PROPOSED BAVIAANSKLOOF WORLD HERITAGE SITE INTERPRETIVE CENTRE, EASTERN CAPE

ENVIRONMENTAL MANAGEMENT PROGRAMME

DEA Ref. No.: *Pending*

Prepared for:

Eastern Cape Parks and Tourism Agency

Prepared by:

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TABLE OF CONTENTS

1 INTRODUCTION

1.1 Objectives of an EMPr

The Environmental Management Programme (EMPr) has been compiled to provide recommendations and guidelines according to which compliance monitoring can be done during the construction and operation of the proposed Baviaanskloof Interpretive Centre in the Baviaanskloof World Heritage Site (WHS) in the Eastern Cape (Figure 1.1). The purpose of the EMPr is to provide specifications for "good environmental practice" for application during all the phases of development.

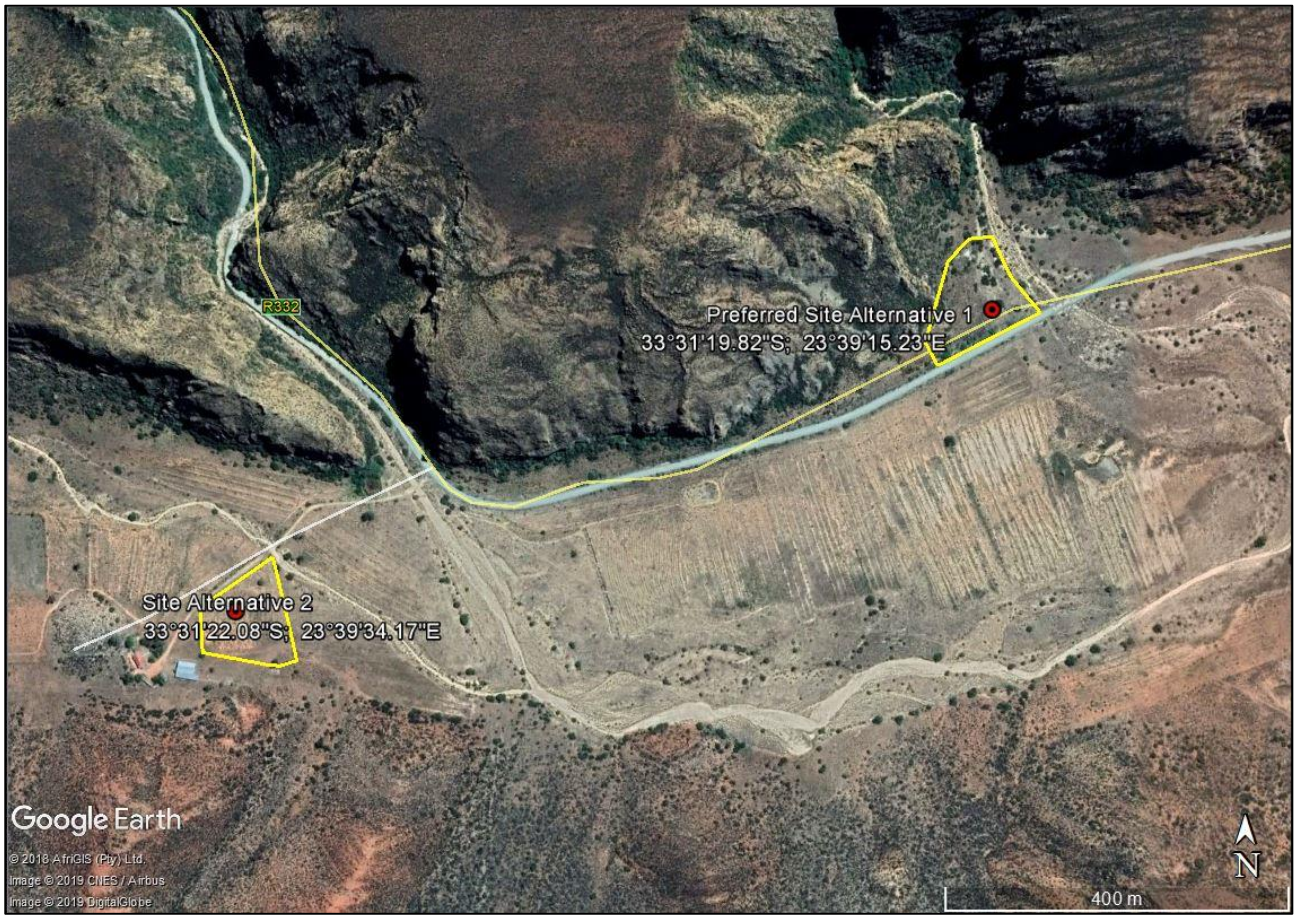

Figure 1.1: Locality of the proposed development.

This EMPr informs all relevant parties (the Project Coordinator, the Contractor(s) and all other staff employed at the site) as to their duties in the fulfilment of the legal requirements for the construction and operation of the Baviaanskloof WHS Interpretive Centre with particular reference to the prevention and mitigation of anticipated potential environmental impacts.

The objectives of an EMPr are to:

- Ensure compliance with regulatory authority stipulations and guidelines which may be local, provincial, national and/or international.
- Ensure that there is sufficient allocation of resources on the project budget so that the scale of EMPr-related activities is consistent with the significance of project impacts.
- Verify environmental performance through information on impacts as they occur.
- Respond to unforeseen events.

- Provide feedback for continual improvement in environmental performance.
- Identify a range of mitigation measures which could reduce and mitigate the potential impacts to minimal or insignificant levels.
- Detail specific actions deemed necessary to assist in mitigating the environmental impact of the development.
- Identify measures that could optimize beneficial impacts.
- Create management structures that address the concerns and complaints of I&APs with regards to the development.
- Establish a method of monitoring and auditing environmental management practices during all phases of the activity.
- Ensure that safety recommendations are complied with.
- Specify time periods within which the measures contemplated in the final environmental management programme must be implemented, where appropriate.

1.2 Structure and Function of an EMPr

An EMPr is focused on sound environmental management practices, which will be undertaken to minimise adverse impacts on the environment through the lifetime of a development. In addition, an EMPr identifies what measures will be in place or will be actioned to manage any incidents and emergencies that may occur during operation of the facility.

As such the EMPr provides specifications that must be adhered to, in order to minimise adverse environmental impacts associated with all phases of development. The content of the EMPr is consistent with the requirements as set out in Appendix 4 of the EIA regulations 2014 (as amended)) stated below, for the planning and design, construction and operation phases.

According to APPENDIX 4 of GN R 326, an environmental management programme must include:

(a) Details of –
  (i) The EAP who prepared the environmental management programme; and
  (ii) The expertise of the EAP to prepare an environmental management programme, including a curriculum vitae;

(b) A detailed description of the aspects of the activity that are covered by the draft environmental management programme as identified by the project description;

(c) A map at an appropriate sale which superimposes the proposed activity, its associated structures, and infrastructure on the environmental sensitivities of the preferred site, indicating any areas that should be avoided, including buffers;

(d) A description of the impact management outcomes, including management statements, identifying the impacts and risks that need to be avoided, managed and mitigated as identified through the environmental impact assessment process for all phases of the development including –
  (i) Planning and design;
  (ii) Pre-construction activities;
  (iii) Construction activities;
  (iv) Rehabilitation of the environment after construction and where applicable post closure; and
  (v) where relevant, operation activities;

(f) a description of proposed impact management actions, identifying the manner in which the impact management outcomes contemplated in paragraphs (d) will be achieved, and must, where applicable include actions to –
  a. Avoid, modify, remedy, control or stop any action, activity or process which causes pollution or environmental degradation;
  b. Comply with any prescribed environmental management standards or practices;
  c. Comply with any applicable provisions of the Act regarding closure, where applicable;

d. Comply with any provisions of the Act regarding financial provisions for rehabilitation, where applicable;

(g) The method of monitoring the implementation of the impact management actions contemplated in paragraph (f);

(h) The frequency of monitoring the implementation of the impact management actions contemplated in (f);

(i) An indication of the persons who will be responsible for the implementation of the impact management actions;

(j) The time periods within which the impact management actions contemplated in paragraph (f) must be implemented;

(k) The mechanism for monitoring compliance with the impact management actions contemplated in paragraph (f);

(l) A program for reporting on compliance, taking into account the requirement as prescribed by the regulations;

(m) An environmental awareness plan describing the manner in which –

a. The applicant intends to inform his or her employees of any environmental risk which may result from their work; and

b. Risks must be dealt with in order to avoid pollution or the degradation of the environment; and

(n) Any specific information that may be required by the competent authority.

1.3 Legal requirements

The Contractor must identify and comply with all South African national and provincial environmental legislation, including associated regulations and all local by-laws relevant to the project. Key legislation currently applicable to the construction and implementation phases of the project must be complied with. The list of applicable legislation provided below is intended to serve as a guideline only and is not exhaustive:-

- The Constitution of the Republic of South Africa Act (No. 108 of 1996).
- National Environmental Management Act (No. 107 of 1998).
- National Environmental Management: Protected Areas Act (No. 57 of 2003).
- National Environmental Management: Biodiversity Act (No. 10 of 2004).
- National Water Act (No. 36 of 1998).
- Hazardous Substances Act (No. 15 of 1973).
- National Heritage Resources Act (No. 25 of 1999).
- National Environmental Management: Waste Management Act (No. 59 of 2008).
- Occupational Health and Safety Act (No. 85 of 1993).
- National Environmental Management: Air Quality Act (No. 39 of 2004).
- National Dust Control Regulations (GN R.827) of the National Environmental Management: Air Quality Act (No.39 of 2004).
- All relevant provincial legislation, municipal by-laws and ordinances.

2 DETAILS OF THE ENVIRONMENTAL ASSESSMENT TEAM

According to APPENDIX 4 of GN R 326, an environmental management programme must include:

(a) Details of –
  (i) The EAP who prepared the environmental management programme; and
  (ii) The expertise of the EAP to prepare an environmental management programme, including a curriculum vitae;

Environmental Assessment Practitioner (EAP):

CES – Environmental and Social Advisory Services
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PO Box 8145, Nahoon, East London, 5210
Tel: 043 726 7809/8313
Fax: 043 726 8352
E-mail: cesel@cesnet.co.za
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Project Team:

- Dr Alan Carter
- Ms Jaclyn Smith

CES was established in 1990 as a specialist environmental consulting company and has considerable experience in terrestrial, marine and freshwater ecology, the Social Impact Assessment (SIA) process, State of Environment Reporting (SOER), Integrated Waste Management Plans (IWMP), Environmental Management Plans (EMPs), Spatial Development Frameworks (SDF), public participation, as well as the management and co-ordination of all aspects of the Environmental Impact Assessment (EIA) and Strategic Environmental Assessment (SEA) processes.

Dr Alan Carter
Alan is the executive of the CES East London Office. He holds a PhD in Marine Biology and is a Certified Public Accountant, with extensive training and experience in both financial accounting and environmental science disciplines with international accounting firms in South Africa and the USA. He has 25 years' experience in environmental management and has specialist skills in sanitation, coastal environments and industrial waste. Dr Carter is registered as a Professional Natural Scientist under the South African Council for Natural Scientific Professions (SACNASP). He is also registered as an EAP with the Environmental Assessment Practitioners of South Africa (EAPSA) interim EAP certification body.

SACNASP

South African Council for Natural Scientific Professions

herewith certifies that

Alan Robert Carter

Registration number: 400332/04

is registered as a

Professional Natural Scientist

in terms of section 20(3) of the Natural Scientific Professions Act, 2003 (Act 27 of 2003) in the following fields(s) of practice (Schedule 1 of the Act)

Environmental Science

Effective 31 August 2004 Expires 31 March 2019

President Executive Director

The Interim Certification Board for Environmental Assessment Practitioners of South Africa

Alan Robert Carter

was certified as an

ENVIRONMENTAL ASSESSMENT PRACTITIONER

on this 1st day of March 2012

Chairperson Secretary

Ms Jaclyn Smith

Jaclyn Smith is an Environmental Consultant holding a BSc degree with majors in Geology and Environmental Science from Rhodes University and a BSc Honours degree in Geology from Nelson Mandela Metropolitan University. Jaclyn's honours thesis focused on the sediment disturbance depth over two beaches in Port Elizabeth. Jaclyn has over five years' experience as an environmental consultant and has undertaken various Environmental Impact Studies and Environmental Management Plans.

