

Remedial Actions

Specifies actions needed to be taken if the targets are not met; or if there is an unforeseen event.

Goals

The following 8 are specified goals:

Goal 1: Waste Management

Goal 2: Pollution Control

Goal 3: Water Quality and Storm Water Management

Goal 4: Soil erosion

Goal 5: Fire Management

Goal 6: Safety, Security and Emergency Procedures

Goal 7: On-going Monitoring of social environmental impacts

Goal 8: Management of open areas

Goal 1: Waste Management

Objectives	Risks	Actions	Monitoring	Criteria/Targets	Remedial Actions
<p>Ensure allocation of sufficient resources for on-going Integrated Waste Management (E.g. staff, equipment).</p>	<p>Pollution, odours, and nuisances.</p>	<ol style="list-style-type: none"> 1. No solid waste may be incinerated on the property. 2. All vehicles transporting waste must be closed to avoid possible pollution of waste on transport routes. 3. Waste needs to be sorted and recycled where necessary. 4. All waste types to be handled, stored, transported and disposed of according to relevant legislature. 5. Domestic waste not suitable for compost or bio electricity generation needs to be stored in skips for transport to the Local Authorities registered Landfill site. 6. Squatting and rubble dumping adjacent to the new development must be controlled and regular inspections conducted to ensure control. 7. An integrated waste management approach must be implemented on site, based on waste minimisation, reduction, recycling, re-use and disposal where possible. 8. The National Information System Regulations must be adhered to in terms of registering and reporting hazardous waste generated on site via the Integrated Pollutant Waste Information System (IPWIS). 	<p>Audits of operations vs EMP to identify those requirements that are not being met.</p> <p>Responsibility: Municipality</p>	<p>Adequate annual Budgets. Ongoing employment of in house maintenance staff.</p>	<ul style="list-style-type: none"> • If pollution on site is detected immediate action must be taken to contain the pollution. • Within 24hours of detection the ECO must be informed of the incident, where after the ECO will conduct a site visit and recommend further rehabilitation methods to be implemented. • Depending on the type and extent of pollution that occurred specialists may be contacted to provide specific recommendations. • An incident report is to be compiled and sent to the municipal and relevant governmental authorities.

Waste Management

Waste is defined as any matter, for which the current user has no further purpose, or any matter, gaseous, liquid, or solid or any combination thereof originating from any residential, commercial or industrial use, which has been discarded, accumulated, or stored.

It further is worth noting that on average 80% of waste management costs accrue to transport.

Principally three types of waste occur-

- | | |
|-----------------------------------|---|
| - Gaseous | Open fires |
| - High moisture (effluent) | sewerage/waste water/ petroleum products |
| - Low moisture (solid/semi solid) | glass/plastic/cardboard/paper/domestic/chemical |

Some potential consequences-

- Salination of ground/surface/ river water.
- Eutrophication (nutrient enrichment) of natural areas.
- Microbiological contamination of natural areas.
- Sediment and silt migration inflows.
- Harmful inorganic/organic compounds introduction into soil.

Chemical residues and empty containers are required as per purchase contract to be removed ex site by the original supplier. The supplier is asked to further declare that such waste is disposed of within accepted Waste Management Programs standards.

Identified Waste Streams:

Components-

Sewerage (black water)

Sewerage (grey water)

Wet refuse

Dry refuse

Bottles and glass

Tins or cans

Plastic or polypropylene

Garden refuse

Building Rubble

General other waste

Integrated Waste Management Strategy:

Waste Avoidance-

Objective is to promote the concept of minimisation in the generation of any waste in all activities and sites.

Waste Reduction-

To promote the reduction of all waste by ensuring that nothing that can be decomposed is disposed of to waste as opposed to recycling.

Waste Recycling-

Re-using waste or selling waste to recycling companies as far as and if possible to prevent re-usable waste from going to municipal landfill site.

Waste Disposal-

To store, dispose or treat all waste that cannot be avoided, recycled, or composted at licensed facilities within regular operational and environmental monitoring and always in accordance with regulatory requirements.

Storm Water Pollution Management-

Storm water and effluent systems must be separated by cut-off trenches to ensure that storm water is not contaminated by effluent water.

Goal 2: Pollution Control

Objectives	Risks	Actions	Monitoring	Criteria/Targets	Remedial Actions
<p>Ensure allocation of sufficient resources for on-going Integrated Waste and pollution control Management (E.g. staff, equipment, budget).</p>	<p>Pollution, odours and health.</p>	<ol style="list-style-type: none"> 1. Waste to be stored in appropriate containers or facilities as provided by the municipality. 2. All vehicles transporting waste must be closed to avoid pollution of transport routes. 3. Special measures such as surface drainage works to prevent water from running onto this area must be constructed. 4. All spillages should be reported immediately. 	<p>Audits of operations vs EMP to identify those requirements that are not being met. Responsibility: Municipality</p>	<p>Adequate annual Budgets. On-going employment of in house maintenance staff.</p>	<ul style="list-style-type: none"> • If pollution on site is detected immediate action must be taken to contain the pollution. • Within 24hours of detection the ECO must be informed of the incident, where after ECO will conduct a site visit and recommend further rehabilitation methods to be implemented. • Depending on the type and extent of pollution that occurred specialists may be contacted to provide specific recommendations. • An incident report to be compiled and sent to the municipal and relevant governmental authorities.

Goal 3: Water Quality and Storm Water Management Measures

Objectives	Risks	Actions	Monitoring	Criteria/Targets	Remedial Actions
<p>Ensure allocation of sufficient resources for on-going Water Quality and Storm Water Management (E.g. staff, equipment, budget).</p>	<p>Pollution, odours, erosion and illegal quality of waste water discharge.</p>	<ol style="list-style-type: none"> 1. Ensure no pollution of any water resources, including surface water, storm water and ground water takes place as a result of any activities on the site. 2. Ensure that no water other than storm water be discharged in the storm water system. 3. The proposed storm water channels/ detention ponds must be monitored and maintained on a regular basis by the municipality. 4. All waste within the channels/detention ponds must be removed. 5. If any erosion and/or degradation of the storm water channel or surrounds are noticed immediate action must be taken by the municipality to rectify the situation. (Corrective and preventative measures taken will depend upon the type and extent of erosion and/or degradation occurring). <p>*see SWMP in appendix B.</p>	<p>Audits of operations vs EMP to identify those requirements that are not being met.</p> <p>Responsibility: Municipality</p>	<p>Adequate annual Budgets. On-going employment of in house maintenance staff.</p>	<ul style="list-style-type: none"> • If pollution or erosion is detected immediate action must be taken to contain the pollution or erosion. • Within 24hours of detection the ECO must be informed of the incident, where after the ECO will conduct a site visit and recommend further rehabilitation methods to be implemented. • Depending on the type and extent of pollution or erosion that occurred specialists may be contacted to provide specific recommendations. • An incident report to be compiled and sent to the municipal and relevant governmental authorities.

Goal 4: Erosion Control

Objectives	Risks	Actions	Monitoring	Criteria/Targets	Remedial Actions
<p>Ensure allocation of sufficient resources) for on-going erosion control management (E.g. staff, equipment, budget)</p>	<p>Erosion, sink-holes and or blocking of storm water systems. Damage to Infrastructure.</p>	<ol style="list-style-type: none"> 1. Ongoing control and management of roads, roadways and areas susceptible to erosion. 2. Ensure suitable vegetation cover or surface on non-hardened surfaces. 3. Control runoff of storm water to prevent soil erosion. 4. Avoid the formation of sink-holes on sensitive soils. 5. Management and control of erosion. 	<p>Audits of operations vs EMP to identify those requirements that are not being met. Responsibility: Municipality</p>	<p>Adequate annual Budgets. On-going employment of in house maintenance staff.</p>	<ul style="list-style-type: none"> • If erosion is detected immediate actions must be taken to contain the erosion. • Within 24hours of detection the ECO must be informed of the incident, where after the ECO will conduct a site visit and recommend further rehabilitation methods to be implemented. • Depending on the type and extent of erosion that occurred specialists may be contacted to provide specific recommendations. • An incident report to be compiled and sent to the municipal and relevant governmental authorities.

