

APPENDIX H: EMPR

ENVIRONMENTAL MANAGEMENT PROGRAMME

THE PROPOSED ENLARGEMENT OF DAM 2 ON HUGOSDALE FARM (NO. RE/141), NEAR GREYTON IN THE THEEWATERSKLOOF LOCAL MUNICIPALITY, WESTERN CAPE PROVINCE

Prepared for

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1. INTRODUCTION

An Environmental Management Programme (EMPr) must consist of a set of mitigation, monitoring and institutional measures to be taken during implementation and operation to eliminate adverse environmental and social impacts, offset them, or reduce them to acceptable levels. The plan also includes the actions needed to implement these measures.

An Environmental Management Programme (EMPr) can be defined as, “*an environmental management tool used to ensure that undue or reasonably avoidable adverse impacts of the construction, operation and decommissioning of a project are prevented; and that the positive benefits of the project are enhanced*”. The EMPr is an important tool used to ensure the sound environmental management of projects, provided the specifications are implemented and the user understands the contents of the report and the reasons for the implementation of certain specifications.

The EMPr has the following objectives:

- To state standards and guidelines which are required to be achieved in terms of environmental legislation;
- To set out the mitigation measures and environmental specifications which are required to be implemented for all phases of the project in order to minimise the extent of environmental impacts, and to manage environmental impacts and where possible to improve the condition of the environment;
- To provide guidance regarding method statements which are required to be implemented to achieve the environmental specifications;
- To define corrective actions, this must be taken in the event of non-compliance with the specifications; and
- To prevent long-term or permanent environmental degradation.

There are four broad categories of EMPrs: Design EMPr, Construction EMPr, Operational EMPr and Decommissioning EMPr. The objectives of these EMPrs are all the same and include identifying the possible environmental impacts of the proposed activity and developing measures to minimise, mitigate and manage the negative impacts while enhancing the positive ones. The difference between these EMPrs is related to the different mitigation measures required for the different stages of the project life cycle.

The proposed farm dam will not be decommissioned in the foreseeable future, and thus the decommissioning phase for this development is not assessed further in this report. Each remaining category of the EMPr is discussed in more detail below.

1.1. CONSTRUCTION EMPr

The Construction EMPr details the environmental management system/framework within which construction activities will be governed for the Construction Phase. The Construction EMPr consists of various actions, initiatives and systems (such as a Standard Operating Procedure – SOP, or a Method Statement) that the contractor will have to ensure are in place and are implemented and complied with. The Construction EMPr consists of both a management system (in so far as it explains responsibilities and lines of reporting), and environmental specifications which contain detailed specifications related to achieving specific mitigation measures that will need to be undertaken or adhered to by the contractor.

The Construction EMPr must be developed in parallel with the final design stages, and constructive input must be invited from the selected contractor. This is required not to soften the document, but rather to ensure that the requirements in the Construction EMPr are practical, cost effective and implementable. Sound environmental management is orientated around pragmatic, unambiguous but enforceable guidelines and specifications, and for this reason it is imperative that the contractor, while being bound by the EMPr, fully understands it and has had input into its final development. For this reason the final construction EMPr will need to be signed off after input from the selected contractor, and prior to the initiation of construction activities. It should, however, be noted that the contractor must tender on the existing document and that in areas of uncertainty, a precautionary approach to the environmental guidelines and specifications must be adopted (by, for example, providing Prime Cost and Provisional Sum amounts).

1.2. OPERATIONAL AND MAINTENANCE EMPR

The operational phase EMPr provides specific guidance related to operational activities associated with a particular development. Operational EMPrs are sometimes referred to as an Environmental Management System (EMS). Impacts during the operational phase of a development of this nature (i.e. a dam) will be few in number and low in intensity. By taking pro-active measures during the construction phase, potential operational phase environmental impacts will be minimised. Monitoring of certain issues, such as the success of vegetation re-establishment and erosion control, will need to continue during operation. The final Operational EMPr must be developed in conjunction with any other relevant stakeholders prior to the adoption thereof.