3 PROPOSED ACTIVITY

According to APPENDIX 4 of GN R 326, an environmental management programme must include:

(b) A detailed description of the aspects of the activity that are covered by the draft environmental management programme as identified by the project description;

(c) A map at an appropriate sale which superimposes the proposed activity, its associated structures, and infrastructure on the environmental sensitivities of the preferred site, indicating any areas that should be avoided, including buffers;

3.1 Description of proposed activity

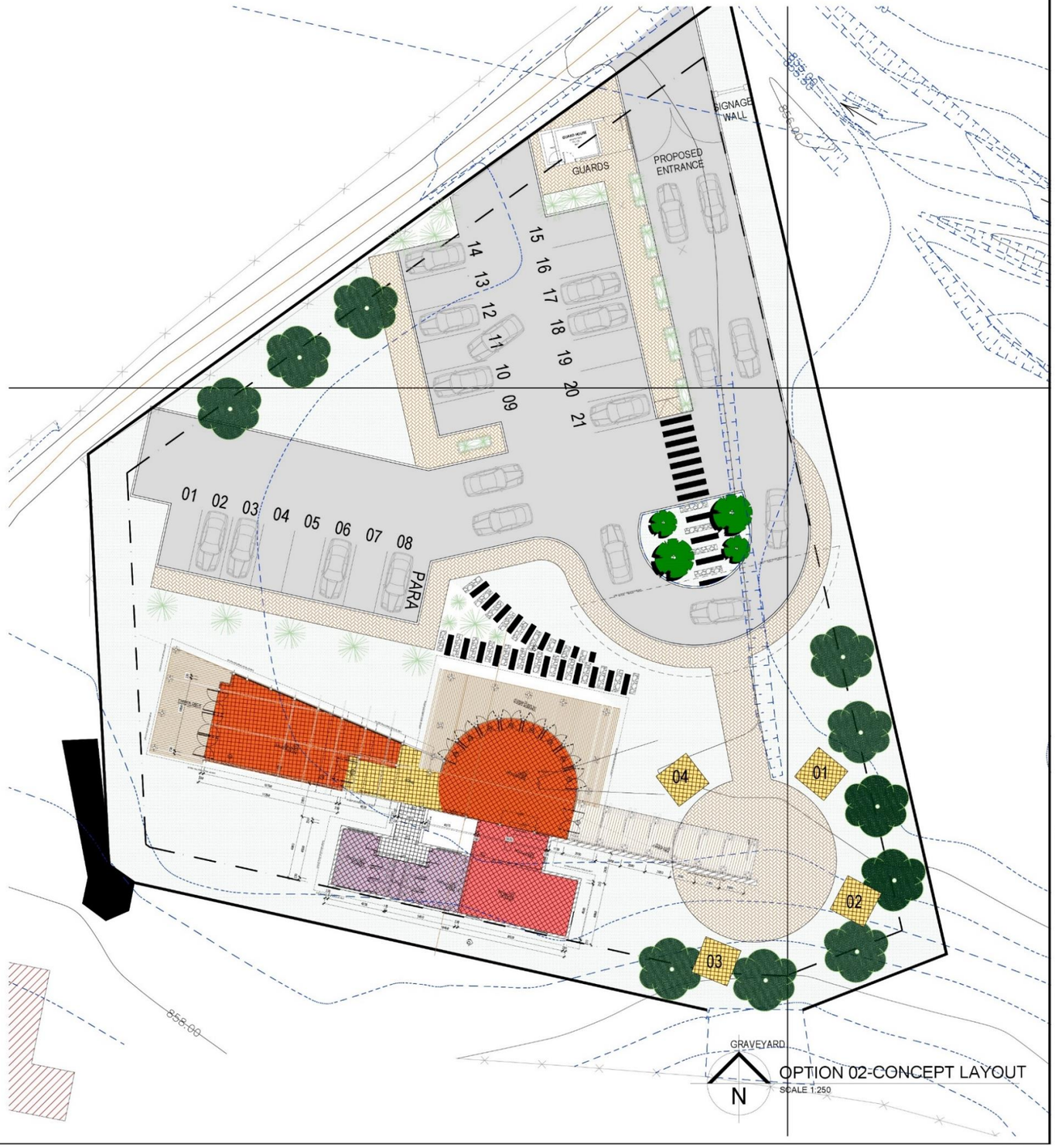
ECPTA are proposing the development of the Baviaanskloof WHS Interpretive Centre which will entail the development of the following at a minimum:

- An information centre, gallery, conference room, admin area, reception area and curios shop;
- Staff areas, kitchen, scullery, store room and female and male toilets;
- Walkways and decks made from hardwood;
- Water, electrical and sewer services; and
- Roads, parking bays and a guard house.

Two site alternatives are proposed for the Baviaanskloof WHS Interpretive Centre.

Figure 3.1 Preferred site alternative 1 layout plan.

	SPACE & FINISH	No OF UNITS	AREA (M^2)
	CURIOS SHOP tiles	3	110.3
	COVERED ENTRY WALKWAY hardwood	1.	32
	EXT SEATING DECKS hardwood	8.	59.9
	ENTRY FOYERS tiles	1, Exhibition Stands	29.6
	GALLERY tiles	1, Exhibition Stands	112.4
	CONFERENCE ROOM tiles	25 Seats 1 Refreshments servery	55.7
	INFORMATION CENTER tiles	25 Seats interactive display	54
	ADMIN OFFICE & RECEPTION tiles	2	31
	ADMIN STORE tiles	1. general storage	38
	ABLUTIONS tiles	3 WCs Female 3 WHBs Female 3 WCs Male 3 WHBs Male 3 URs Male 1 Uni Disabled 1WC Male Staff 1 Shwr 1 WC Female Staff 1Shwr	70.3
	EXT VIP ABLUTIONS	2 WCs Female 1 WHBs Female 1 WCs Male 1 WHBs Male 1 URs Male 1 Uni Disabled	60.2
	EXT SERVICE AREA powerfloat slab	1. general	20
	EXT DRIVEWAY & PARKING 'grasscrete' paving	1.	2823
	EXT WALKWAY interlock pavering	1.	325
	SECURITY GUARD HSE tiles	1.	28



NOTES:

The Engineer (Civil and Structural) hereby assures the Eastern Cape Department of Education and the Eastern Cape Department of Roads and Public Works that these drawings concur with the approved Site Development Plans, and will be used without any changes or alterations. Any necessary and unavoidable changes or alterations must be preapproved by the Eastern Cape Department of Education and Eastern Cape Department of Roads and Public Works before any works commences on construction site

Registration No:
Date:
Signature:
Client Approval:
Date:

CLIENT:

IMPLEMENTING AGENT:

PRINCIPAL AGENT:
MBSA CONSULTING
Consulting Engineers ■ Civil and Electrical

DRAWING NAME:
INTERPRETIVE CENTER
BAVIAANSKLOOF
SITE DEVELOPMENT PLAN - OPT 02 CONCEPT

DESIGNED BY:	DRAWN BY:	CHECKED BY	APPROVED BY:
GM	GM	ET	

PROJECT NO: XX
DRAWING NO: 001
DRAWING REVISION:
SCALE: 1:250

Figure 3.2: Site Alternative 2 for the proposed Baviaanskloof WHS Interpretive Centre.

4 SCOPE OF THE EMPr

In order to ensure a holistic approach to the management of environmental impacts during the planning and design, construction and operation of the development this EMPr sets out the methods by which proper environmental controls are to be implemented by the Applicant's Project Manager and/or the Contractor as well as all other parties involved.

The EMPr is a dynamic document subject to influences and changes as are wrought by variations to the provisions of the project specification.

4.1 Layout of the EMPr

The EMPr is divided into three phases of development. Each phase has specific issues unique to that period of the planning and design, construction and operation of the development. The impacts are identified and given a brief description. The phases of the development are identified as below:

4.1.1 Planning and design phase

This section of the EMPr provides management principles for the planning and design phase of the project. Planning, procedures and responsibilities as required during the planning and design phase are specified.

4.1.2 Construction phase

This section of the EMPr provides management principles for the construction phase of the project. Environmental actions, procedures and responsibilities as required during the construction phase are specified. These specifications will form part of the contract documentation and therefore the Contractor will be required to comply with these specifications to the satisfaction of the Applicant's Project Manager and the Environmental Control Officer (ECO).

4.1.3 Operational and maintenance phase

This section of the EMPr provides management principles for the operation and maintenance phase of the project. Environmental actions, procedures and responsibilities as required during the operation and maintenance phase are specified.

5 MITIGATION AND/OR MANAGEMENT MEASURES

According to APPENDIX 4 of GN R 326, an environmental management programme must include:

(d) A description of the impact management outcomes, including management statements, identifying the impacts and risks that need to be avoided, managed and mitigated as identified through the environmental impact assessment process for all phases of the development including–
  (i) Planning and design;
  (ii) Pre-construction activities;
  (iii) Construction activities;
  (iv) Rehabilitation of the environment after construction and where applicable post closure; and
  (v) where relevant, operation activities;

(f) A description of proposed impact management actions, identifying the manner in which the impact management outcomes contemplated in paragraphs (d) will be achieved, and must, where applicable include actions to –
  (i) Avoid, modify, remedy, control or stop any action, activity or process which causes pollution or environmental degradation;
  (ii) Comply with any prescribed environmental management standards or practices;
  (iii) Comply with any applicable provisions of the Act regarding closure, where applicable;
  (iv) Comply with any provisions of the Act regarding financial provisions for rehabilitation, where applicable;

A variety of potential impacts are associated with the planning and design phase, the construction phase and the operational phase of this project. This section focuses on the mitigation measures associated with each project phase in order to reduce negative impacts.

Table 5.1: Issues and Mitigation Measures associated with the development.

Issue	Alternative	Mitigation measure
Planning and Design Phase		
Legal and policy compliance	All	• All relevant legislation and policy must be consulted and the proponent must ensure that the project is compliant with such legislation and policy. • These should include (but are not restricted to): NEMA, Eastern Cape Biodiversity Conservation Plan (ECBCP), Local Municipal bylaws. • All relevant permits and authorisations including Water Use Licences, Building Plan Approvals and plant removal permits must be in place prior to commencement of construction.
Site establishment	All	• Appropriate areas for site establishment must be identified prior to construction preferably on the existing site or alternative transformed land and away from sensitive areas.
Bulk services and infrastructure	Preferred Site Alternative 1	• Planning for and placement of infrastructure must be done so as to avoid sensitive areas as far as possible. This includes placing infrastructure and buildings out of the floodline and maintaining appropriate buffers from sensitivity heritage features.
	Site Alternative 2	
Stormwater management	All	• A Stormwater Management Plan must be developed by the Engineer or Contractor prior to construction to control runoff and

Issue	Alternative	Mitigation measure
		prevent erosion of the site and its surroundings. • An Erosion Management Plan must be developed by the Engineer/Contractor during the final design stages to mitigate the unnecessary loss of soil and sedimentation of watercourses during all phases of the project. • The Erosion Management Plan must be approved by the appointed ECO. • Regular monitoring of implementation of this plan for the rehabilitation of disturbed areas must be conducted. • Appropriate stormwater structures alongside a stormwater management plan must be designed to minimise erosion of the surrounding environment and sedimentation of surrounding watercourses. • Pervious surfaces should be used for the parking lot, roads and footpaths where possible to promote infiltration and reduce concentrated runoff. • Impermeable bunded areas must be designed to store all oil tanks. These areas must be 110% the volume of the oil storage tanks within them and there must be an outlet valve with an oil trap for release of uncontaminated stormwater from the bunded areas.
Waste management	All	• A proper waste management plan for handling onsite general and hazardous waste during the construction and operation phases must be developed and implemented. • An appropriate area must be identified where waste can be stored before disposal.
Soils	All	• An Erosion Management Plan must be developed by the Engineer/Contractor prior to construction to mitigate the unnecessary loss of soil and sedimentation of watercourses during all phases of the project. • The Erosion Management Plan must be approved by the appointed ECO prior to implementation.
Natural vegetation	All	• Permits must be obtained by the Competent Authority to remove any plant SCC and all affected plants must be relocated outside construction footprint.
Species of Conservation Concern	All	• All necessary permits must be obtained for the removal of any identified SCC prior to the commencement of construction activities • Planning for any search and rescue operations mus be conducted prior to the commencement of construction activities.
Control of alien species	All	• An Alien Vegetation Management Plan must be developed by the Contractor prior to construction to mitigate the establishment and spread of undesirable alien plant species during all phases of the project. • The Alien Vegetation Management Plan must be approved by the appointed ECO prior to implementation. • Regular monitoring of the implementation of this plan for the rehabilitation of disturbed areas must be conducted by the