Erosion Control

Erosion control and maintenance will be an on-going process, especially erosion developing on or as a result of roads. The municipality must implement erosion control measures to ensure that no erosion occurs on site. The area must also be regularly monitored and erosion maintenance measures implemented to prevent erosion.

Goal 5: Fire Management

Objectives	Risks	Actions	Monitoring	Criteria/Targets	Remedial Actions
<p><i>Ensure allocations of sufficient resources (E.g. staff, equipment, Budget) for on-going fire management</i></p>	<p>Pollution, fire, damage to property and health risks.</p>	<ol style="list-style-type: none"> 1. Sufficient fire- fighting equipment to be on site. 2. Yearly pre-fire season clearing and maintenance of fire breaks. 3. Yearly pre-season testing and servicing of fire-fighting equipment. 	<p>Six monthly at start and then yearly audits of operations vs EMP to identify those requirements that are not being met. Responsibility: Municipality</p>	<p>Adequate annual Budgets. On-going employment of staff.</p>	<p>To be determined when required</p>

Fire Management

Such legislation applies to the open countryside beyond urban limits and puts in place a range of legal requirements.

The responsibilities of people who own or control land.

The landowner on whose land a fire may start, or from whose land it may spread across boundaries, must have in place:

- Prepared firebreaks on your boundary, if there is a reasonable risk of fire.
- Have available such equipment, protective clothing and trained personnel required to extinguishing such fire as may occur.
- Take all reasonable steps to notify the fire chief of the local authority should a fire break out.
- Do everything in their reasonable power to stop the spread of the fire.

The Act also requires that should the owner be absent, a known and identified other person responsible needs to be present on or near this land to:

- Extinguish a fire if one breaks out, or assist or instruct others to do so
- Take all reasonable steps to alert the neighbours and Fire Chief.
- The owner may appoint an agent to act on his or her behalf to perform these duties.

Goal 6: Safety and Security Measures and Emergency Procedures

Objectives	Risks	Actions	Monitoring	Criteria/Targets	Remedial Actions
<p><i>Ensure allocation of sufficient resources for on-going safety, security and emergency procedures (E.g. staff, equipment, and budget).</i></p>	<p>Pollution, fire, security and health risks.</p>	<ol style="list-style-type: none"> 1. Any emergency incident, originating at the development site, which falls within the definition of section 30(1)a of the National Environmental Management Act (NEMA), Act 107 of 1998, must be dealt with by the facility in accordance with Section 30 of NEMA. 2. In the event of any incident the facility must ensure containment by the responsible person. 3. On-site emergency plans should be reviewed regularly. 	<p>Six monthly at start and then yearly audits of operations vs EMP to identify those requirements that are not being met. Responsibility: Municipality</p>	<p>Adequate annual Budgets. On-going employment of staff.</p>	<p>To be determined when required.</p>

Goal 7: On-going Monitoring of Social Environmental Impacts

Objectives	Risks	Actions	Monitoring	Criteria/Targets	Remedial Actions
<p><i>Ensure allocation of sufficient resources for on-going monitoring of environmental impacts (E.g. staff, equipment, budget).</i></p>	<p>Pollution, nuisances and health risks.</p>	<ol style="list-style-type: none"> 1. Internal formal management inspections. 2. The municipality will do weekly inspections and maintain critical issued observed and do management actions when required. 	<p>Six monthly at start and then yearly audits of operations vs EMP to identify those requirements that are not being met. Responsibility: Municipality</p>	<p>Adequate annual Budgets. On-going employment of staff.</p>	<p>To be determined when required.</p>

Goal 8: Management of open areas

Objectives	Risks	Actions	Monitoring	Criteria/Targets	Remedial Actions
<p><i>Ensure allocation of sufficient resources for on-going monitoring of environmental impacts (E.g. staff, equipment, budget).</i></p>	<p>Pollution, nuisances and health risks.</p>	<p>1. Comply with open space management plan and MMP and monitoring programme below.</p>	<p>Six monthly at start and then yearly audits of operations vs EMP to identify those requirements that are not being met. Responsibility: Municipality</p>	<p>Adequate annual Budgets. On-going employment of staff.</p>	<p>To be determined when required.</p>

Operational phase management and Monitoring

Prudent monitoring of the rehabilitated portions of the affected wetland is of utmost importance, as this will ensure a continual flow of data, enabling all parties involved to accurately assess and manage the progress of the rehabilitation interventions and any arising issues. To ensure the accurate gathering of data, the following techniques and guidelines should be followed:

- Site walk through surveys should be applied as the preferred method of monitoring (at specified frequencies) with specific focus on:
 - Erosion monitoring (for the duration of the raining season);
 - Sedimentation (for the duration of the raining season);
 - Alien and invasive vegetation proliferation (at the start and end of the growing season);
 - Spills events (regularly at the direction of the relevant engineer);
 - Surface water monitoring; and
 - Waste and litter problems.
- General habitat unit overviews should also be undertaken;
- Stability and appropriateness of stormwater controls;
- All data gathered should be measurable (qualitative and quantitative);
- Monitoring actions should be repeatable;
- Data should be auditable; and
- Reports should present and interpret the data obtained.

The monitoring plan comprises but is not limited to the following:

- Identification of areas of concern. These are areas that are affected by disturbances such as:
 - Erosion;
 - Waste dumping;
 - Alien vegetation species encroachment;
 - Soil compaction; and
- Ensuring that the management/rehabilitation measures as stipulated in Section 6 of this report are adhered to;
- A list of all alien vegetation species must be compiled as well as possible control methods such as manual, chemical or mechanical.
- Gathering all equipment required for the monitoring process; and
- Compiling a monitoring report.

Monitoring actions for the proposed Idas Valley rehabilitation site.

Aspect	Monitoring Location	Frequency of sampling	Frequency of Reporting
AIP control	<p>1. Screening of the entire rehabilitation area(s);</p> <p>2. Logging locations of any newly coppiced species to be treated/removed.</p>	<p>1. Before the initial AIP clearing a baseline assessment should be taken to indicate densities and species;</p> <p>2. After the initial AIP clearing densities should be re-recorded, including all methods and chemicals used;</p> <p>3. Quarterly assessment during the first-year post rehabilitation. Densities and locations of newly coppiced AIPs to be recorded; and</p> <p>4. Annually during the growing season for the second and third year, post rehabilitation to ensure long-term maintenance measures are effective.</p>	<p>1. Before and after AIP clearing report should be compiled;</p> <p>2. Quarterly report during the first-year post AIP clearing; and</p> <p>3. Annually during each growing season, for at least 3 years post rehabilitation – report should include information from before and after mobilisation of follow-up clearing teams.</p>
Wetland Water Quality (only applicable when water is present)	<p>1. Upstream and downstream of the river to the east of the study area.</p> <p>2. For consistency, the same point should be used for each repeat sample.</p>	<p>1. Water must be tested one month before the rehabilitation process begins, and at least once a month during the rehabilitation of the wetlands and should include:</p> <ul style="list-style-type: none"> a. pH (allowable limit 6.5 – 8.0); b. Electrical Conductivity (EC) (limit: ≤50); c. Temperature (limit <15% variation); d. Total Dissolved Solids (TDS) (limit <15% variation); and e. Turbidity (limit <3). <p>> Once a month after rehabilitation for three months. Please see below for allowed monitoring variables.</p>	<p>Results should be included in the monthly monitoring report compiled by the appointed ECO.</p>

Waste and litter problems	1. All areas which are frequently traversed by personnel during the rehabilitation. 2. Stormwater outlets	Monitoring of waste or litter problems should occur daily where rehabilitation and AIP clearing is taking place. The Contractor is to ensure that no staff litter on site.	Monthly monitoring report compiled by the appointed ECO.
Erosion	1. All rehabilitated areas; and 2. All areas disturbed by construction activities	1. Weekly during rehabilitation activities; 2. After every major rainstorm and / flood for the first wet season post rehabilitation.	Monthly monitoring report compiled by the appointed ECO.
Re-vegetation	All areas rehabilitated as part of the offset.	1. Monthly for 6 months after re-instatement of vegetation; 2. Annually during the growing season for at least three (3) years post rehabilitation to ensure plant survival and to ensure that no AIPs are outcompeting indigenous species.	1. Before commencement of rehabilitation activities a report should be compiled listing existing species as well as any endangered species that may need to be rescued. Should the Contractor not have the expertise to undertake this list, they are to appoint a suitable botanist to assist; 2. Monthly for 6 months after the re-instatement; and 3. Annually during each growing season, for at least 3 years post rehabilitation.