2. CONTENTS OF THE ENVIRONMENTAL MANAGEMENT PROGRAMME (EMPR)

The contents of the *Environmental Management Programme (EMPr)*, as defined the 2014 EIA Regulations published as Government Notice (GN) No R. 982 (amended in 2017 in GN R 326) and Chapter 5 of the National Environmental Management Act (NEMA) (Act No. 107 of 1998, as amended) is presented in Table 2.1 below.

Table 2.1: Contents of an EMPr

EMPr REQUIREMENTS ACCORDING TO APPENDIX 4 OF THE 2014 EIA REGULATIONS (AS AMENDED IN APRIL 2017)	SECTION OF REPORT
An EMPr must comply with section 24N of the Act and include-	Section 3.5 and Annexure 3
a. Details of:	
i. the EAP who prepared the EMPr; and	Annexure 3
ii. the expertise of that EAP to prepare an EMPr, including a curriculum vitae.	
b. a detailed description of the aspects of the activity that are covered by the EMPr as identified by the project description;	Chapter 3
c. a map at an appropriate scale 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;	Annexure 4
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-	Chapter 4
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. 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 -	Section 3.2 – Section 3.4 and Chapter 5
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; and	
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);	Chapter 5 and Chapter 6
h. the frequency of monitoring the implementation of the impact management actions contemplated in paragraph (f);	Chapter 6
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 requirements as prescribed by the Regulations;	
m. an environmental awareness plan describing the manner in which-	Section 5.2.17
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.	Nothing specified at this stage

3. BACKGROUND INFORMATION

3.1. PROJECT DESCRIPTION

The applicant, Wijnberg Farm Trust, has proposed the expansion of an existing dam (dam 2) on Hugosdale farm (RE/141), near Greyton in the Western Cape. The reason for the proposed expansion is to increase the water available for irrigation on the farm (for the new deciduous fruit trees and grass fed cattle) and reduce electricity consumption, by increasing gravity fed irrigation.

The Farm has 5 dams with a combined storage capacity of less than 56 965 m³. Water sources include surface water runoff from the farm catchments and summer and winter enlistment (i.e. water abstracted from the Sonderend River) under the Zonderendrivier Water Users Association (ZWUA). The existing water use rights in terms of the National Water Act, 1998 (ACT 36 of 1998), for Hugosdale Farm includes:

Table 3.1: Contents of an EMPr

Section of NWA	Type of Water Use	Existing Lawful Water Use		
		Volume (m ³ / annum) *	Source	Irrigation Board or Water User Association Scheme
21 (a)	Taking of water for irrigation purposes	180 000	WUA/IB Scheme	Zonderendrivier WUA (Summer)
21 (a)	Taking of water for irrigation purposes	80 000	WUA/IB Scheme	Zonderendrivier WUA (Winter)
21 (a)	Taking of water for irrigation purposes	335 940	Surface Water	
21 (b)	Storage of water	56 965		

* In the case of Storage, the Existing Lawful Water Use is in m³

The proposed dam will have a new dam wall 22m high and will increase the storage capacity to 500 000m³ and water surface area to 65 500 m².

Dam 2 is currently fed by a non-perennial (seasonal flow) mountain stream that flows in a north-east south-west direction as well as by surrounding run-off. The stream is a tributary of the Sonderend River. Following the expansion, the dam will continue to be filled by the stream and surrounding surface water run-off. In addition to this, water (summer and winter enlistment) will be pumped into the dam from the Sonderend River.

- Surface water run-off will contribute 335 940 m³ per annum to storage capacity.
- The balance of the storage capacity (164 060 m³) will be abstracted/pumped from the Sonderend River.

Construction is planned for the summer dry season November 2019 – March 2020 to be completed before the wet season of 2020.

The following infrastructure will be required as part of the proposed activity:

- Dam wall
- Spillway
- Laydown area
- Pipeline



Figure 3.1: Photograph of the proposed site showing the existing dam and the location of the proposed dam wall.

3.2. THE ENVIRONMENTAL POLICY

The contractor is required to compile an Environmental Management Policy, which must consider the following:

- The contractor’s mission, vision and core values;
- Guiding principles;
- Requirements of, and communication with I&APs;
- The environmental specifications and intentions of the specifications must be upheld;
- The need to work towards continual improvement;
- The obligation to prevent pollution and ecological degradation;
- The importance of coordination with other organisational policies (e.g. quality, occupational health and safety, etc.);
- Site activities will be conducted in a manner that does not create a nuisance, risk or hazard to the natural environment;
- Reference to specific local and/or regional conditions;
- Employee and public health and safety must be considered a priority; and
- A commitment to compliance with relevant environmental laws, regulations, by-laws and other criteria to which the contractor subscribes.