Issue	Alternative	Mitigation measure
		appointed ECO.
Habitat loss, destruction and pollution	All	• Layout and design must take into account watercourses on and surrounding site whereby all heavy infrastructure and buildings should be outside of the 1:100 year floodline and riparian zone. • All necessary Water Use Authorisations must be obtained for any of the following activities: - Construction within 500 m of a wetland - Construction within a watercourse. - Abstraction from a dam or watercourse.
Job creation	All	• N/A
Health, safety and crime	All	• A health and safety plan in terms of the Occupational Health and Safety Act (Act No 85 of 1993) must be drawn up by and HSE officer prior to construction to ensure workers safety. • All buildings and infrastructure must be above the 1:100 year floodline. • Rockfall protection measures should be in place between the cliffs to the north east and the proposed buildings and infrastructure. Potential protection measures include barriers and/or catch areas.
Visual	All	• Architectural guidelines must be formulated with a view to blending buildings into the landscape through selection of specific materials and colours. Natural materials should be adopted if possible.
	Preferred site alternative 1	
	Site alternative 2	
On-site fire risk	All	• An Emergency Preparedness Plan must be in place for both the construction and operational phases and before these phases commence. • ECPTA must plan for and put measures in place to prevent and deal with fires including the provision of firefighting equipment and establishment of fire breaks.
Heritage and paleontological resources	Preferred site alternative 1	• It is recommended that the "preferred" site be selected for the development. However, if the "alternative" site is selected for the development, then a historian must be appointed to conduct a cultural historical impact assessment with further recommendations. • A pre-construction site visit by a suitably qualified palaeontologist should be commissioned by the developer if the Alternative 2 site is chosen. The palaeontologist concerned should record any fossil heritage resources within the development footprint or its vicinity and submit a specialist report to ECPHRA with recommendations for any monitoring or mitigation measured relevant to the construction phase.
	Site alternative 2	
Inadequate rehabilitation	All	• Rehabilitation Plan must be developed and implemented during construction and operation phases.

Issue	Alternative	Mitigation measure
and maintenance		
Construction Phase		
Legal and policy compliance	All	• The Applicant must employ an independent Environmental Control Officer (ECO) for the duration of the construction phase to audit the contractors compliance with the specifications in the EA, EMPr and any other permits/authorisations.
Site establishment	All	• Site camp must be established away from sensitive areas on previously transformed areas where possible. • Vegetation clearance must be kept to a minimum during site clearance activities.
Bulk services and infrastructure	All	• Vegetation clearance must be kept to construction footprint and extra care must be taken when working within close proximity to sensitive areas.
Material stockpiling	All	• Material stockpiles must be located away from sensitive areas and they must be monitored for erosion and alien vegetation. • Material stockpiles locations must be approved by the ECO.
Stormwater management	All	• The construction site must be managed in a manner that prevents pollution to downstream watercourses or groundwater, due to suspended solids, silt or chemical pollutants. • Berms and swathes must be placed in areas that may be prone to erosion. • Temporary cut-off drains and berms may be required to capture storm water and promote infiltration.
Waste management	All	• A Waste Management Plan for handling onsite general and hazardous waste during the construction and operation phases must be developed and implemented. • All general waste must be disposed of in bins/waste skips labelled “general waste”. • Sufficient waste bins must be provided throughout the construction site for collecting waste. • All general waste collected on site must be disposed of at a licensed general waste disposal site. • All hazardous waste generated on site must be placed in a temporary impermeable bunded containment area which must be disposed of at a hazardous landfill site or be collected by the appropriate service provider. • Proof of receipt of hazardous waste by a licenced service provider must be maintained on the site. • Adequate sanitary facilities must be provided for construction workers and they must be properly secured to the ground. • Maintenance of the chemical toilets should be done on a regular basis to prevent any leakages.
Hazardous substances	All	• Any storage tanks containing hazardous materials (ie fuel, diesel) must be placed in bunded containment areas with sealed surfaces and the capacity of the bunded containment areas must be 110% the volume of the storage tanks within it.

Issue	Alternative	Mitigation measure
		• Cement and concrete must not be mixed directly on the ground, or during rainfall events when the potential for transport of pollutants to watercourses is the greatest. • Used cement bags should be collected and stored in containers to prevent wind-blown cement dust and water contamination. • Mixed cement/concrete must not be allowed to flow into any watercourses. • Drip trays must be placed under stationary construction machinery overnight to avoid soil contamination from oil and fuel leaks. • Absorbent materials in the form of a spill kit must be provided on site. • The ECO must determine the precise method of treatment of polluted soil. This could involve the application of soil absorbent materials or oil-digestive powders to the contaminated soil. • Contaminated soil must either be excavated or treated on-site, depending on the nature and extent of the spill. • Contaminated remediation materials must be carefully removed from the area of the spill so as to prevent further release of petrochemicals to the environment, and stored in suitable containers until appropriate disposal.
Soils	All	• Wind screening and stormwater control must be undertaken to prevent soil loss from the site. • The contractor must develop and implement an Erosion Management Plan. • All erosion control mechanisms must be regularly maintained. • Natural vegetation must be retained where possible to avoid soil erosion. • Construction must be phased in order to minimise the area of exposed soil at any one time. • Disturbed areas of natural vegetation must be rehabilitated immediately to prevent further soil erosion. • Fill and stabilise all erosion rills before they develop into larger gullies that advance from erosion and runoff due to construction activities
Natural vegetation	All	• The construction footprint must be surveyed and demarcated prior to construction commencing. • No construction activities will be allowed outside the demarcated footprint. • Construction activities must be kept to a minimum where untransformed areas of natural vegetation occur. • Construction activities should be preferred in areas where degraded natural vegetation is found. • Intact Albany alluvial vegetation patches must be avoided and activities in Kouga Grassy Sandstone vegetation type must be kept to a minimum. • Where vegetation has been cleared, site rehabilitation in terms of soil stabilisation and vegetation must be undertaken. • Cleared vegetation must not be piled on top of natural vegetation but must be stockpiled temporarily on bare ground and removed to a registered landfill site. Alternatively, cleared vegetation may be

Issue	Alternative	Mitigation measure
		mulched and used as ground cover during rehabilitation. • The contractor's staff must not harvest any natural vegetation.
Species of Conservation Concern (SCC)	All	• A search and rescue operation must be conducted by a qualified botanist prior to commencement of construction activities. • All SCC impacted by construction activities must be conserved and rescued. • All rescued SCC must be transplanted to a suitable habitat or nursery for the duration of the construction phase; • All rescued SCC must be replanted within the site where it was originally found or in close proximity during rehabilitation • The development area must be surveyed prior to topsoil removal in order to locate and capture any animal SCC and relocate them. • Provide training for construction workers on the contents of the EMPr. • The contractor's workers must not poach or trap wild animals.
Wildlife mortalities	All	• Train all staff on site regarding the proper management and response should animals be encountered. • Search and clear the construction region prior to work commencing, relocating animals where found. • No animal shall be killed or hurt deliberately. • No hunting, baiting or trapping shall be allowed.
Loss/fragmentation of habitats	All	• Vegetation clearance and aquatic habitats must be avoided as far as possible; • Should avoidance be impractical, harm to the environment shall be minimised as far as possible.
Establishments of alien plant species	All	• The approved Alien Vegetation Management Plan must be implemented during the construction phase to reduce the establishment and spread of undesirable alien plant species. • Alien plants must be removed from the site through appropriate methods such as hand pulling, application of chemicals, cutting etc. as in accordance to the NEMBA: Alien Invasive Species Regulations. • All temporarily impacted areas must be rehabilitated with indigenous vegetation as soon as construction in the particular area or phase of work is complete, i.e. rehabilitation is on-going throughout construction. • Restoration must be conducted as per the approved Erosion and Alien Vegetation Management Plans.
Riparian vegetation	Preferred site alternative 1	• Layout and design should take into account watercourses on and surrounding site whereby all infrastructure and buildings should be outside of the 1:100 year floodline and riparian zone. • Clearance of riparian vegetation must be kept to an absolute minimum and only if entirely necessary must be conducted • All riparian vegetation clearance activities must be monitored by the appointed ECO throughout the construction phase.
	Site alternative 2	
Habitat loss, destruction and pollution	All	• All chemicals/hazardous substances must be stored safely in bunded area at least 100m from any watercourse.

Issue	Alternative	Mitigation measure
		• Emergency plans must be in place in case of spillages of hazardous substances/materials.
Influx of job seekers	All	It is suggested that a project steering committee (PSC) consisting of ECPTA, contractor, Community Liaison Officer (CLO), recruitment agency, community leaders, elders, and youth, ward councillors and the municipal departments must be established in order to: • Conduct an audit of the affected communities in terms of employment capacity. • Identify potential workers from the affected and surrounding communities. • Identify possible conflicts in and between communities. • Set up a central labour desk where all workers register and only workers registered on the database should be considered for employment. • Recommend support programmes that would assist with conflict minimisation and resolution. • Contractually oblige sub-contractors to only employ workers through the labour force desk.
		• All construction workers must be clearly identifiable and wear easily recognisable uniforms. They need to carry identification cards issued by the contractor. • The SAPS must have access to construction sites. • Local communities should be encouraged to report suspicious activity to the community liaison or nearest site officer. • The use of local labour will minimise safety and security concerns to a great extent. • The contractor must prevent loitering around the construction camp by providing transport to and from the camp sites. • Implement on site safety and security measures, such as security guards and access control.
		• A Health and Safety Officer must be appointed on site and must comply with the Occupational Health and Safety policies. • A HIV/AIDS, non-discrimination, awareness, prevention and health care support policy and programme should be implemented. • Condoms must be made easily accessible to all workers. • An HIV/AIDS education and behaviour change programme for all contracted workers should be developed. • Existing public health care centres must be involved in HIV/AIDS campaigns and monitoring of HIV/AIDS prevalence should be undertaken in collaboration with these agencies. • Voluntary counselling and testing should be encouraged for all workers.
Impact on health and general quality of life	All	• Service providers associated with DBNLM clinics, schools and the SAPS must be made aware of the potential increase in demand for services, and the anticipated increased pressure to provide services for new households. • This will require the establishment of direct contact between LM, DM, the Department of Health, SAPS, Department of Education,

Issue	Alternative	Mitigation measure
		etc. The channels of communication must be established as permanent points of contact throughout the construction phase of the project. • Regular monitoring of schools and clinics must be undertaken in order to determine whether there are sufficient resources. When resources are insufficient, ECPTA must communicate, through established channels, with the relevant departments for assistance.
		• Noise and dust prevention measures and monitoring thereof must be included in an Environmental Management Programme.
		• Surrounding communities must have access to a grievance reporting mechanism, e.g. through a project steering committee.
Stimulation of economic growth	All	• Equal jobs opportunities for women and men must be promoted. • Culture and tradition must be considered when planning the division of labour for construction. • Employment must be managed by the PSC that uses a selection system that ensures recruitment of semi and unskilled workers from all local impacted communities in accordance with recent government policies related to local procurement. This must ensure a fair and equitable recruitment process. • Where appropriate, employees involved in the construction phase should be incorporated into the permanent maintenance staff for the operational phase.
		• ECPTA must ensure that the principle of utilising local business resources (suppliers and SMMEs), in accordance with recent government policies related to local procurement, forms part of the procurement specifications.
		• ECPTA should implement a skills development programme which will also include training in business, project management, monitoring and evaluation.
Air quality and dust control	All	• During windy periods un-surfaced and un-vegetated areas must be dampened down. • Vegetation must be retained where possible as this will reduce dust travel. • Any complaints or claims emanating from dust issues must be attended to immediately and noted in the complaints register. • A community liaison officer (CLO) must be appointed during the construction phase to facilitate a close working relationship with the Contractor and/or ECPTA and the surrounding landowners and general public. • Vehicles and construction plant must be serviced regularly so as to reduce excessive vehicle emissions.
Noise	All	• Activities which include the movement of construction vehicles and the operation of machinery should be restricted to normal working hours (07:00am – 17:00pm). • There must be a complaints register on site for nearby residents to