In accordance with the South African water quality guidelines volume 7, Aquatic ecosystems (DWAF, 1996), the below percentage change guidelines must be followed:

- Electrical conductivity (EC)/Total Dissolved Solids (TDS) concentrations should not be changed by > 15 % from the normal cycles of the water body under unimpacted conditions at any time of the year, and the amplitude and frequency of natural cycles in EC/TDS concentrations should not be changed;
- pH values should not be allowed to vary from the range of the baseline pH values for a specific site and time of day, by > 0.5 of a pH unit, or by > 5 % temporal variation, and should be assessed by whichever estimate is the more conservative.
- Note that EC and pH comparisons refer to temporal comparisons. However, as no guidelines are available for spatial comparisons, the percentage change recommendations will also be applied to spatial comparisons. For the purpose of this monitoring, a temporal or spatial change of 15% will be considered significant.

CHAPTER 8

ENVIRONMENTAL REPORTING

In order to ensure that the necessary environmental issues are adequately addressed and recorded, the following environmental reporting shall be undertaken:

- Incident reporting; and
- Compliance reporting

See below for a template of an Incident Report to serve as a guideline for the recording and addressing of emergency incidents as and when they occur.

ENVIRONMENTAL INCIDENT REPORT

DATE:	File Ref:
NAME:	Copy to:
EXACT LOCATION OF INCIDENT:	

SECTION 1 : DESCRIPTION OF INCIDENT

SECTION 2 : REMEDIAL ACTION REQUIRED

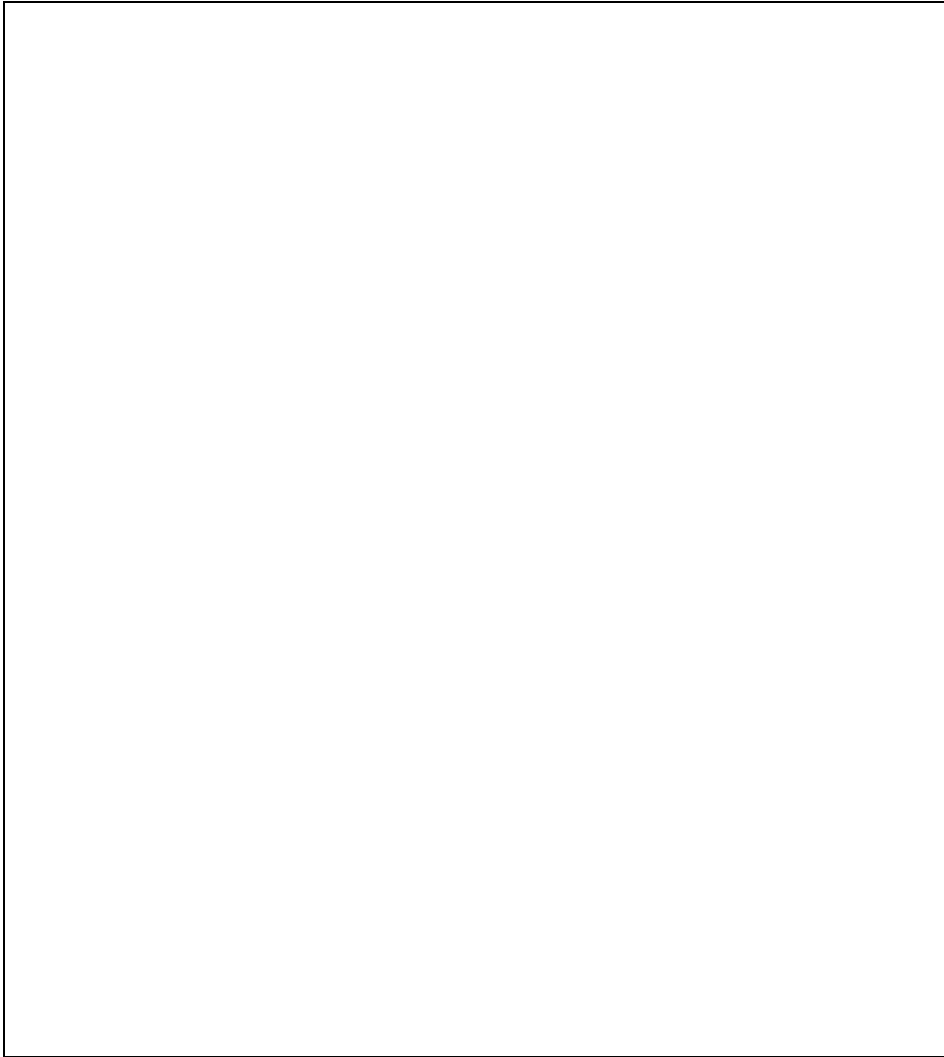
Remedial Action Due Date: _____
Confirmation of implementation: Name: _____ Date: _____

SECTION 3 : RELEVANT DOCUMENTATION

SECTION 4 : SIGNATURES

Municipal Engineer:
Name:	
Date:	
ECO:
Name:	
Date:	

SECTION 5: DRAWING/SKETCH



CHAPTER 9

DECOMMISSIONING PHASE

As the final phase in the project cycle, decommissioning may present positive environmental opportunities associated with the return of the land for alternative use and the cessation of impacts associated with operational activities. However, depending on the nature of the operational activity, the need to manage risks and potential residual impacts may remain well after operations have ceased.

The decommissioning phase EMP provides specific guidance with respect to the management of the environmental risks associated with the decommissioning stage of a project.

Closure and decommissioning impacts are likely to be similar to the construction phase impacts. The management actions and control under the construction phase EMP need to be implemented to mitigate the negative impacts on the environment and to restore the property to its natural state.

A decommissioning phase is where a structure is removed or otherwise modified to make it incapable for re-use for the original design purpose.

The results of environmental monitoring during the decommissioning phase will be used to assess the impact of the decommissioning on the surrounding environment and demonstrate compliance with regulatory requirements.

The actual scope of the decommissioning environmental monitoring will be established following consultation with the regulatory authorities. The format of decommission management strategy will probably be similar to that of earlier development phases and consist of the following:

- Management Principles
 - Develop monitoring procedures in accordance with standard protocols and the requirements of the environmental legislation.
 - Undertake environmental monitoring during the decommissioning phase as shown below.

Environmental monitoring during the decommission phase will include terrestrial flora rehabilitation monitoring.

CHAPTER 10

REHABILITATION SPECIFICATIONS (OPEN AREAS – RIVERS AND WETLANDS)

Step 1: planning - Initial planning before AIP clearing or rehabilitation activities

All plans and authorisations must be in place prior to commencement of the rehabilitation activities. This includes but is not limited to:

- a) Obtaining all required authorisations and permits;
- b) Appointment of a Contractor and ECO;
- c) Planning for on-site requirements; and
- d) Timeframes and budgetary allowances.

Step 2: AIP Clearing - Best time is during winter and spring (June - November) during the growing season

Before any rehabilitation activities can commence, the rehabilitation areas must be cleared of AIPs. This will include:

- a) Mechanical removal of all large stems (focus mainly on the NEMBA listed species *Acacia saligna*); and
- b) Chemical treatment of AIPs and weed species within the surrounding terrestrial areas.

Step 3: Rehabilitation of the wetland - Wetland re-sloping to be done during the drier summer months (December – April). Re-vegetation activities should commence early spring (September)

The rehabilitation of the wetlands within the identified rehabilitation areas will enhance the service provision of the wetlands through:

- a) Re-sloping of embankments/ removal of soil deposits and infilling of excavated areas (as identified in Section 6 below);
- b) Removal of weeds and AIPs; and
- c) Repair of any identified erosion and incision.
- d) The re-vegetation of the rehabilitation areas will commence on completion of any required re-sloping and removal of all AIPs. Only indigenous vegetation species may be reinstated. It is noted that *Pennisetum clandestinum* is already established in the wetlands and will have to be managed in the long-term.

These steps will be expanded upon in greater detail in the sections that follow.