Issue	Alternative	Mitigation measure
		make complaints. These must be addressed and recorded.
On-site fire risk	All	In order to reduce the risk of fires: • All flammable substances must be stored in dry areas which do not pose an ignition risk to the said substances. • Smoking must not be permitted near flammable substances. • All cooking must be done in demarcated areas that are safe in terms of runaway or uncontrolled fires. • No open fires must be allowed on site. • Fire extinguishers must be available onsite.
Traffic	All	• Local residents should be made aware of the presence of construction vehicles by making use of high-visibility signage. • All traffic safety (flagmen) and traffic calming measures should be in place within the site and where traffic enters the main road.
Heritage and paleontological resources	All	• Although it would seem unlikely that any significant archaeological remains will be exposed during the development, there is always a possibility that human remains and/or other archaeological remains and historical material may be uncovered during the development. Should such material be exposed during construction, all work must cease in the immediate area (depending on the type of find) and it must be reported to the archaeologist at the Albany Museum in Makhanda (Grahamstown) (Tel.: 046 6222312) or to the Eastern Cape Provincial Heritage Resources Authority (Tel.: 043 7450888), so that a systematic and professional investigation can be undertaken. Sufficient time should be allowed to investigate and to remove/collect such material. Recommendations will follow from the investigation (See appendix B for a list of possible archaeological sites that maybe found in the area). • In either case, any substantial fossil remains (e.g. fossil shells, petrified wood or plant remains, vertebrate bones, teeth) encountered during the construction phase of the development should be reported by the ECO to the Eastern Cape Provincial Heritage Resources Agency, ECPHRA (Contact details: Mr Sello Mokhanya, 74 Alexander Road, King Williams Town 5600; smokhanya@ecphra.org.za) for possible mitigation by a professional palaeontologist. A tabulated Chance Fossil Finds Procedure is appended to this report. • All clearing activities and construction activities must be monitored. Managers/foremen should be informed before clearing/construction starts on the possible types of heritage sites and cultural material they may encounter and the procedures to follow when they find sites. Alternatively it is suggested that a person must be trained (ECO) as a site monitor to report to the foreman when heritage sites/materials are found.
Inadequate rehabilitation and maintenance	All	• The rehabilitation plan must be implemented during and after the construction has been completed. • All temporarily disturbed areas must be rehabilitated with indigenous vegetation as soon as construction in the particular area

Issue	Alternative	Mitigation measure
		or phase of work is complete, i.e. rehabilitation is on-going throughout construction as phases have been completed.
Operation Phase		
Legal and policy compliance	All	• The proponent must ensure that operation of the Baviaanskloof WHS Interpretive Centre is compliant with the relevant legislation and policy. • These should include (but are not restricted to): NEMA, EA, WULA, plant removal permits and any other permits/authorisations.
Bulk services and infrastructure	All	• Regular maintenance and inspections of all infrastructure and services must be undertaken by a designated person (ie. Caretaker). • Any leakages of sewage infrastructure on site must be stopped immediately and contaminated areas remediated.
	Preferred Site Alternative 1	• All infrastructure and buildings should be placed outside and above of the 1:100 year floodline. • Water diversion and drainage channels must be constructed to direct water away from the buildings. • Permeable surfaces should be retained and used as far as possible especially for parking bays and road infrastructure. • Should any flood damage occur to infrastructure or close to the sites, the Department of Environmental Affairs must be contacted prior to any remediation measures being put in place. • Areas surrounding and adjacent to the watercourses on site should be left in a natural state covered with natural vegetation as far as possible to ensure stability of the banks of the watercourse.
Stormwater management	All	• Stormwater management measures such as attenuation structures, channels, etc. must be properly maintained and monitored. • If the stormwater management measures put in place are deemed insufficient, a qualified engineer must be approached to assist with additional storm water attenuation mechanisms and remediation.
Waste management	All	• A waste management plan must be implemented to ensure appropriate handling, collection, processing and disposal of solid waste. (An adequate backup system for waste management should be in place in case of service delivery strikes). • Reuse, recycling and separation-at-source of waste should be promoted. • If any hazardous waste that is generated on site it must be stored in an impermeable container until such time as it can be disposed at a registered hazardous landfill site or be collected by the appropriate service provider (eg. Enviroserv). • A “clean site policy” must be adopted by all employees.
Wildlife disturbances and mortalities	All	• Train all staff on site regarding the proper management and response should animals be encountered. • No animals shall be hunted or killed. • Rules for guests should be enforced that prohibit the feeding of

Issue	Alternative	Mitigation measure
		animals and harvesting of plants.
Establishment of alien plant species	All	• The approved Alien Vegetation Management Plan must be implemented to reduce the establishment and spread of undesirable alien plant species. • Alien plants must be removed from the site through appropriate methods such as hand pulling, application of chemicals, cutting etc. as in accordance to the NEMBA: Alien Invasive Species Regulations.
Habitat loss, destruction and pollution	All	• Layout and design should take into account watercourses on and surrounding site whereby all infrastructure and buildings should be outside of the 1:100 year floodline and riparian zone. • Should infrastructure be placed within watercourses then a Water Use Licence/General Authorisation must be obtained from the Department of Water and Sanitaiton prior to any construction activities within the watercourse.
Stimulation of economic growth	All	• Equal jobs opportunities for women and men must be promoted. • A skills development programme and training should be implemented.
Tourism	All	• No mitigation required.
Conservation and protection	All	• No mitigation required.
Health, safety and crime	All	• Crime statistics should be monitored within the Baviaanskloof WHS area and appropriate action taken should crime levels increase as a result of the increase of people within the area. • A first aid kit must be available on site and the health and safety officer must be trained in first aid. • Emergency procedures must be made known to all workers and covered in toolbox talks. • Emergency numbers for the local police, fire department and local municipal must be displayed in a known area on site.
Visual	All	• Appropriate lighting must be installed which is shaded and directed. • Natural vegetation must be retained where possible, especially along the existing fence line along the road where there is already a “natural screen” that has developed.
On-site fire risk	All	• Fire extinguishers must be placed throughout the site. • No smoking or open flame should be permitted on the site. • An Emergency Response Plan must be in place and must be known by all employees. • Fire breaks should be considered by ECPTA.
Traffic	All	• Traffic calming measures should be in place along approaching roads. • Measures to accommodate pedestrians should be in place and continually enforced.
Heritage and paleontological resources	Site alternative 2	• Should any heritage resources be identified during the course of the operation phase, a heritage assessment practitioner should be notified and the appropriate route followed should the heritage

Issue	Alternative	Mitigation measure
		resource need to be removed or the appropriate buffer zone adopted should the heritage resource not require removal.
Inadequate rehabilitation and maintenance	All	• All disturbed areas must be continuously rehabilitated with indigenous vegetation post-construction.

6 ENVIRONMENTAL MONITORING

According to APPENDIX 4 of GN R 326, an environmental management programme must include:

(g) The method of monitoring the implementation of the impact management actions contemplated in paragraph (f);

(h) The frequency of monitoring the implementation of the impact management actions contemplated in (f);

A monitoring programme should be implemented for the duration of the construction and operation of the project. This programme should include:

- Establishing a baseline of pre-construction site conditions validated with photographic evidence.
- Bi-monthly (fortnightly) monitoring during the first month of construction, where after monthly audits will be conducted by an independent ECO for the remainder of the construction phase to ensure compliance with the EMPr conditions, and where necessary make recommendations for corrective action. Compliance monitoring can be conducted randomly and do not require prior arrangement with the Project Manager.
- Compilation of an audit report with a rating of compliance with the EMPr. The ECO must keep a photographic record of the demarcated site and construction area. The Contractor will be held liable for all unnecessary damage to the environment. A register must be kept of all complaints from the community. All complaints / claims must be handled immediately to ensure timeous rectification / payment by the responsible party.
- Compilation of a final audit report after all site construction and rehabilitation is complete. A final report containing a summary of all compliance monitoring during construction will be compiled at the end of construction.

7 ROLES AND RESPONSIBILITIES

According to APPENDIX 4 of GN R 326, an environmental management programme must include:

(i) An indication of the persons who will be responsible for the implementation of the impact management actions;

7.1 Applicant

ECPTA is the applicant and will therefore be the entity monitoring the implementation of the EMPr and compliance with the environmental authorisation. However, the Applicant's Project Manager may appoint a Contractor to implement the project and hence implement the proposed mitigation measures documented in this EMPr on their behalf.

The Applicant's Project Manager must:

- Ensure that all third parties who carry out all or part of the Applicant's obligations under the Contract comply with the requirements of this EMPr;
- Be responsible for obtaining any further environmental permits which are required for the design, construction and operation of the development; and
- Ensure that the infrastructure is maintained and functional during the operational phase of the development.

7.2 Contractor

The successful Contractor is responsible for:

- The finalisation of the EMPr in terms of methodologies (method statements) which are required to be implemented to achieve the environmental specifications contained herein and the relevant requirements contained in the environmental authorisation, if issued by DEA;
- The overall implementation of the EMPr in accordance with the requirements of the environmental authorisation, if issued by DEA;
- Ensuring that all third parties who carry out all or part of the Contractor's obligations under the Contract comply with the requirements of this EMPr;
- Obtaining any environmental permits which are required for the design, construction and operation of the development.

7.3 Environmental Control Officer

For the purposes of implementing the conditions contained herein, the Applicant's Project Manager must appoint an Environmental Control Officer (ECO) for the contract. The ECO will be the responsible person for ensuring that the provisions of the EMPr as well as the conditions of the environmental authorisation are complied with during the construction period. The ECO will be responsible for issuing instructions to the contractor where environmental considerations call for action to be taken. The ECO will submit regular written reports to the applicant, but not less frequently than once a month.
The ECO's duties in this regard will include, inter alia, the following:

- Confirming that all the environmental authorisations and permits required in terms of the applicable legislation have been obtained prior to construction commencing.
- Monitoring and verifying that the EMPr, Environmental Authorisation, other relevant permits and Contract are adhered to at all times and taking action if specifications are not followed.
- Monitoring and verifying that environmental impacts are kept to a minimum.

- Reviewing and approving construction method statements, where necessary, in order to ensure that the environmental specifications contained within this EMPr, environmental authorisation and any other relevant permits are adhered to.
- Inspecting the site and surrounding areas on a regular basis regarding compliance with the EMPr, the Environmental Authorisation and the Contract.
- Monitoring the undertaking, by the Contractor, of environmental awareness training for all new personnel on site.
- Ensuring that activities on site comply with all relevant environmental legislation.
- Ordering the removal of, or recommending spot fines for person(s) and/or equipment not complying with the specifications of the EMPr and/or environmental authorisation.
- Undertaking a continual internal review of the EMPr and submitting any changes to the Applicant's Project Manager for review and approval.
- Checking that the required actions are/were undertaken to mitigate the impacts resulting from non-compliance.
- Reporting all incidences of non-compliance to the Applicant's Project Manager.
- Keeping a photographic record of progress on site from an environmental perspective and recommending additional environmental protection measures, should this be necessary.
- Providing feedback on any environmental issues at site meetings.
- Conduct a final audit of all compliance monitoring conducted during construction.

The ECO must have:

- A good working knowledge of all relevant environmental policies, legislation, guidelines and standards;
- The ability to conduct inspections and to produce thorough, readable and informative reports;
- The ability to manage public communication and complaints;
- The ability to think holistically about the structure, functioning and performance of environmental systems; and
- Proven competence in the application of the following integrated environmental management tools:
  - Environmental Impact Assessment.
  - Environmental management plans/programmes.
  - Environmental auditing.
  - Mitigation and minimisation of impacts.
  - Monitoring and evaluation of impacts.
  - Environmental Management Systems.

The ECO must be fully conversant with this EMPr and the Environmental Authorisation (if issued) and all relevant environmental legislation.

The Applicant's Project Manager will have the authority to replace the ECO if, in their opinion, the appointed officer is not fulfilling his/her duties in terms of the requirements of the EMPr or this specification. Such instruction will be in writing and will clearly set out the reasons why a replacement is required and within what timeframe.

8 COMPLIANCE WITH THE EMPr

According to APPENDIX 4 of GN R 326, an environmental management programme must include:

(j) The time periods within which the impact management actions contemplated in paragraph (f) must be implemented;

(k) The mechanism for monitoring compliance with the impact management actions contemplated in paragraph (f);

A copy of the EMPr must be kept on site at all times during the construction and operation period. The EMPr will be binding on all staff operating on the site and must be included within the Contractual Clauses.

It should be noted that in terms of Section 28 of the National Environmental Management Act (No. 107 of 1998) those responsible for environmental damage must pay the repair costs both to the environment and human health and the preventative measures to reduce or prevent further pollution and/or environmental damage (The 'polluter pays' principle).

8.1 Non-compliance

The contractors must act immediately when notice of non-compliance is received from any government entity and corrective actions must be implemented. Complaints received regarding activities on the construction site pertaining to the environment must be recorded in a dedicated register and the response noted with the date and action taken.