DETAILED PLAN:

Step 1: Planning

1.1. Obtaining all relevant authorisations and permits

Before rehabilitation activities can commence all necessary permits and authorisations will be required, including but not limited to:

- Water Use Authorisation for all rehabilitation activities; and
- Rezoning/ conservation servitude or similar for the rehabilitation areas this may not be in place before rehabilitation commences, however, proof of initiation of this process should be available on request.

1.2. Appointment of a Contractor and all required specialists

During the planning phase certain aspects need to be considered in order to effectively implement this plan. This includes:

- Appointment of a suitably qualified Contractor(s) to undertake the required work;
- Appointment of an ECO to audit and monitor the rehabilitation activities as well as to undertake the required post rehabilitation monitoring;
- The ECO is to compile a monthly audit report indicating all observations, actions and any remediation measures that were implemented and the reports are to be submitted to the DWS.
- Should the Contractor not have the appropriate expertise for implementation of this plan then it is the responsibility of the Contractor to appoint a suitably qualified freshwater ecologist to oversee the implementation.

1.3. Planning for on-site requirements

The following objectives and control measures must be implemented as part of the planning phase.

Relevant Objectives and Control Measures to be implemented as part of the planning phase

Establishment and Access

- The neighbouring property must be correctly zoned as an open conservation servitude and no future developments may be allowed. The title deed should ideally indicate that the site has been utilised for an offset.
- The rehabilitation area should be pegged out and demarcated with danger tape. At no point should construction equipment extend past the designated construction site (unless for the required rehabilitation works). All vehicles must utilise the culvert crossing over the river only and may not indiscriminately drive within any freshwater features.
- Adequate signage (in the adequate various languages) must be placed around the planned rehabilitation areas.

Indigenous plant harvesting and propagation

- As part of the proposed rehabilitation plans, some indigenous wetland species will need to be re-instated within the wetland habitat. As such, plans should be made for where the species are to be sourced and budgetary allowances made for the purchasing of various species.
- One such nursery from which indigenous plant species can be obtained is from the Cape Flats LIFE.
- Availability of species needs to be secured before rehabilitation activities commence to ensure that plants are ready and available for re-vegetation (Step 3), so as not to leave areas exposed and vulnerable to erosion and incision.

Unplanned Fire Management

- Unplanned fires can occur within the area surrounding the study area and the wetlands to be rehabilitated. This is specifically true due to the high density of urbanisation in the surrounding area, therefore there is an increased likelihood of human-started fires. The Municipality must have the necessary fire management plans in place prior to construction works.
- Awareness - Contractors working on site must be made aware of how their actions may result in the ignition of wild fires and must be adequately prepared to suppress any fires that may start whilst they are working, specifically in dense AIP areas. Signage should be erected to indicate that fires are not permitted and to promote vigilance and reporting of signs of veldfires.

Step 2: AIP Clearing

Alien and Invasive Plants (AIPs) *Acacia saligna* (Port Jackson Willow, Category 1b), *Echium plantagineum* (Patterson's Curse, Category 1b) as well as *Pennisetum clandestinum* (Kikuyu Grass, Category 2) were identified within the site. Category 1b species require compulsory control and must be removed and destroyed as they have high invasive potential. It must be noted that Port Jackson (*Acacia saligna*) have been known to have large seed banks that can germinate for upwards of five (5) decades thus it is imperative that sufficient capacity and funding be provided for follow-up control for a number of years after the initial clearing.

AIP control can be divided up into two phases, namely:

1. The initial control phase whereby AIPs are removed from the rehabilitation areas; and
2. The follow-up control whereby AIPs (coppice, saplings, and seedlings) within the rehabilitation must be done once a year during spring (September – November) for a minimum period of seven (7) years to ensure that new AIP infestation does not occur within the rehabilitated areas, after which the follow-up period should be re-assessed based on the need.

The following definitions are applicable to this section:

Hand Pull	Saplings and seedlings must be pulled out by hand. All root material should be removed to avoid re-sprouting of the plant.
Frill	The technique whereby an axe or cane knife is used to chip/cut around the base of a tree (±2mm deep) in order to place herbicide into the cuts (cutting not to be as deep as to

	ringbark). Herbicide to be applied within 30 minutes from frilling.
Ringbark	Removal of a ring of bark at least 25cm wide and pull down to just below ground level. Ring barking interferes with the circulation of the tree and results in it slowly dying.
Tree Felling	Complete removal of the AIP down to a stump by means of a chainsaw, hand axe or cane knife.
Stumping	The treatment of the remaining stump after felling with an appropriate herbicide (see recommended below).
Soil application	The application of herbicide (see recommended below) to the soil which is taken up by the plants roots.
Foliar Spray	The application of herbicides directly to the leaves. Foliar spraying can be done by using the following: a) A hose and handgun spraying the solution from a herbicide tank; b) A backpack spray unit; or c) Splatter guns which allow for larger droplets at higher concentrations – suitable for regrowth.
Stump Coppice	New shoots that regenerate from the stumps of felled trees.
Root Suckers	New vertical regrowth that arises from the base of the trunk, a new stem arising away from the main, stumped stem.

The table below indicates the control measures to be implemented as part of the rehabilitation plan. All recommended herbicides and active ingredients are listed under species specific control. It is important to note that AIP control (specifically *Acacia saligna* thickets occurring within the rehabilitated areas) must be done from the outer sections inwards in order to contain the existing AIP and prevent further spread

Relevant Objectives and Control Measures to be implemented as part of the AIP clearing

Initial Control

Chemical Control

- Dense seedling growth must be controlled with knapsack sprayers with a flat fan nozzle;
- Suitable dye must be used to limit over- or under spray of areas;
- Chemical control will entail limited usage of registered herbicides for a specific species and one must adhere to the measurements on the product label; and
- Care must be taken as to not use herbicides containing Glyphosate, Diquat and Paraquat within the identified watercourses associated with the rehabilitation area. These chemicals may only be used in the terrestrial zones as they are known to be toxic to aquatic life.

Species Specific Treatment

The following are species specific treatment for the three main AIPs noted within the rehabilitation areas. Use of these listed chemical treatments should occur after or during the mechanical removal process and may be used on other common weeds, as deemed appropriate by the ECO.

Treatment of Port Jackson (*Acacia saligna*):

- Seedlings must be hand pulled and no herbicide is needed;
- Young plants should be lopped/pruned and treated by means of a foliar spray of 50ml of Triclopyr Ester* mixed with 10l of water and applied at a rate of 3 l/ha; and
- Adult plants must first be cut down to a stump and frilled before being treated with 300ml of Triclopyr Amine salt* mixed in 10 l of water applied at a rate of 1.5 l/ha. Additionally, a Triclopyr Ester* solution can also be applied to approximately 0.6m length of stump.
- All branches that have been mechanically removed must be transported off site to a

designated dumping facility. Cut branches should not be left in stockpiles as the seeds will likely germinate.

Treatment of Kikuyu Grass (*Pennisetum clandestinum*)

- A herbicide with active ingredient Glyphosate*, dalapon or haloxyfop-P methyl ester should be used. Plants should be sprayed during their active growing season (autumn). It is to be noted that Glyphosate* or haloxyfop herbicides may not be used within the watercourses where water is free flowing as it is known to be toxic to aquatic life.
- Haloxyfop-P Methyl Ester is deemed to have a minimal environmental impact (although on an acute basis is toxic to aquatic life) and is not expected to leach into groundwater. Furthermore, it has been identified to degrade in soils under normal environmental conditions.

Treatment of Patterson's Curse (*Echium Plantagineum*)

- Plants can easily be hand pulled and no herbicide is needed, however, chemical control can be used with active ingredients chlorsulfuron, mesulfuron methyl, triasulfuron or Glyphosate* to control seed sets during the flowering season.