The Contractor is deemed not to have complied with the EMPr if, *inter alia*:

- There is evidence of contravention of the EMPr specifications within the boundaries of the construction site, site extensions and roads.
- There is contravention of the EMPr specifications which relate to activities outside the boundaries of the construction site.
- Environmental damage ensues due to negligence.
- Construction activities take place outside the defined boundaries of the site.
- The Contractor fails to comply with corrective actions or other instructions issued by the Engineer within a specific time period.

It is recommended that the Contractor institutes penalties for the following less serious violations and any others determined during the course of work as detailed below:

- Littering on site.
- Lighting of illegal fires on site.
- Persistent or un-repaired fuel and oil leaks.
- Any persons, vehicles or equipment related to the Contractor's operations found within the designated "no-go" areas.
- Excess dust or excess noise emanating from site.
- Possession or use of intoxicating substances on site.
- Any vehicles being driven in excess of designated speed limits.
- Removal and/or damage to fauna, flora or cultural or heritage objects on site.
- Urination and defecation anywhere except at designated facilities.

8.2 Emergency preparedness

The Contractor must compile and maintain environmental emergency procedures to ensure that there will be an appropriate response to unexpected or accidental actions or incidents that will cause environmental impacts, throughout the construction period. Such activities may include, inter alia:

- Accidental discharges of polluting substances to water and land.
- Accidental exposure of employees to hazardous substances.
- Accidental fires.
- Accidental spillage of hazardous substances.
- Accidental toxic emissions into the air.
- Specific environmental and ecosystem effects from accidental releases or incidents.

These plans must include:

- Emergency organisation (manpower) and responsibilities, accountability and liability.
- A list of key personnel and contact details.
- Details of emergency services available (e.g. the fire department, spill clean-up services, etc.).
- Internal and external communication plans, including prescribed reporting procedures where required by legislation.
- Actions to be taken in the event of different types of emergencies.
- Incident recording, progress reporting and remediation measures required to be implemented.
- Information on hazardous materials, including the potential impact associated with each, and measures to be taken in the event of accidental release.
- Training plans, testing exercises and schedules for effectiveness.

The Contractor must comply with the emergency preparedness and incident and accident-reporting requirements, as required by the Occupational Health and Safety Act, 1993 (Act No. 85 of 1993), the NEMA, 1998 (Act No. 107 of 1998) and the National Water Act, 1998 (Act No. 36 of 1998) and/or any other relevant legislation.

8.3 Incident reporting and remedy

If a leakage or spillage of hazardous substances occurs on site, the local emergency services must be immediately notified of the incident. The following information must be provided:

- The location;
- The nature of the load;
- The extent of the impact; and
- The status at the site of the accident itself (i.e. whether further leakage is still taking place, whether the vehicle or the load is on fire).

Written records must be kept on the corrective and remedial measures decided upon and the progress achieved therewith over time. Such progress reporting is important for monitoring and auditing purposes.

8.4 Penalties to contractors

Where environmental damage is caused or a pollution incident, and/or failure to comply with any of the environmental specifications contained in the EMPr, the Project Applicant and/or contractor will be liable to pay a penalty fine.

The following violations, and any others determined during the course of work, should be penalised:

- Hazardous chemical/oil spill and/or dumping in non-approved sites.
- Damage to sensitive environments.
- Damage to cultural and historical sites.
- Unauthorised removal/damage to indigenous trees and other vegetation, particularly in identified sensitive areas.
- Uncontrolled/unmanaged erosion.
- Pollution of water sources.

9 REPORTING

According to APPENDIX 4 of GN R 326, an environmental management programme must include:

(l) A program for reporting on compliance, taking into account the requirement as prescribed by the regulations;

9.1 Administration

The Contractor must provide the Applicant's Project Manager and/or the ECO with a written method statement, prior to the commencement of the construction phase, setting out the following:

- The type of construction activity.
- Locality where the activity will take place.
- Identification of impacts that might result from the activity.
- Identification of activities that may cause an impact.
- Methodology and/or specifications for impact prevention for each activity or aspect.
- Methodology and/or specifications for impact containment for each activity or aspect.
- Emergency/disaster incident and reaction procedures.
- Treatment and continued maintenance of the impacted environment.

New submissions must be given to the Applicant's Project Manager and/or the ECO whenever there is a change or variation to the original.

The Applicant's Project Manager and/or the ECO should provide comment on the methodology and procedures proposed by the Contractor but they will not be responsible for the Contractor's chosen measures of impact mitigation and emergency/disaster management systems.

9.2 Good housekeeping

The Contractor must undertake "good housekeeping" practices during construction. This will help avoid disputes on responsibility and allow for the smooth running of the contract as a whole. Good housekeeping extends beyond the wise practice of construction methods to include the care for and preservation of the environment within which the construction activities are situated.

9.3 Record keeping

The Applicant's Project Manager and/or the ECO will continuously monitor the Contractor's adherence to the approved impact prevention procedures and the ECO must issue the Contractor a notice of non-compliance whenever transgressions are observed. The ECO should document the nature and magnitude of the non-compliance in a designated register, the action taken to discontinue the non-compliance, the action taken to mitigate its effects and the results of the actions. The non-compliance will be documented and reported to the Applicant's Project Manager in the monthly report. These reports must be made available to DEA when requested.

9.4 Document control

The Applicant's Project Manager and/or the ECO will be responsible for establishing a procedure for electronic document control. The document control procedure should comply with the following requirements:

- Documents must be identifiable by organisation, division, function, activity and contact person.

- Every document must identify the personnel and their positions, who drafted and compiled the document, who reviewed and recommended approval, and who finally approved the document for distribution.
- All documents must be dated, provided with a revision number and reference number, filed systematically, and retained for a five year period.

The Applicant's Project Manager and/or the Contractor must 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 EMPr are performed. All documents must be made available to the ECO and other independent external auditors.

10 ENVIRONMENTAL AWARENESS

According to APPENDIX 4 of GN R 982, an environmental management programme must include:

(m) An environmental awareness plan describing the manner in which –

(i) The applicant intends to inform his or her employees of any environmental risk which may result from their work; and

(ii) Risks must be dealt with in order to avoid pollution or the degradation of the environment;

Contractors must ensure that their employees and any third party that carries out all or part of the Contractor's obligations are adequately trained with regard to the implementation of the EMPr, as well as regarding environmental legal requirements and obligations.

Environment and health awareness training programmes should be targeted at three distinct levels of employment, i.e. project manager, supervisor and labour.

The appointed ECO must provide training and ensure that records of all training interventions are kept in accordance with the record keeping and documentation control requirements as set out in this EMPr.

The environmental training should, as a minimum, include the following:

- Environmental legal requirements and obligations.
- The importance of conformance with all environmental policies.
- The environmental impacts, actual or potential, of their work activities.
- The environmental benefits of improved personal performance.
- Their roles and responsibilities in achieving conformance with the environmental policy and procedures, including emergency preparedness and response requirements.
- The potential consequences of departure from specified operating procedures.
- The mitigation measures required to be implemented when carrying out their work activities.
- Details regarding floral/faunal species of special concern and protected species, and the procedures to be followed should these be encountered during construction activities.
- The importance of not littering.
- The importance of using supplied toilet facilities.
- The need to use water sparingly.
- Details of and encouragement to minimise the production of waste and re-use, recover and recycle waste where possible.

11 CLOSURE PLANNING

11.1 Final site restoration

The Contractor must clear and restore the site and ensure that all excess building material and construction debris is removed from site once the construction phase has been completed.

11.2 Rehabilitation

The Contractor (landscape architect/horticulturist) will be responsible for the rehabilitation and re-vegetation of all disturbed areas earmarked for conservation during construction to the satisfaction of the Applicant's Project Manager and/or the ECO.

11.3 Post-construction audit

A post-construction audit must be carried out for submission to the Applicant. Objectives should be to audit compliances with the key components of the EMPr, to identify the main areas requiring attention and recommend priority actions. The audit should be undertaken annually and should cover a cross section of issues, including implementation of environmental controls, environmental management and environmental monitoring.

Results of the audits should inform changes required to the specifications of the EMPr or additional specifications to deal with any environmental issues which arise on site and have not been dealt with in the current document.

12 CONCLUSIONS

Although all foreseeable actions and potential mitigations or management actions are contained in this document, the EMPr should be seen as a day-to-day management document. The EMPr thus sets out the environmental and social standards that would be required to minimise the negative impacts and maximise the positive benefits of the construction and operational activities.

All attempts should be made to have this EMPr available, as part of any tender documentation, so that the Engineers and Contractor are made aware of the potential cost and timing implications needed to fulfil the implementation of the EMPr, thus adequately costing for these.

The EMPr will be reviewed by the ECO on an on-going basis. Based on observations during site inspections and issues raised at site meetings, the ECO will determine whether any procedures require modification to improve the efficiency and applicability of the EMPr on-site.

Any such changes or updates will be registered in the ECOs records, as well as being included as an annexure to this document.

It is the responsibility of ECPTA to ensure the Operational Phase mitigation measures are followed.

APPENDIX A – ENVIRONMENTAL TRAINING

PROPOSED ENVIRONMENTAL EDUCATION COURSE OUTLINE

http://www.webweaver.nu/clipart/environmental.shtml

Reasons why should we look after the environment

- We have a right to a clean environment
- A clean environment is essential to healthy living
- All our basic needs come from the environment
- A contract has been signed – development vs the environment
- Penalties / fines could be issued

How to look after the environment

- Report issues
- Teamwork
- Follow the set rules and guidelines (EA, EMPr, Method statements etc.)
- Conserve, reuse and recycle

Tips and Guidelines

- Workers and equipment should not be allowed outside demarcated areas
- No swimming or polluting of water bodies allowed
- No damage / disturbance to vegetation or water bodies without consent / permits
- No disturbance allowed in no-go areas
- No hunting of animals
- Report all fires
- No burning or burying of waste
- No smoking near hazardous materials
- Training on fire fighting equipment
- Hazardous materials to be stored in designated and bunded areas
- Spill kits and drip trays a must
- Report all spills
- Control dust and Noise
- Maintain construction vehicles
- Availability and maintenance of sanitation facilities

Tips and Guidelines

- Only eat is designated areas
- Do not litter
- Vehicles to remain on approved tracks and adhere to speed limit
- Ensure emergency phone numbers are available
- Ensure PPE is worn
- Report fires, leaks and injuries
- Ask if unsure

APPENDIX B – METHOD STATEMENT EXAMPLE

EXAMPLE OF A METHOD STATEMENT

METHOD STATEMENT

CONTRACT:……..... **DATE**:…….

PROPOSED ACTIVITY (give title of Method Statement and reference number from the EMPr):

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 sketches and plans where possible):

*** Note: Please attach additional pages should you require more space.**

DECLARATIONS

1) ENVIRONMENTAL CONTROL OFFICER (ECO)

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 will audit my compliance with the contents of this Method Statement

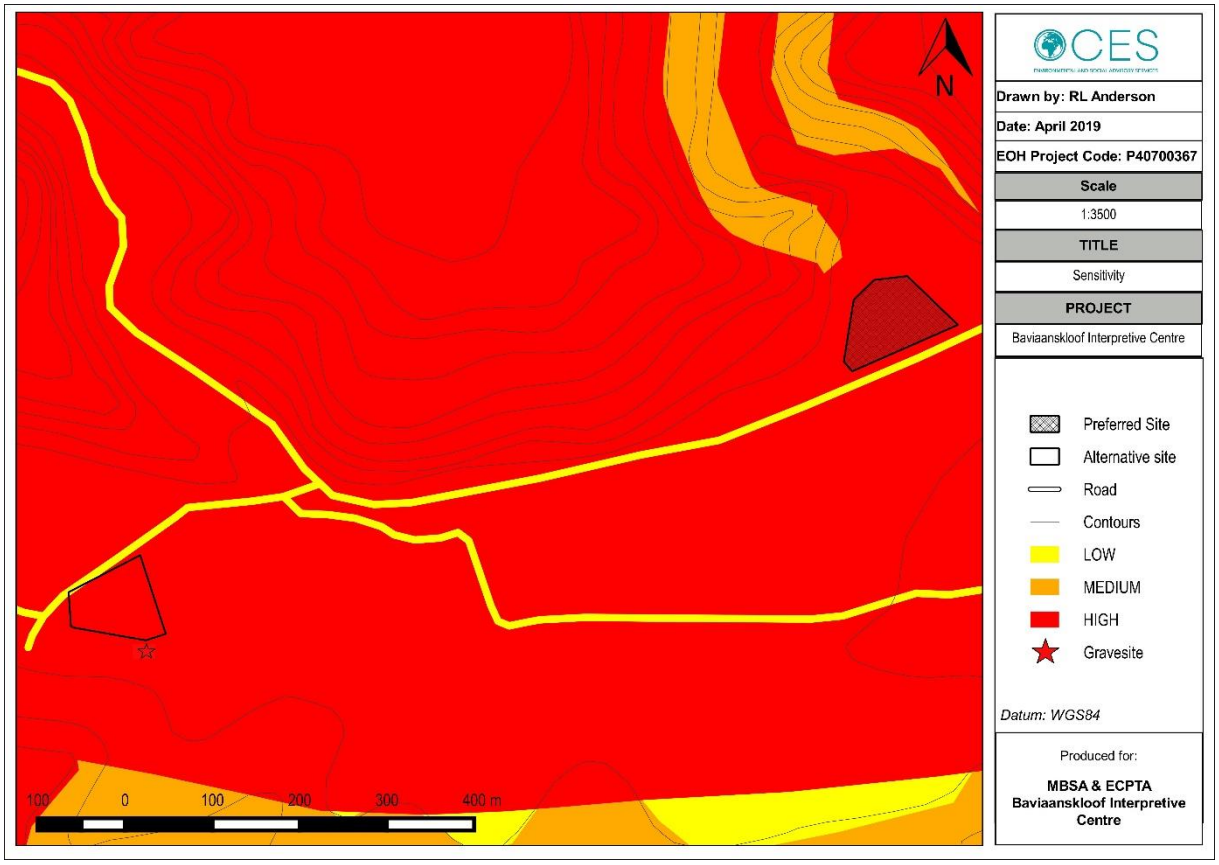
_____ _____

(Signed) (Print name)

Dated: _____

APPENDIX C – SENSITIVITY MAP

Sensitivity Map of the study area:



APPENDIX D – ALIEN VEGETATION MANAGEMENT PLAN

Background and Legislative Framework

The proponent is required to comply with all necessary legislation, policies and guidelines. These include:

National Environmental Management: Biodiversity Act (NEM:BA, Act 10 of 2004).

Control and management of invasive alien plant species falls within the ambit of the NEM:BA which defines different categories of invasive alien plant species according to their current invasive state and potential to become invasive. These categories are, as per the NEM:BA Regulations (October 2014):

- Category 1a Listed Invasive Species

1) Category 1a Listed Invasive Species are those species listed as such by notice in terms of section 70(1)(a) of the Act as species which must be combatted or eradicated.

2) A person in control of a Category 1a Listed Invasive Species must –
   a) comply with the provisions of section 73(2) of the Act;
   b) immediately take steps to combat or eradicate listed invasive species in compliance with sections 75(1), (2) and (3) of the Act; and
   c) allow an authorised official from the Department to enter onto land to monitor, assist with or implement the combatting or eradication of the listed invasive species.

3) If an Invasive Species Management Programme has been developed in terms of section 75(4) of the Act, a person must combat or eradicate the listed invasive species in accordance with such programme."

Control method: Invasive species requiring compulsory control. Remove and destroy. Any specimens of Category 1a listed species need, by law, to be eradicated from the environment. No permits will be issued.

- Category 1b Listed Invasive Species

1) Category 1b Listed Invasive Species are those species listed as such by notice in terms of section 70(1)(a) of the Act as species which must be controlled.

2) A person in control of a Category 1 b Listed Invasive Species must control the listed invasive species in compliance with sections 75(1), (2) and (3) of the Act.

3) If an Invasive Species Management Programme has been developed in terms of section 75(4) of the Act, a person must control the listed invasive species in accordance with such programme.

4) A person contemplated in sub-regulation (2) must allow an authorised official from the Department to enter onto the land to monitor, assist with or implement the control of the listed invasive species, or compliance with the Invasive Species Management Programme contemplated in section 75(4) of the Act."

Control method: Invasive species requiring compulsory control as part of an invasive species control programme. Remove and destroy. These plants are deemed to have such a high invasive potential that infestations can qualify to be placed under a government sponsored invasive species management programme. No permits will be issued.

- Category 2 Listed Invasive Species

1) Category 2 Listed Invasive Species are those species listed by notice in terms of section 70(1)(a) of the Act as species which require a permit to carry out a restricted activity within an area specified in the Notice or an area specified in the permit, as the case may be.

2) Unless otherwise indicated in the Notice, no person may carry out a restricted activity in respect of a Category 2 Listed Invasive Species without a permit.

3) A landowner on whose land a Category 2 Listed Invasive Species occurs or person in possession of a permit, must ensure that the specimens of the species do not spread outside of the land or the area specified in the Notice or permit.

4) If an Invasive Species Management Programme has been developed in terms of section 75(4) of the Act, a person must control the listed invasive species in accordance with such programme.

5) Unless otherwise specified in the Notice, any species listed as a Category 2 Listed Invasive Species that occurs outside the specified area contemplated in sub-regulation (1), must, for purposes of these regulations, be considered to be a Category 1 b Listed Invasive Species and must be managed according to Regulation 3.

6) Notwithstanding the specific exemptions relating to existing plantations in respect of Listed Invasive Plant Species published in Government Gazette No. 37886, Notice 599 of 1 August 2014 (as amended), any person or organ of state must ensure that the specimens of such Listed Invasive Plant Species do not spread outside of the land over which they have control."

Control methods: Invasive species regulated by area. A demarcation permit is required to import, possess, grow, breed, move, sell, buy or accept as a gift any plants listed as Category 2 plants. No permits will be issued for Cat 2 plants to exist in riparian zones.

- Category 3 Listed Invasive Species

1) Category 3 Listed Invasive Species are species that are listed by notice in terms of section 70(1)(a) of the Act, as species which are subject to exemptions in terms of section 71(3) and prohibitions in terms of section 71A of Act, as specified in the Notice.

2) Any plant species identified as a Category 3 Listed Invasive Species that occurs in riparian areas, must, for the purposes of these regulations, be considered to be a Category 1b Listed Invasive Species and must be managed according to regulation 3.

3) If an Invasive Species Management Programme has been developed in terms of section 75(4) of the Act, a person must control the listed invasive species in accordance with such programme."

Control methods: Invasive species regulated by activity. An individual plant permit is required to undertake any of the following restricted activities (import, possess, grow, breed, move, sell, buy or accept as a gift) involving a Category 3 species. No permits will be issued for Cat 3 plants to exist in riparian zones.

General guidelines for alien invasive species removal:

It is essential that alien invasive species be removed from the study area. Following the Working for Water guidelines for effective alien vegetation removal (DWAF, 2009), an alien removal programme should consist of the following three phases:

1. Initial control: Clearing and eradication of alien invasive stands so as to drastically reduce the existing population;
2. Follow-up control: Control of re-growth (including seedlings, root suckers and coppice growth); which should be conducted annually for the first 5 years; and
3. Maintenance control: Sustain alien plant numbers with on-going annual monitoring for the life of the project, and if necessary implement additional control methods to avoid re-establishment of alien invasive stands.

Potential Alien Invasive Plant Species on the proposed Baviaanskloof WHS Interpretive Centre sites.

The following list of alien species was developed based on the following information:

- Alien plants that are known to colonise disturbed areas within the Eastern Cape Region;
- Alien plants identified during the site visit undertaken by the Ecologist as part of the Ecological Impact Assessment undertaken in support of the EIA; and
- List of alien plants identified by ECPTA as part of their draft Invasive Species Monitoring, Control and Eradication Plan (2017-18).

List of alien invasive species potentially occurring on the site alternatives:

Species name	Common name	NEM:BA Category
Acacia cyclops	Rooikrans	1b
Acacia longifolia	Long-leaf wattle	1b
Acacia mearnsii	Black wattle	2
Acacia melanoxylon	Blackwood	2
Acacia podalyriifolia	Pearl wattle	1a
Acacia saligna	Port Jackson willow	1b
Argemone ochroleuca subsp. ochroleuca	Mexican poppy	1b
Bryophyllum delagoense	Mother of millions	1b
Datura stramonium	Common thorn apple	1b
Echinopsis schickendantzii	Torch cactus	1b
Elodea canadensis	Canadian waterweed	1b
Emex australis	Devil's thorn	Unlisted
Eucalyptus sp.	Gum	1b
Hakea sericea	Silky hakea	1b
Lantana camara L.	Lantana	1b
Melia azedarach	Syringa	1b

Species name	Common name	NEM:BA Category
Nerium oleander	Oleander	1b
Nicotiana glauca	Wild tobacco	1b
Opuntia aurantiaca	Jointed cactus	1b
Opuntia ficus-indica	Sweet prickly pear	1b
Pennisetum clandestinum	Kikuyu	1b
Pennisetum setaceum	Crimson fountain grass	1b
Pereskia aculeata	Barbados gooseberry	1b
Phytolacca americana	Pokeweed	1b
Pinus sp.	Cluster pine	2
Ricinus communis	Castor oil plant	1b
Rubus cuneifolius	American bramble	2
Salix babylonica	Weeping willow	1b
Sesbania punicea	Red sesbania	1b
Solanum mauritianum	Bugweed	1b
Tamarix ramosissima	Pink tamarisk	Unlisted
Torilis arvensis	Spreading hedge-parsley	Unlisted
Verbesina encelioides	Butter daisy	1b
Xanthium spinosum	Cockle bur	2

Alien Invasive Control Methods

There are a number of possible methods which can be used to control alien invasive species; these include mechanical, chemical and biological control. The sections below outline possible techniques used in mechanical and chemical control methods. Biological control is not a feasible option for this site, and is thus not discussed further.

Mechanical control methods

Mechanical methods for alien plant removal may include felling, removing or burning invading alien plants. The following mechanical methods for felling are recommended:

- Hand pulling: Grip the young plant low down and pull out by hand (using gloves);
- Ring barking: Bark is removed to from the bottom of the stem to a height of 0.75-1.0 m to below ground level. Bush knives or hatchets can be used for debarking;
- Frill or Ring-bark: Using an axe or bush knife, angled cuts are made downward into the cambium layer through the bark in a ring; herbicide is applied into the cuts; and
- Cut stump treatment: Stems should be cut as low as practical as stipulated on the herbicide label. Chemical herbicides are applied in diesel or water as recommended. Applications in diesel should be to the whole stump and exposed roots and in water to the cut area as recommended on the label.

Chemical control methods

Chemical methods for alien plant removal include using a number of approved environmentally safe herbicides, which are applied to the leaves, stems or stumps of alien invader species (details of herbicides

suitable for the various species is provided in the table below. Herbicide application must be undertaken with care and applicators must be trained to ensure compliance with health and safety as well as ensuring that the herbicides are applied effectively.

Summary of methods to be used for removal of alien invasive plant species:

Species name	Treatment method						
	Hand pull or hoe	Soil applications	Foliar Spray		Cut stump and herbicide	Frill and herbicide	Spray from boat/shoreline
			Seedlings	Trees			
Acacia cyclops	Seedlings		Garlon/ Confront	Garlon (trees up to 2m tall)	Timbrel	Timbrel	
Acacia longifolia	Seedlings		Garlon/ Confront		Timbrel	Timbrel	
Acacia mearnsii	Seedlings		Touchdown/ Confront	Confront/ Timbrel	Timbrel	Access	
Acacia melanoxylon	Seedlings		Garlon/ Confront	Confront	Confront	Confront	
Acacia podalyriifolia	Seedlings				Garlon	Garlon	
Acacia saligna	Seedlings		Touchdown/ Confront	Access/ Confront	Access/ Confront	Access/ Confront	
Argemone ochroleuca subsp. ochroleuca			Kilo	Kilo/Muscle-up			
Bryophyllum delagoense	No herbicides recommended to date.						
Datura stramonium			Extreme/ Muscle-up				
Echinopsis schickendantzii	No herbicides recommended to date.						
Elodea canadensis							Midstream
Emex australis	No herbicides recommended to date.						
Eucalyptus sp.	Seedlings				Chopper	Chopper	
Hakea sericea		Molopo					
Lantana camara L.			Roundup/ Chopper		Chopper		
Melia azedarach	Seedlings		Chopper		Chopper		
Nerium oleander			Hatchet		Hatchet		
Nicotiana glauca			Mamba				
Opuntia aurantiaca			MSMA				
Opuntia ficus-indica						Roundup/ Glyphosate 360 (inject stem)	
Pennisetum	No herbicides recommended to date.						