Follow-up Control

- Follow-up control is essential to control alien saplings, seedlings and coppice regrowth to achieve and sustain the progress that was made in the initial phase. If the follow up control phase is neglected, the alien infestation may become worse and denser than before the eradication process started.
- Follow-up should be quarterly after the initial AIP clearing, thereafter, annually, within the growing season (September – November) for at least seven (7) years.
- An annual assessment before mobilisation of the clearing crew should be undertaken to determine equipment and personnel requirements in order to secure the necessary funding.
- After initial control operations dense regrowth may arise as new regrowth will sprout in the form of stump coppice, seedlings and root suckers. The following should therefore be applied:
 - Plants that are less than 1 m in height must be controlled by foliar application.
 - For *Pennisetum clandestinum*, the use of a registered selective herbicide must be used so as to not harm the grass, and if grass is not present a registered non-selective or selective herbicide can be used.
 - Areas with dense seedlings should not be uprooted or hoed out, as these areas will result in soil disturbance and will in return promote flushes and germination of alien seedling growth.

Step 3: Wetland and River Rehabilitation

General mitigation

General

- It is imperative that no construction equipment or personnel enter into the wetland to be rehabilitated, unless authorised as part of the rehabilitation interventions. The proposed development must be fenced off from the surrounding open space area both during construction and operation.
- Any rehabilitation works should be undertaken just before the rainy season (between the months of February – May so that vegetation growth can be quickly re-established.
- At no point may vehicles or construction equipment move within the remaining wetlands. All vehicles should remain on designated roads within the road reserve.
- No equipment may be stored within the delineated freshwater features while not in use. Any designated storage and parking bays must be located no closer than 32 m from the river and the wetland features.
- The open space area as included in the master development plan must be fenced off from the residential development with suitable fencing (such as ClearVu) that cannot be easily removed or cut.

Vegetation Clearing, and earthworks

- In order to access the river with the required construction equipment, and re-instate the area upstream of the culvert crossing, vegetation will need to be cleared. All vegetation removed must be disposed of at a suitable disposal facility.
- At no point may construction equipment stand unauthorised within the wetlands or near the river.
- All excess sediment removed from the watercourses must be utilised as part of the building activities or be removed from site. At no point may this material be dumped on site or within any of the other freshwater features identified within the surrounding area. Topsoil will have a high density of alien invasive seeds which will need to be controlled into the operational phase.

Rehabilitation earthworks associated with the Seep Wetlands

The following rehabilitation interventions are required:

- It is imperative that all alien and invasive *Acacia saligna* be removed and controlled into perpetuity within the Seep Wetlands. Follow-up control, as indicated within Table 3 of this report is imperative.
- The wetland area was noted to have various piles of deposited material. These deposits are dominated by *Pennisetum clandestinum* and alter the geomorphological and hydrological processes as well as the wetting patterns within the wetland. It is therefore recommended that all deposits be removed from the wetland (as indicated above) and the area sloped to maintain the average 5% fall in a southerly direction and ensure that it is free draining and that no concentration of flow occurs.
- The area should not be uniformly levelled as minor water ponding should be encouraged in areas of the Seep Wetland to increase the presence and diversity of niche habitats. Oversight from a freshwater specialist is recommended for this component of the rehabilitation to ensure the hydrological retention of the system is not adversely altered.
- An excavated channel is located to the north of the Seep Wetland. This channel is currently sedimented in places and invaded by *Pennisetum clandestinum*. Soils from this excavation have been piled alongside the channel, preventing any spill over of water being conveyed from the upper reaches. It is recommended that this channel be infilled, and the gradient levelled with the surrounding area so as to encourage water dispersal across the surrounding area, rather than it being retained within the channel. Care must be taken to ensure that the outlet of the remaining channel is correctly levelled.

Rehabilitation considerations

- The rehabilitation of the Seep wetlands should only be undertaken at the end of the development construction. Dust generated from the construction works may smother new re-instated vegetation.
- All rehabilitation work must be done during the drier summer months leading up to the rainy season (May – April) to reduce contamination of surface water and ensure maximum survival of new plant species (see section below of re-vegetation). Some watering of plants during the first dry season may be necessary to ensure survival.
- It is important that no further works be allowed to the north east of the wetland as it is the opinion of the freshwater ecologist that this is the main inlet for surface water (based on historical imagery that indicated a drainage line used to be located within this area). Without the hydrological drivers in place the wetlands longevity will be compromised.
- Should the ECO not have the relevant expertise, it is recommended that the rehabilitation be overseen by a suitably qualified wetland specialist to ensure maximum service provision is achieved over the long-term in terms of hydrology, geomorphology, water quality and biota.

Rehabilitation earthworks associated with the River

Rehabilitation interventions

Extensive works need to be undertaken within this system to improve the ecoservice provision and ecological state. The system was divided into three portions, namely Portion A: Embankment re-sloping, Portion B: extensive re-sloping works and vegetation clearing and Portion C: limited rehabilitation requirements other than vegetation control.



The following rehabilitation interventions are required:

- All alien vegetation within all three portions must be cleared, as per the guidelines stipulated within Table 3 of this report.
- Once cleared, all embankments within Portion A should be re-sloped to a minimum of 1:3 ratio (or similar, depending on what is feasibly possible given the space limitations due to the surrounding existing houses) and all erosion and gully formation fixed.
- Portion B of the river should be re-sloped with a 1:5 ratio, and a channel area created. All excess sediment must be utilised as part of the embankment re-instatement, for the building activities or be removed from site. At no point may this material be dumped on site or within any of the other freshwater features identified within the surrounding area.
- On completion of re-sloping within portion B, the channel should be developed so as to meander and not as a straight line through the site. This will assist in increasing the water retention capability of the system and creation of ecological pockets for smaller faunal species.
- Loose pebbling should be installed within the channel and riparian vegetation re-instated within all portions to assist with increased sediment trapping and energy dispersal to prevent erosion and incision from occurring.

➤ Exposed slopes along the edge of the rehabilitated embankments are highly prone to erosion, therefore the surrounding area should be covered with a geotextile product such as hessian, with commercially available products such as Geojute, which is to be staked to the surface of the slopes and indigenous riparian vegetation should be re-instated therein.

➤ Should active erosion be identified, control features such as earth berms or perimeter berm/swales (see below) must be used to intercept and convey runoff from above disturbed areas to suitable dispersal areas or drainage systems. This helps to reduce the sedimentation from exposed areas. Walker, D. 1999 et al. and USEPA. 2005 have identified the following methods:

- Brush layering is when branches are placed perpendicular to the slope contour. This method is effective for earth reinforcement and mass stability. Brush layers break up the slope length, preventing surface erosion, and reinforce the soil with branch stems and roots, providing resistance to sliding or shear displacement. Brush layers also trap debris,

aid infiltration on dry slopes, dry excessively wet sites, and mitigate slope seepage by acting as horizontal drains. Brush layers facilitate vegetation establishment by providing a stable slope and a favourable microclimate for growth of vegetation. USEPA 2005

- Live gully repair is a technique that is similar to branch packing but is used to repair rills and gullies. Live gully repairs offer immediate reinforcement and reduce the velocity of concentrated flows. They also provide a filter barrier that reduces further rill and gully erosion and must be used where gully erosion is taking place on the project footprint. USEPA 2005.
- Rehabilitation considerations
- All rehabilitation work must be done during the drier summer months (November – April) to reduce contamination of surface water, increased sedimentation and erosion.
- Should the ECO not have the relevant expertise, it is recommended that the rehabilitation be overseen by a suitably qualified wetland specialist to ensure maximum service provision is achieved over the long-term in terms of hydrology, geomorphology, water quality and biota.

Re-vegetation

The last stage of the rehabilitation activities should be to re-instate indigenous vegetation within the rehabilitation areas. Propagation and purchasing of the required species should have been undertaken as part of the Planning (Step 1) and must be ready and available for transplantation as soon as the AIP clearing and re-sloping activities have been completed. The following points are of key importance for re-vegetation:

- Planting must start as soon as possible after soil profiling so as to reduce the duration of bare ground being exposed, which could lead to erosion and sedimentation of the area, and to establish ecological habitats. Furthermore, all disturbed areas as part of the rehabilitation, as well as where AIP have been removed should also be re-instated with indigenous vegetation.
- Re-instatement of indigenous vegetation should be undertaken in early May for the larger specimens (Growing season) and early spring (August/September) for the smaller saplings. This will ensure that the hot summer months are avoided, and that species will be planted prior to the onset of winter rainfall, which will maximize growth and early establishment.
- Water will need to be made available for irrigation purposes for the first season after indigenous vegetation has been planted. It is recommended that all planted specimens be watered during the first summer.
- Should the Contractor not have the relevant expertise on planting of specimens, they should appoint a suitably qualified botanist or landscape architect to assist with the re-vegetation.
-

The following criteria is recommended to be used to inform the selection of wetland plant species within the site:

Plants must be hardy, and ideally able to withstand:

- Elevated nutrients;
- Periodically high hydrocarbons (oils);
- Occasional high sediment inflows;
- Elevated ammonia concentrations;
- Periods of low oxygen, depending on zonation; and
- Periodic inundation (it is assumed that inundation is likely during the rainy season).
- Plants must be readily available;
- Plants must establish rapidly to facilitate prompt onset of wetland function;
- Plants should ideally be locally indigenous and no plants that are alien and invasive (e.g. Port Jackson) should be planted or allowed to remain in the study area.

It is important to note that the Contractor must ensure a variety of plants be used within the Seep Wetlands and consideration must be given to the wetland zonation (this system is predominantly seasonal and temporary) when selecting plant species. It is noted that *Pennisetum clandestinum* has already invaded the area, so regular maintenance will be required until the reinstated vegetation is self-sustaining.

- Proliferation of any of the following common Western Cape weed and alien plant species should be

removed by hand and the use of chemicals be limited to when absolutely necessary, in order to prevent die back of remaining indigenous vegetation and to prevent contamination of the water resource:

- Acacia saligna (see Table 3)
- Pennisetum clandestinum (see Table 3)
- Echium plantagineum (see Table 3)
- Ricinus communis
- Avena fatua
- Plantago lanceolate

Stormwater Management

- A Storm water attenuation facility is proposed to the south of the development, alongside the river. It is recommended that this attenuation facility be designed to be as natural as possible (earthed and unlined) and vegetated to function as a constructed wetland for water quality filtration.
- Storm inlets and outlet points must be designed at ground level so as to prevent erosion and gully formation. Suitable engineering solutions (such as concrete aprons or gabion mattresses) should be utilised at all outlets to reduce the speed at which the water flows into the attenuation facility.
- Litter traps should be installed at all outlets to catch any litter/solid wastes from entering the system. This can be in the form of a stormwater drain net or grates. These traps should be regularly cleaned during the operational phase to prevent blockages.

Culvert crossings

- Soil surrounding the wingwalls must be suitably backfilled and sloped (minimum of a 1:3 ratio) and concrete aprons as well as gabion mattresses should be installed both up and downstream for energy dissipation and sediment trapping.
- All soils within the river surrounding the culvert must be loosened on completion of works to allow for revegetation.

SITE CLEAN-UP

The contractors must ensure that all temporary structures, equipment, materials and facilities used or created on site for, or during construction activities, are removed once the project has been completed. The construction sites must be cleared, and cleaned to the satisfaction of the developer and ECO.

Stabilisation and rehabilitation must take place immediately after construction operations have been completed. No vehicles or unauthorised personnel must be allowed onto areas that have been rehabilitated.

The areas impacted during construction must be stabilised and shaped according to the natural surrounding contours. If topsoil was removed during construction the topsoil must be used to stabilise the impacted areas.

If erosion occurred the ECO must be informed immediately who will then recommend erosion mitigation measures to be implemented.

Alien vegetation monitoring of the rehabilitated areas and surrounds must be conducted on an annual basis and if alien vegetation is detected the ECO must be informed immediately who will then recommend eradication methods.

CHAPTER 11

ENVIRONMENTAL AWARENESS INDUCTION COURSE MATERIAL

This section of the report is included in compliance with Section 24N (3) (c) of the National Environmental Management Act 107 of 1998.

WHAT IS THE ENVIRONMENT?

- Soil
- Water
- Plants
- People
- Animals
- Air we breathe

the houses



• Airings, cars &

WHY MUST WE LOOK AFTER THE ENVIRONMENT?

- It affects us all as well as future generations
- We have a right to a healthy environment
- A Policy and System will be signed

HOW DO WE LOOK AFTER THE ENVIRONMENT?

- Report problems to your supervisor/ foreman
- Team work
- Follow the rules in the EMP



WORKING AREAS

Workers & equipment must stay inside the site boundaries at all times



RIVERS & STREAMS

- Do not swim in or drink from streams
- Do not throw oil, petrol, diesel, concrete or rubbish in the stream
- Do not work in the stream without direct instruction
- Do not damage the banks or vegetation of the stream



ANIMALS

- Do not injure or kill any animals on the site
- Ask your supervisor or Contract's Manager to remove animals found on site



TREES AND FLOWERS

- Do not damage or cut down any trees or plants without permission
- Do not pick flowers



SMOKING AND FIRE

- Put cigarette butts in a rubbish bin
- Do not smoke near gas, paints or petrol
- Do not light any fires without permission
- Know the positions of fire fighting equipment
- Report all fires
- Do not burn rubbish or vegetation without permission



PETROL, OIL AND DIESEL

- Work with petrol, oil & diesel in marked areas
- Report any petrol, oil & diesel leaks or spills to your supervisor
- Use a drip tray under vehicles & machinery
- Empty drip trays after rain & throw away where instructed



DUST

Try to avoid producing dust



NOISE

- Do not make loud noises around the site, especially near schools and homes
- Report or repair noisy vehicles



TOILETS

- Use the toilets provided
- Report full or leaking toilets



EATING

- Only eat in demarcated eating areas
- Never eat near a river or stream
- Put packaging & leftover food into rubbish bins



RUBBISH

- Do not litter – put all rubbish (especially cement bags) into the bins provided
- Report full bins to your supervisor
- The responsible person should empty bins regularly



TRUCKS AND DRIVING

- Always keep to the speed limit
- Drivers - check & report leaks and vehicles that belch smoke
- Ensure loads are secure & do not spill



EMERGENCY PHONE NUMBERS

Know all the emergency phone numbers:

- Ambulance:
- Fire:
- Police: 10111



FINES AND PENALTIES

- Spot fines of between R20 and R2000
- Your company may be fined
- Removal from site
- Construction may be stopped



PROBLEMS - WHAT TO DO!

- Report any breaks, floods, fires, leaks and injuries to your supervisor
- Ask questions!



CHAPTER 12

COMPLIANCE WITH THE ENVIRONMENTAL AUTHORISATION

All conditions of the Environmental Authorisation must be adhered to onsite during the construction-, operational-, decommissioning- and rehabilitation phases of the proposed project. A copy of the Environmental Authorisation must be available on site together with the EMP and all contractors on site must sign the Declaration of Understanding as proof of awareness and understanding of all the conditions to be adhered to on site in terms of the EA and EMP.

CHAPTER 13

UPDATING/ADAPTING THE EMP

Although care has been taken to address all known relevant environmental issues for the development, it will become necessary to add or amend certain procedures or instructions to improve the efficiency of the EMP. Only those additions to, or amendments of, this EMP that will either improve environmental protection or can be proven not to have any negative effects would be considered to be included, and any amendments to the EMP must first be approved by the ECO and competent authority/ies i.e. DEA&DP.

REFERENCES

City of Cape Town (2002) Environmental Management Programme (Version 5) for Civil Engineering Construction Activities.

DEA&DP: Environmental Management Programme. Version 5 (04/2002). Guideline Document for the ECO / ESO and the ER

Department of Water Affairs and Forestry, February 2005. Environmental Best Practice Specifications: Construction Integrated Environmental Management Sub-Series No. IEMS 1.6. Third Edition. Pretoria.

ANNEXURE A: OPEN SPACE MANAGEMENT PLAN (OPERATIONAL PHASE)

Open spaces play an integral part in maintaining the environmental integrity in most settlements. Overtime, these open spaces have been degraded due to a number of demands ranging from housing developments and other land use demands and at times end up being illegal dump sites.

Projects implemented under this focus area contribute not only to the maintenance and the integrity of the natural environment but also plays a significant role in the biodiversity conservation, social and physical well-being of the human population by creating job opportunities and also providing food security through the planting of fruit trees. Equally important, is the integration of greening and open space management into any developmental objectives and plans by municipalities.

Given the growth in population and the demand for settlements as well as the continuously growing need for natural resources to sustain livelihoods, the programme supports and promotes the use of alternative greener technologies in such developments. Through the greening and open space management focus area, newly developed human settlements are supported through installation of greener technologies as well as greening of open spaces.