Species name	Treatment method						
	Hand pull or hoe	Soil applications	Foliar Spray		Cut stump and herbicide	Frill and herbicide	Spray from boat/shoreline
			Seedlings	Trees			
clandestinum							
Pennisetum setaceum			Springbok				
Pereskia aculeata				Garlon			
Phytolacca americana			Kilo				
Pinus pinaster				Kilo (ring bark)			
Ricinus communis					Chopper		
Rubus cuneifolius			Access/ Garlon/ Confront				
Salix babylonica			Timbrel	Timbrel			
Sesbania punicea			Roundup/ Garlon		Chopper/ Garlon		
Solanum mauritianum			Roundup/ Garlon		Chopper		
Tamarix ramosissima	Seedlings				Garlon/ Lumberjack		
Torilis arvensis	No herbicides recommended to date.						
Verbesina encelioides	No herbicides recommended to date.						
Xanthium spinosum			2.4-D Amine				

Visual Manual for Alien Invasive Plant Species Identification:

The following plates provide a guide to the alien invasive plant species with the potential to invade the site. Each species is described in terms of how it looks, timing of flowering and/or fruiting, its invasive status (as classified by NEM:BA, Act 10 of 2004).

Scientific name	*Acacia cyclops*
Common name(s)	Rooikrans
Description	Evergreen shrub approximately 1.5 to 4m high.
Leaves	Bright elongated green leaves with prominent parallel veins
Flowers	Yellow flowers which flower all year round.
Fruit	Broad brown twisted pods with black seed encircled by a row of bright red.
Invasive status	NEMBA: Category 1b

Proposed control methods	
Seedlings	Hand pull or hoe over small areas Foliar spray
Mature or large plants	Foliar spray Cut stump and herbicide

Scientific name	*Acacia longifolia*
Common name(s)	Long-leaf wattle
Description	Evergreen shrub approximately 2-6m in height.
Leaves	Long bright green leaves with prominent longitudinal veins.
Flowers	Bright yellow and cylindrical leaves growing 50mm long and 7mm wide.
Fruits	Elliptic and irregularly shaped 4-6mm long.
Invasive status	NEMBA: Category 1b

Proposed control methods	
Seedlings	Hand pull or hoe over small areas Foliar spray
Mature or large plants	Cut stump and herbicide

Scientific name	*Acacia mearnsii*
Common name(s)	Black wattle
Description	Evergreen tree growing 5-10m in height.
Leaves	Dark olive-green finely hairy leaves.
Flowers	Pale yellow or cream spherical flowers.
Fruits	Fruits dark brown, finely hairy pods.
Invasive status	NEMBA: Category 2

Proposed control methods	
Seedlings	Hand pull or hoe over small areas Foliar spray
Mature or large plants	Cut stump/frill and herbicide

Scientific name	*Acacia melanoxylon*
Common name(s)	Blackwood
Description	Tree growing up to 20m high with dark greyish-black bark with deep fissures on older trunks. Younger branches are greenish with angular or flattened shape.
Leaves	Dark green leaves.
Flowers	Pale yellow, cream or whitish coloured flowers
Fruits	Fruits elongated and somewhat flatted with strong stwist, curves and approximately 4-15cm long.
Invasive status	NEMBA: Category 2

Proposed control methods	
Seedlings	Hand pull or hoe over small areas Foliar spray
Mature or large plants	Cut stump/frill and herbicide

Scientific name	*Acacia podalyriifolia*
Common name(s)	Pearl wattle
Description	Small evergreen shrub/tree growing 3-6m high.
Leaves	Silvery-grey to dull green ovaly, velvety leaves.
Flowers	Flowers are bright yellow, spherical and long in display
Fruits	Greyish brown velvety pods
Invasive status	NEMBA: Category 1a

Proposed control methods	
Seedlings	Hand pull or hoe over small areas Foliar spray
Mature or large plants	Cut stump and herbicide

Scientific name	*Acacia saligna*
Common name(s)	Port Jacksons willow
Description	Evergreen tree 3-7m high
Leaves	Blue green bright green leaves
Flowers	Bright yellow globe shaped flowers
Fruits	Brown pods
Invasive status	NEMBA: Category 1b

Proposed control methods	
Seedlings	Hand pull or hoe over small areas Foliar spray
Mature or large plants	Cut stump/frill and herbicide

Scientific name	*Argemone ochroleuca subsp. ochroleuca*
Common name(s)	Mexican poppy
Description	Spiny herb growing approximately 90cm high
Leaves	Grey bluish green leaves with prominent white vein
Flowers	Creamy white or pale yellow flowers
Fruits	Green oblong spiny fruit
Invasive status	NEMBA: Category 1b

Proposed control methods	
Seedlings	Foliar spray
Mature or large plants	Foliar spray

Scientific name	*Bryophyllum delagoense*
Common name(s)	Mother of millions
Description	Perennial succulent growing 1.2m high
Leaves	Grey-green mottled leaves with dark green to reddish spots with pencil shape
Flowers	Flowers deep magenta to pale orange
Fruits	
Invasive status	NEMBA: Category 1b

Proposed control methods	
Seedlings	Hand pull. No herbicides recommended to date.
Mature or large plants	No herbicides recommended to date.

Scientific name	*Datura stramonium*
Common name(s)	Common thorn apple
Description	Erect shrub growin approximately 1.5m high with some hairy to smooth green and purple stems.
Leaves	Leaves dark green on upper surface and lighter underneath.
Flowers	Mauve, purplish or white flowers with funnel-shape.
Fruits	Spiny brown hard fruit approximately 10mm in length.
Invasive status	NEMBA: Category 1b

Proposed control methods	
Seedlings	Hand pull plants before they have seeded. Foliar spray.
Mature or large plants	Foliar spray.

Scientific name	*Echinopsis schickendantzii*
Common name(s)	Torch cactus
Description	Multi-stemed spiny succulent up to 1.5m high with numerous spines with central spine the longest.
Leaves	No leaves.
Flowers	White flowers with long hairs covering floral tube.
Fruits	Hairy green fruit with black seeds.
Invasive status	NEMBA: Category 1b

Proposed control methods	
Seedlings	Foliar spray.
Mature or large plants	Foliar spray.

Scientific name	*Elodea canadensis*
Common name(s)	Canadian waterweed
Description	Submerged aquatic plant with slender stems up to 3m long.
Leaves	Green finely serrated leave 5-15mm long usually displayed in whorls.
Flowers	Cream or yellow flowers with long thread-like stalks.
Fruits	No fruits.
Invasive status	NEMBA: Category 1b

Proposed control methods	
Seedlings	Foliar spray.
Mature or large plants	Foliar spray.

Scientific name	*Emex australis*
Common name(s)	Devil's thorn
Description	Herbaceous plant which spreads horizontally.
Leaves	Dull green pear shaped leaves.
Flowers	
Fruits	Cluster of 3 hardened spines brown in colours
Invasive status	Unlisted

Proposed control methods	
Seedlings	Hand pull. No herbicides recommended to date.
Mature or large plants	Hand pull. No herbicides recommended to date.

Scientific name	*Eucalyptus sp.*
Common name(s)	Gum trees
Description	Tall tree with single main stem with bark that gets darker every year and sheds somewhat exposing fresh light bark underneath.
Leaves	Evergreen leaves usually hanging downwards with waxy or glossy texture.
Flowers	Yellow, white, cream, pink or red fluffy stamens.
Fruits	
Invasive status	NEMBA: Category 1b
	
Proposed control methods	
Seedlings	Hand pull.
Mature or large plants	Cut stump/frill and herbicide.

Scientific name	*Hakea sericea*
Common name(s)	Silky hakea
Description	Prickly shrub growing 5m high with numerous branches.
Leaves	Dark green need shaped leaves smooth in texture.
Flowers	Cream flowers.
Fruits	Purplish brown wooden fruit capsules.
Invasive status	NEMBA: Category 1b
	
Proposed control methods	
Seedlings	Hand pull. Soil application.
Mature or large plants	Soil application.

Scientific name	*Lantana camara L.*
Common name(s)	Lantana
Description	Spreading untidy shrub growing up to 2m.
Leaves	Dark green rough hairy leaves with strong smell when crushed.
Flowers	Pink, orange, yellow, red and white flowers arranged in compact flat-topped heads.
Fruits	Glossy green to purplish black fruits.
Invasive status	NEMBA: Category 1b

Proposed control methods	
Seedlings	Hand pull. Foliar spray.
Mature or large plants	Cut stump and herbicide.

Scientific name	*Melia azedarach*
Common name(s)	Syringa
Description	Large tree growing 23m high with smooth reddish-brown bark.
Leaves	Dark glossy leaves.
Flowers	Lilac to purple flowers
Fruits	Green berries.
Invasive status	NEMBA: Category 1b

Proposed control methods	
Seedlings	Hand pull. Foliar spray.
Mature or large plants	Cut stump and herbicide.

Scientific name	*Nerium oleander*
Common name(s)	Oleander
Description	Evergreen shrub growing 6m high.
Leaves	Dull green leaves with distinctive veins.
Flowers	White, pink or red flowers.
Fruits	Reddish brown fruit follicles.
Invasive status	NEMBA: Category 1b

Proposed control methods	
Seedlings	Hand pull. Foliar spray.
Mature or large plants	Cut stump and herbicide.

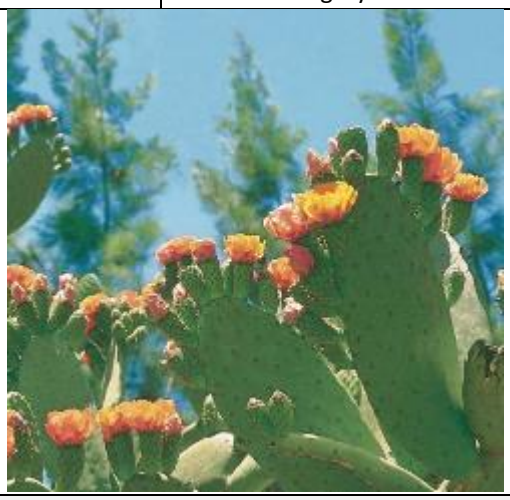
Scientific name	*Nicotiana glauca*
Common name(s)	Wild tobacco
Description	Evergreen shrub growing 6m high.
Leaves	Blue-green leathery leaves.
Flowers	Yellow flowers tubular drooping shape.
Fruits	Four-valved brown fruit capsules.
Invasive status	NEMBA: Category 1b

Proposed control methods	
Seedlings	Hand pull. Foliar spray.
Mature or large plants	Cut and herbicide application.

Scientific name	*Opuntia aurantiaca*
Common name(s)	Jointed cactus
Description	Spiny multi-branched spreading cactus growing up to 1.5m high. Stems bright green with reddish-purple tinge.
Leaves	No leaves.
Flowers	Bright yellow flowers.
Fruits	Reddish succulent fruit.
Invasive status	NEMBA: Category 1b

Proposed control methods	
Seedlings	Foliar spray.
Mature or large plants	

Scientific name	*Opuntia ficus-indica*
Common name(s)	Sweet prickly pear
Description	Succulent multi-branched shrub/tree growing up to 3m high. Grey to grey-green stems sometimes heavily spined and sometimes without.
Leaves	No leaves.
Flowers	Orange and bright yellow flowers.
Fruits	Yellow reddish edible fruit.
Invasive status	NEMBA: Category 1b



Proposed control methods	
Seedlings	Foliar spray.
Mature or large plants	Frill and herbicide application.

Scientific name	*Pennisetum clandestinum*
Common name(s)	Kikuyu grass
Description	Rhizomatous grass with matted roots growing up to 46cm high.
Leaves	
Flowers	
Fruits	
Invasive status	NEMBA: Category 1b

Proposed control methods	
Seedlings	Hand pull and foliar spray.
Mature or large plants	

Scientific name	*Pereskia aculeata*
Common name(s)	Barbados gooseberry
Description	Spiny clambering vine with long slender branches growing 2-10m high.
Leaves	Stems and leaves succulent with hooked spines in leaf axils. Bright green lance-shaped leaves.
Flowers	Yellow and white cream flowers
Fruits	Green succulent berries about 20mm in length and turn yellow over time.
Invasive status	NEMBA: Category 1b

Proposed control methods	
Seedlings	Foliar spray
Mature or large plants	Foliar spray

Scientific name	*Phytolacca americana*
Common name(s)	Pokeweed
Description	Perennial plant herbaceous in nature with purplish stems.
Leaves	Leaves green to red.
Flowers	Flowers green to white
Fruits	Black berries
Invasive status	NEMBA: Category 1b

Proposed control methods	
Seedlings	Hand pull. Foliar spray.
Mature or large plants	

Scientific name	*Pinus pinaster*
Common name(s)	Cluster pine
Description	Coniferous tree growing 8-15m high with tall main trunk and reddish-brown bark
Leaves	Dull green needle like leaves
Flowers	No flowers.
Fruits	Cones initially purple turning light brown.
Invasive status	NEMBA: Category 2

Proposed control methods	
Seedlings	
Mature or large plants	Ring bark and herbicide.