MANAGEMENT OF OPEN AREAS

- Ensure allocation of sufficient resources for on-going monitoring of environmental impacts
- Inspections and maintenance must be done on the storm water infrastructure and in public open spaces on a monthly basis.
- The municipality will do monthly inspections and maintain critical issued observed and do management actions when required.
- Management actions may include removal of waste and debris within the public open space areas and will also include the eradication of alien invasive species.
- Eradication of alien invasive species and on-going clearing of alien species.
 - The municipality must implement alien clearing management programmes in the public open space areas. Clearing of alien invasive species must take place, as these species inhibiting undergrowth and thereby enhancing erosion impacts.
- Vandalism must be addressed as soon as it occurs.
- Erosion control in public open spaces
 - If any erosion and/or degradation is noticed immediate action must be taken by the municipality to rectify the situation. Corrective and preventative measures taken will depend upon type and extent of erosion and/or degradation occurring.
 - Management and control of erosion will be an ongoing process and must be closely monitored and immediately rectified by the municipality.
 - The commitment remains to keep to the existing standards as evident. The municipality must implement erosion control measures to ensure that no erosion occur on site. The area must also be regularly monitored and erosion maintenance measures implemented to prevent erosion. Depending on type and extent of erosion occurred specialists may be contacted to provide specific recommendations.
- Alien vegetation removal, Site Inspections, Erosion Protection and Removal of Silt, Sediment, Debris or Nuisance vegetation growth must be done in accordance with the Approved MMP.

It is the mandate of the municipality of to maintain a finite standard and quality finishing and of service delivery on the property to prevent degradation. This requires on-going maintenance of municipal buildings, gardens and infrastructure and the repair of environmental damage caused by users e.g. erosion or trampling of vegetation. The South African Constitution states that municipalities have the responsibility to make sure that all citizens are provided with services to satisfy their basic needs. The Municipality has a legal mandate to ensure that infrastructure development and maintenance of such infrastructure takes place to ensure the wellbeing of people within its jurisdiction.

ANNEXURE B: STORM WATER MANAGEMENT PLAN (OPERATIONAL PHASE)

INTRODUCTION

The plan addresses groundwater recharge, storm water quantity, and storm water quality impacts by incorporating storm water design and performance standards for the new development. The main component or output of this plan is **a design** that includes appropriate mitigation strategies. Specific storm water management measures are identified to lessen the impact of the proposed development.

GOALS OF THE SWMP

The goals of the SWMP are to:

- reduce flood damage, including damage to life and property;
- minimize, to the extent practical, any increase in storm water runoff from any new development;
- reduce soil erosion from any development or construction project;
- assure the adequacy of existing and proposed culverts and bridges, and other in-stream structures;
- maintain groundwater recharge;
- prevent, to the greatest extent feasible, an increase in nonpoint pollution;
- minimize pollutants in storm water runoff from new and existing development;
- protect public safety through the proper design and operation of storm water infrastructure.

TECHNICAL INFORMATION

A desk top study of the surface hydrology on a proposed site was conducted and a variety of engineering calculations done in order to determine potential flow rates etc. Following this a storm water layout was developed. Hydrology is used in stormwater management for the design. The climate, historical storm rainfall, etc. was used in the run-off calculations.

Please refer to Appendix H5 – Services Report – ANNEXURE F - Existing and Proposed Stormwater Reticulation.

THE DESIGN

Surfaces and conduits are constructed to drain runoff more efficiently but following the assessment mentioned above it was determined that runoff would need to be stored in a constructed attenuation facility.

However, to be effective, such attenuation facility usually demand much space. Successful detention of runoff may therefore have to rely on several technologies involving detention ponds.

A detention facility is designed to attenuate runoff, specifically the peak flows experienced. This facility was planned on a multi-purpose basis, and can achieve a number of storm water objectives.

It was required to ensure that runoff from the proposed development does not exceed pre-development runoff for a particular frequency design flood. This is accomplished by the use of the detention basin or facility.

POLLUTION PREVENTION

This section deals with pollution prevention, and in particular the situation where pollution of a water resource occurs or might occur as a result of activities on land. The person who owns, controls, occupies or uses the land in question is responsible for taking measures to prevent pollution of water resources.

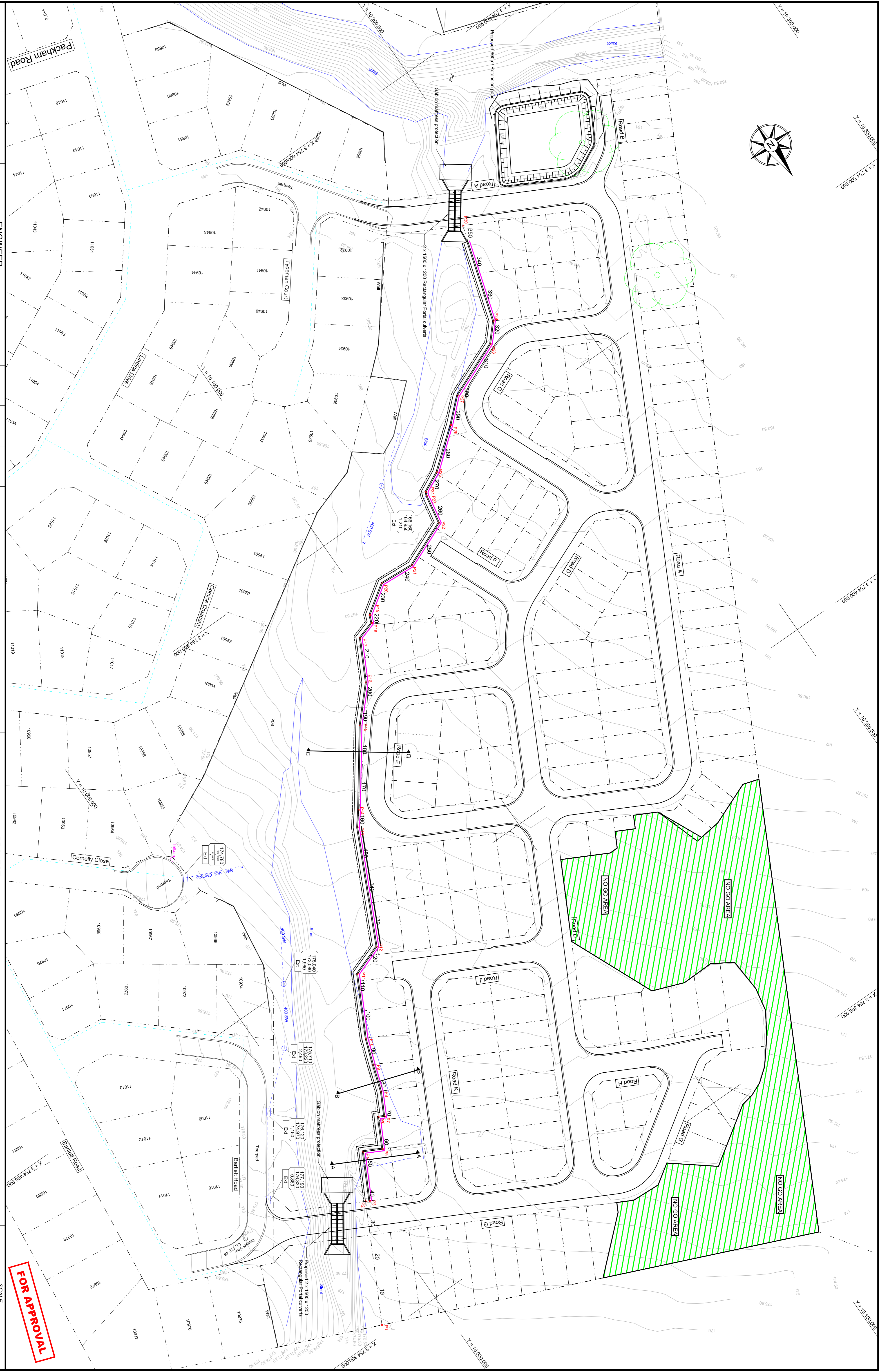
- Ensure no pollution of any water resources, including surface water, storm water and ground water takes place as a result of any activities on the site.
- Ensure that no water other than storm water be discharged in the storm water system.
- The proposed storm water channels/ detention ponds must be monitored and maintained on a regular basis by the municipality.
- All waste within the channels/detention ponds must be removed.
- If any erosion and/or degradation of the storm water channel or surrounds are noticed immediate action must be taken by the municipality to rectify the situation. (Corrective and preventative measures taken will depend upon the type and extent of erosion and/or degradation occurring).