Scientific name	*Ricinus communis*
Common name(s)	Castor oil plant
Description	Shrub/small tree growing up to 4m high.
Leaves	Dark green to reddish leave with serrated margins.
Flowers	Cream to reddish flowers.
Fruits	Three-lobed green, reddish and brown with soft spines.
Invasive status	NEMBA: Category 1b

Proposed control methods	
Seedlings	Hand pull.
Mature or large plants	Cut stump and herbicide.

Scientific name	*Rubus cuneifolius*
Common name(s)	American bramble
Description	Thorny shrub growing up to 2m high.
Leaves	Green serrated leaves.
Flowers	White flowers
Fruits	Edible fruits first red and turning black.
Invasive status	NEMBA: Category 2

Proposed control methods	
Seedlings	Hand pull. Foliar spray.
Mature or large plants	

Scientific name	*Salix babylonica*
Common name(s)	Weeping willow
Description	Deciduous tree growing 20-25m high
Leaves	Light green leave alternate and narrow.
Flowers	Flowers appear in delicate green catkins approximately 2.5cm in length.
Fruits	
Invasive status	NEMBA: Category 2

Proposed control methods	
Seedlings	Hand pull. Foliar spray.
Mature or large plants	Foliar spray.

Scientific name	*Sesbania punicea*
Common name(s)	Red sesbania
Description	Small tree/shrub growing 4m high with slender branches.
Leaves	Dark green oblong leaves with pointed tips.
Flowers	Red or orange flowers
Fruits	Four winged pods 6-8cm long
Invasive status	NEMBA: Category 1b

Proposed control methods	
Seedlings	Hand pull. Foliar spray.
Mature or large plants	

Scientific name	*Solanum mauritianum*
Common name(s)	Bugweed
Description	Shrub/small tree up to 4m high
Leaves	Dull green leaves
Flowers	Purple flowers
Fruits	Spherical green to yellow berries
Invasive status	NEMBA: Category 1b

Proposed control methods	
Seedlings	Hand pull. Foliar spray.
Mature or large plants	Cut stump and herbicide.

Scientific name	*Tamarix ramosissima*
Common name(s)	Pink tamarisk
Description	Evergreen shrub or tree growing 3-6m high with reddish brown bark and feathery branches.
Leaves	Grey green bluish leaves which are minute.
Flowers	Pale to purplish pink flowers 15-70mm long and thin long twigs.
Fruits	3-4mm long papery capsules.
Invasive status	Unlisted

Proposed control methods	
Seedlings	Hand pull.
Mature or large plants	Cut stump and herbicide.

Scientific name	*Torilis arvensis*
Common name(s)	Spreading hedge-parsley
Description	Slender rough haired stem growing up to 1m high.
Leaves	Alternately arranged leaves.
Flowers	Flowers consist of arrangement of five white petals with pinkish or reddish tinge.
Fruits	Greenish or pinkish fruit 3-5mm long.
Invasive status	Unlisted
	
Proposed control methods	
Seedlings	Hand pull.
Mature or large plants	Cut stump and herbicide.

Scientific name	*Verbesina encelioides*
Common name(s)	Wild sunflower/butter daisy
Description	Herb plant growing 0.5 to 1m in height.
Leaves	Silvery green with small white hairs.
Flowers	Yellowish orange disc florets.
Fruits	Brown to black flat winged seeds.
Invasive status	NEMBA Category 1b
	
Proposed control methods	
Seedlings	Hand pull.
Mature or large plants	Cut stump and herbicide.

Scientific name	*Xanthium spinosum*
Common name(s)	Cockle bur
Description	Branched shrub growing up to 1.2m high.
Leaves	Green leaves with densely white-woolly beneath.
Flowers	
Fruits	Pale yellowish burrs
Invasive status	NEMBA Category 2
	
Proposed control methods	
Seedlings	Hand pull. Foliar spray
Mature or large plants	

APPENDIX E – EROSION AND REHABILITATION MANAGEMENT PLAN

All temporarily impacted areas must be rehabilitated with indigenous vegetation as soon as construction in the particular area or phase of work is complete (i.e. rehabilitation is on-going throughout construction). In terms of the scope of the construction activities, landscaping and rehabilitation will be required around all disturbed areas within and surrounding the development.

The Rehabilitation and Erosion Management Plan will address the following key areas:

- Storm water soak away features and landscaped areas;
- The transformed portions of the site not developed which need to be rehabilitated by planting indigenous plant species occurring in the area;
- Areas prone and showing signs of erosion channels;
- Areas where pockets of alien invasive species have been removed; and
- Only plants, approved by the ECO, may be used for landscaping purposes in gardens and also for rehabilitation.

Approved list of indigenous plants

A list of indigenous plants must be approved by the ECO.

Re-vegetation and Rehabilitation

The re-vegetation process will focus on the rehabilitation of all exposed soil, transformed areas and areas where alien invasive plants have been removed within the site. Indigenous grass species, such must be incorporated into these areas to create the initial cover. These must either be seeded or sods removed from cleared areas. Where slopes are steep, pioneer species must be used to create a stabilizing cover. In order to rehabilitate the transformed and invaded areas the following landscaping techniques will be employed:

- Clearing of vegetation must take place in accordance with the construction programme, instead of exposing large tracts of land simultaneously.
- Clearing of invaded areas must be undertaken as per the Alien Species Management Plan.
- No re-useable topsoil may be removed from the site.
- Sods used in re-vegetation must be obtained directly from the veld, but not from the sensitive areas on site. Veld sods must contain at least a 50 mm topsoil layer and the roots shall be minimally disturbed. They shall be obtained either from the near vicinity of the site from an area selected by the Site Engineer or Environmental Control Officer, or from areas of the proposed development site that are earmarked for development. The soil shall be compatible with that removed from the area to be re-vegetated and shall not have been compacted by heavy construction equipment/vehicles.
- Indigenous seeds may be harvested for purposes of re-vegetation in areas that are free of alien / invasive vegetation, either at the site prior to clearance or from suitable neighbouring sites.
- The stockpiled vegetation from the clearing operations must be reduced to mulch.
- Indigenous plant material must be kept separate from alien material. The vegetative material must be reduced by either mechanical means (chipper) or by hand-axing to sticks no longer than 100 mm. The chipped material must be mixed with the topsoil at a ratio not exceeding 1:1.
- Mulch is to be harvested from areas that are to be denuded of vegetation during construction activities, provided that they are free of seed-bearing alien invasive plants.
- No harvesting of vegetation may be done outside the area to be disturbed by construction activities.
- Mulches must be collected in such a manner as to restrict the loss of seed.
- Brush-cut mulch must be stored for as short a period as possible, and seed released from stockpiles must be collected for use in the rehabilitation process.

- Re-vegetated areas must be monitored every 3 months for the first 12 months and every 6 months thereafter.
- Re-vegetated areas showing inadequate surface coverage (less than 30% within 9 months after re-vegetation) must be prepared and re-vegetated from scratch;
- The Contractor will be responsible for maintaining the desired level of moisture necessary to maintain vigorous and healthy growth in re-vegetated area. The quantity of water applied at one time must be sufficient to penetrate the soil to a minimum depth of 800 mm, where appropriate, and at a rate that will prevent saturation of the soil.
- Water used for the irrigation of re-vegetated areas must be free of chlorine and other pollutants that might have a detrimental effect on the plants.
- All seeded, planted or sodded grass areas and all shrubs or trees planted are to be irrigated at regular intervals.
- Where herbicides are used to clear vegetation, species-specific chemicals must be applied to individual plants only. General spraying must be strictly prohibited;
- All horticultural activities must meet the following requirements:
    - Activities must be limited to the building environs and certain landscaped areas;
    - Fertiliser, pesticide and herbicide use must be strictly controlled;
    - Invertebrate pests must be controlled using the least environmentally damaging insecticides; Pyrethroids and Phenylpyrazoles are preferable to Acetylcholines;
    - Insecticides that are specific to the pest (species specific) must be favoured;
    - The lowest effective dosages must be applied;
    - Supplier's advice must be sought;
    - Fungal pathogens must be used in preference to chemical insecticides; and
    - No dumping of any materials in undeveloped open areas and buffer strips (biological corridors) may be permitted. Activities in the surrounding open undeveloped areas must be strictly regulated.

Weeds and alien invasive plants/trees

- The Contractor will be responsible for controlling any woody alien / invasive species. The Contractor shall ensure that all weeds and alien / invasive species are removed.
- Alien management must be as per recommendation of Alien Management Plan.
- The Contractor must mow the grass in specified grassed areas or on road verges at intervals ordered by the Engineer.
- Grass cuttings must be collected and disposed of as directed by the Engineer. The grass shall be mown at regular intervals to stimulate lateral growth. The first cutting s will take place when the grass is 50 mm high and thereafter the height will be maintained at between 30 and 50 mm.
- If during the establishment period, non-indigenous weeds or other non-indigenous plants are present in the planted areas, such vegetation should be removed by hand.
- The areas where alien vegetation must be removed, include:
    - Areas within the demarcated wider development footprint, and
    - If the alien vegetation is currently used by people such as farm workers etc. for firewood, then the vegetation may be left for this purpose.

Erosion, soil stabilisation and stockpiling

- Soil stockpiles during the construction phase must be placed in such a manner that natural drainage pattern is not disrupted (i.e. no stockpiles may be located in or adjacent to any seepage or drainage areas);
- Topsoil stockpiles older than six months must be enriched prior to use in rehabilitation activities to ensure the effectiveness of the topsoil.
- No imported soil material must be used on the property, unless it can be ensured that it is free of exotic and alien vegetation seeds.

- Where necessary, appropriate dust suppression techniques must be employed, such as regular watering of exposed areas and stockpiles.
- It is recommended that exposed areas of soil be stabilised as soon as possible, either through appropriate surfacing or through landscaping.
- It is recommended that topsoil be stockpiled separately to subsoil for use as the final soil layer during rehabilitation.
- The natural topography of the site must, as far as possible, be maintained during and after construction (i.e. indiscriminate levelling or elevating of the site must be avoided).
- Where any addition slope elevation has occurred this must be levelled and contoured to reduce the slope as well as erosion potential while un-vegetated.
- In the case of surface wash-away or wind erosion, the Contractor shall implement remedial measures as soon as possible in order to prevent further erosion.
- Appropriate erosion control/ soil stabilisation measures are to be implemented.
- During construction the Contractor shall protect areas susceptible to erosion by installing necessary temporary and permanent drainage works as soon as possible and by taking other measures necessary to prevent the surface water from being concentrated in streams and from scouring the slopes, banks or other areas.
- Any runnels or erosion channels developed during the construction period or during the vegetation establishment period shall be backfilled and compacted by the Contractor, and the areas restored to a proper condition.
- Installing silt fences wherever surface runoff is likely to occur.
- Additional stabilisation of cleared areas to prevent and control erosion must be actively managed. The method of stabilisation must be determined in consultation with the ECO and engineer.
- The following methods (or a combination) may be considered, depending on the specific conditions of the site:
    - Brushcut packing;
    - Mulch or chip cover;
    - Straw stabilising (at the rate of one bale/m² and rotated into the top 100mm of the completed earthworks);
    - Watering;
    - Planting / sodding;
    - Hand seeding;
    - Hydroseeding;
    - Soil binders and anti-erosion compounds;
    - Mechanical cover or packing structures;
    - Geofabric;
    - Armourflex;
    - Log / pole fencing; and
    - Retaining walls.
- Traffic and movement over stabilised areas is to be restricted and controlled, and damage to stabilised areas shall be repaired and maintained to the satisfaction of the ECO.
- Anti-erosion compounds, consisting of an organic or inorganic material, may be employed to bind soil particles together. Products used must be proven able to suppress dust and erosion.
- Areas to be landscaped that have been compacted to the development activity must be ripped and seeded.

Monitoring

A monitoring programme shall be in place not only to ensure compliance with the EMPr throughout the construction phase, but also to monitor any environmental issues and impacts which require attention over the vegetation establishment/rehabilitation phase, post construction. An Environmental Control Officer (ECO) must be appointed to ensure compliance with the EMPr and to carry out monitoring activities.