MAINTENANCE

The detention ponds must be maintained, if signs of leakage or infrastructure failure are detected it must be repaired immediately and preventative measures must be put in place to prevent re-occurrence. All storm water infrastructure must also be maintained.

ANNEXURE C: LAYOUT

ANNEXURE D: CV



FOR APPROVAL

AMEND	DATE	DESCRIPTION	SCALE
			1:500 (A1)
ENGINEER 			DATE
PG Box 1273 Hermona Street Hermona 7200 Tel: 028 312 2222 Fax: 028 312 2220 Email: paul@deca-co.co.za			SEPTEMBER 2018 PLAN NUMBER D186/01
CLIENT ASLA DEVCO P.O. BOX 118 GORDONS BAY 7151			AMENDMENT
PROJECT ERF 9445 IDAS VALLEY			
PLAN DESCRIPTION OAK TREE VILLAGE: ROAD, CULVERT AND GABION LAYOUT			
Drawn P.E. Checked P.E. R.B. P.E.	Designed P.E. ENGINEER	Signed P. Paul, Eng. Reg. No. 53173/2017	

Curriculum vitae of Jessica Louise Le Roux

Personal Details

Nationality: South African

ID: 9003160270083

Address: 6a Avalon Road, Claremont, Cape Town 7708

Date of Birth: 16.03.1990

Marital Status: Single

Health: Excellent

Language Proficiency: English - Excellent: speaking, reading, writing Afrikaans- Second language, moderate skill

Driver's license: Yes

Cell: 083 666 8046

Email: jessica@ecoimpact.co.za

Jessica Le Roux has completed her professional registration in terms of section 20(3) (b) of the Natural Scientific Professions Act, 2003 (Act 27 of 2003) as a Professional Natural Scientist in the field of practice Environmental Science (Registration number 400192/16).

Work Experience

May-July 2013: Research assistant at the University of Cape Town Zoology Department

August 2013- Current: ISO50001 Energy Expert and Head of Training at Eco Impact Legal Consulting (Pty) Ltd.

Key Responsibilities:

ISO50001

Implementing ISO50001including:

- Baseline calculation of recent energy consumption
- Detailed baseline calculation
- Support to the exercise of Measurement & Verification of implemented measures
- Developing procedures and policy documents

Training

- Development of training brochure
- Marketing of training department
- Liaison with clients
- Developing training material on a variety of Environmental and Health and Safety topics
- Compiling examination paper questions and marking of papers
- Facilitating and presenting workshops on a variety of Environmental and Health and Safety topics

Auditing (Sustainability, Systems)

- Schedule pre-audit meeting with the client and Send pre-audit meeting agenda to client
- Schedule audit dates with the client and Send audit schedule
- Attend/complete audit and write up audit reports
- Compiling of close out reports

Online Legal Registers (ISO14001, OSHAS18001, ISO22000 and ISO50001)

- Keeping Legislation registers up to date in terms of amendments to law
- Build / compile legislation registers
- Summarising national, provincial and local legislation

Senior EAP

- Drafting / Completing Application forms for Basis Assessment Reports and Full Scoping Environmental Impact Reports
- Drafting / Completing draft and final Basis Assessment Reports and Full Scoping Environmental Impact Reports
- Public participations process
- Drafting Environmental Management Plans

Other

- Compile “Aspects and Impacts Registers” for clients sites
- Assist with compilation of Integrated Waste Management Plans and Corrective Action Plans

Key Experience

Systems

Jessica has attended the numerous internal ISO14001 audits (including Paarl Media Cape, Dupont and Betafence Projects South Africa) as a trainee auditor with a lead system compliance auditor. Jessica assisted with the drafting of the audit checklist, audit and drafting of the system compliance audit report under the supervision of the auditor in question. Jessica has also compiled a number of Aspects and Impacts Registers for client’s certification purposes such as Chryso - Boksburg and Isipingo sites. Jessica was also heavily involved in the drafting of ISO 14001 system documentation for Betafence Projects SA.

Training

- Compiled training material on numerous topics such as The Construction Regulations 2014, Carbon Tax, ISO14001 and OSHAS18001 system overview etc.
- Compiled training material of Health and Safety and Environmental Management training for Pioneer Foods. This included an examination for delegates. Jessica compiled the exam questions. Jessica presented this training to all Pioneer Foods Essential Foods bakeries and mills throughout South Africa in 2017.
- Conducted training at Retail Brands InterAfrica in Wadeville Gauteng. The training was “Legal Update Training: with a focus on the implications of the new draft greenhouse gas regulations”.

Education

2012 - University of Cape Town

MSc in Applied Marine Science (by coursework and dissertation)

Course work subjects: Project Management, Numerical skills & Statistics, Ocean Tools, Marine Environmental Law, Introduction to Global Warming & Earth System Science, Population & Fisheries Modelling, Marine Conservation, Ecosystem Approach to Fisheries and Marine Ecosystems.

Master's thesis- "A comparison of parasite assemblages of Cape horse mackerel (*Trachurus capensis*) from the northern and southern Benguela."

2011 - University of Cape Town

BSc (Honours) in Environmental and Geographical Science (specialization Environmental Management)

Course work subjects: Environmental Law for non-lawyers, Living with Environmental Change, Environmental Management and Applied research in Environmental Management.

Honours thesis – "An examination of the encroachment of *Putterlickia pyracantha* in the Witzands Aquifer Nature Reserve."

2008 – 2010 - University of Cape Town

BSc in Environmental and Geographical Science and Oceanography and Atmospheric Science

Deans Merit list 2010

1996 – 2007 - St Mary's DSG, Kloof, KZN Subjects: Mathematics, English, Afrikaans, Geography, Biology, History

Additional courses

1. 2011 - DWESA Climate Research Camp

Held in the Eastern Cape headed up by Professor Bruce Hewitson, UCT. Selected to attend a week long joint research effort with Pennsylvania State University, USA.

2. 2011 - Course on Water Economics and Governance

Under the auspices of the Freshwater Research Unit, UCT headed up by Professor Quentin Grafton (UNESCO Chair in Water Economics and Trans-boundary Water Governance at the Australian National University).

3. 04-05 February 2015 – Energy Management Systems Implementation (EnMS) 2 day Advanced Training (UNIDO, NCPC)

"The advanced course equips trainees with the knowledge, understanding and tools that will enable them to initiate the development and implementation of an EnMS that is aligned with ISO 50001."

4. May 2015- May 2016 – Energy Management Systems Implementation (EnMS) Expert Level Training (UNIDO, NCPC)

"This programme presents a methodological, organised approach to managing energy usage, based on the SANS/ISO 50001 standard. It is aimed at individuals who are responsible for developing and implementing energy management systems in their companies."

The end user course equips trainees with the knowledge, understanding and tools that will enable them to initiate the development and implementation of an EnMS that is aligned with ISO 50001.

The expert course is aimed at equipping delegates with the necessary knowledge, skills and tools to support the adoption and implementation of EnMS in industry. Delegates will gain practical experience in implementing and reviewing an EnMS, as well as being able to report on its performance."

During this course Jessica successfully implemented an ISO 50001 system at a company in Atlantis and achieved an overall score of 88%.

5. 10 August 2016 - Energy Performance Measurement and Indicators (EnPMI) - ISO50006 - 2 day Advanced Training (UNIDO, NCPC)

The goals of the EnPMIs training were:

- To promote and disseminate international best-practices for energy performance measurement and indicators for ISO 50001 EnMS implementation
- To provide the knowledge, competencies and basic tools required to enable organizations and EE practitioners to carry out meaningful and accurate assessment, measurement, monitoring and reporting of energy performance, including defining appropriate energy performance indicators and robust baselines as critical elements for effective EnMS/ISO 50001 implementation.