The contractor (contractor is defined as principal contractor, sub-contractors and any employees retained on this project) is required to be familiar with the environmental policy (to be developed by the applicant) and all that it implies, and to adopt and implement the policy throughout the course of construction. The policy must be communicated to all employees and contractors (and sub-contractors) of the contractor, and made available to the public, if requested.

3.3. ENVIRONMENTAL OBJECTIVES AND TARGETS

In order to meet the commitments detailed within the Environmental Management Policy, as well as those included within the environmental specifications of this EMPr, the contractor shall develop environmental objectives and targets. The objectives and targets must conform to, and comply with, the following criteria:

- The objectives and targets shall constitute the overall goals for environmental performance identified in the environmental policy and strategy;
- When establishing objectives and targets, the contractor shall take into account the identified environmental aspects and associated environmental impacts, as well as the relevant findings from environmental reviews and/or audits;
- The targets must be set to achieve objectives within a specified timeframe;
- Targets must be specific and measurable;
- When the objectives and targets are set, the contractor must establish measurable Key Performance Indicators (KPIs). The latter will be used by the contractor as the basis for an Environmental Performance Evaluation System, and can provide information on both the environmental management and the operational systems. Objectives and targets need to apply broadly across the contractor's operations, as well as to site-specific and individual activities; and
- Objectives and targets must be reviewed from time to time in view of changed operational circumstances and/or changes in environmental legal requirements, and need to take into consideration the views of the I&APs.

3.4. ENVIRONMENTAL LEGISLATION AND GUIDELINES

The Contractor must ensure that all South African legislation concerning the natural environment, pollution and the built environment is strictly enforced. Such legislation must include, but is not limited to the:

- The Constitution of the Republic of South Africa Act No. 108 of 1996;
- National Environmental Management Act No. 107 of 1998 as amended;
- National Heritage Resources Act, No 25 of 1999;
- National Environmental Management: Biodiversity Act 10 of 2004;
- National Environmental Management: Waste Management Act 59 of 2008;
- National Environmental Management: Air Quality Act 39 of 2004;
- The Environment Conservation Act No 73 of 1989;
- National Water Act, No 36 of 1998;
- National Forest Act, No 84 of 1998;
- Occupational Health and Safety Act 85 of 1993;
- Hazardous Substances Act No. 15 of 1973;
- National Environmental Management: Biodiversity Act, 2004 (Act no. 10 of 2004) – Alien and Invasive Species (AIS) Regulations; and
- All relevant provincial legislation, Municipal by-laws and ordinances.

3.5. DETAILS OF EAP

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Please refer to Annexure 3 for the Curricula Vitae of the EAP and the project team.

4. IMPACT ASSESSMENT AND MITIGATION SUMMARY

This section provides an assessment of the pre-mitigation significance as well as the post-mitigation significance of the social and environmental impacts that may result from the major activities associated with the development.

4.1. SUMMARY OF IMPACTS ASSOCIATED WITH THE DEVELOPMENT

The table below shows the significance of the impacts after mitigation is taken into account:

Impacts			Significance rating of impacts after mitigation (Low, Medium, Medium-High, High, Very High):
Planning, design and construction phases			
1.	General	Erosion	Low -
2.		Dust	Low -
3.		Noise	Low -
4.		Visual	Low -
5.		<i>On-site Fire Risk</i>	Low -
6.		Hazardous Substances	Low -
7.		Construction Waste & Litter	Low -
8.		Sanitation	Low -
9.		Creation of temporary jobs	Moderate +
10.	Ecological	Loss of vegetation communities	
		10a: Loss of Shale Fynbos	Moderate -
		10b: Loss of Shale Renosterveld	High-
		10c: Loss of Alien Woodland	Moderate +
11.		Loss of Biodiversity	Low -
12.		Loss of Plant Species of Conservation Concern	Low -
13.	Aquatic	Habitat Fragmentation	Negligible
14.		Invasion of Invasive Alien Plant Species	Low -
15.		Loss of Faunal Habitat	Moderate -
16.		Sedimentation and elevated turbidity	Low -
17.	Aquatic	Contamination from pollutants	Low -
18.		Habitat Modification	Low -
19.		Flow Modification	Negligible
Operational phase			
20.	General	Temporary flooding due to failure of dam wall	Low -
21.		Creation of permanent jobs	High +
22.	Ecological	<i>Dam Wall Failure and Release of Invasive Alien Plant Species Seedbanks</i>	Low-
23.		<i>Effect of alteration of river flow downstream of dam on faunal habitats</i>	Low -
24.	Aquatic	<i>Increase in dam and vegetated fringe habitat</i>	Moderate +
25.		<i>Sedimentation and elevated turbidity</i>	Low -
26.	Aquatic	Flow Modification	Moderate -

4.2. SUMMARY OF MITIGATION MEASURES

The table below shows the mitigation measures which must be applied in order to negate and/or reduce each of the various impacts:

Planning, Design and Construction Phases	
IMPACT	MITIGATION MEASURES
Erosion	<ul style="list-style-type: none"> Construction of the dam should take place during the dry season Take measures to counter erosion. Roads and stormwater gulleys must be maintained. Cleared areas should be exposed for the minimum amount of time possible. Any erosion sites should be rehabilitated as soon as possible and water run-off directed to a safe collection point should erosion become evident on site.
Air Quality and Dust Control	<ul style="list-style-type: none"> Dust levels should be kept to a minimum to avoid smothering of sensitive areas by windblown sediments. During windy periods un-surfaced and un-vegetated areas should be dampened down. Vegetation should be retained where possible as this will reduce dust travel.

Planning, Design and Construction Phases	
IMPACT	MITIGATION MEASURES
	<ul style="list-style-type: none"> Excavations and other clearing activities must only take place during agreed working times and permitted weather conditions to avoid drifting of sand and dust into neighbouring areas. Any complaints or claims emanating from dust issues must be attended to immediately.
Noise	<ul style="list-style-type: none"> During construction, activities which include the movement of construction vehicles and the operation of machinery should be restricted to normal working hours (07:00am – 17:00pm).
Visual	<ul style="list-style-type: none"> The remote location of the development site means it is only visible to the applicant and their staff. The Applicant should only clear the land necessary to accommodate the development. Any disturbed area sites should be rehabilitated as soon as possible
On-Site Fire Risk	<ul style="list-style-type: none"> All flammable substances must be stored in dry areas which do not pose an ignition risk to the flammable substances. Smoking must not be permitted near flammable substances. All cooking must be done in demarcated areas with a low fire risk. No open fires will be allowed on site, unless in a demarcated area. The construction personnel must be educated regarding fires and fire management. Fire extinguishers and other firefighting equipment deemed suitable must be available on site at all times.
Hazardous Substances	<ul style="list-style-type: none"> During the construction phase all oils, fuel and other maintenance equipment and supplies must be stored in a secure area with a compacted surface. Maintenance of vehicles or machinery should not take place within 50 m of any watercourse and drip trays must be used. Ideally all maintenance must take place at the homestead where such maintenance is normally done. Spill kits must be kept on-site and maintained. Cement and concrete must only be mixed in designated areas and on an impermeable surface. No concrete mixing must take place within 32 m of any watercourse.
Construction Waste and Litter	<ul style="list-style-type: none"> Sufficient waste bins must be provided throughout the construction site for collecting of waste; No waste must be buried or burned on site. Any waste or building rubble generated during the construction phase should be recycled, where possible. Rubble or vegetation debris should not be dumped onto adjacent natural vegetation. Personnel should be instructed not to litter on site.
Sanitation	<ul style="list-style-type: none"> During the construction phase adequate sanitary facilities must be provided for construction workers. The facilities must be regularly serviced to reduce the risk of surface or groundwater pollution. Sanitation facilities must not be located within 100 metres of any watercourse.
Creation of temporary jobs	<ul style="list-style-type: none"> It is recommended that, where possible, the labour force required during construction must be sourced from the local communities; and Skills development in the form of training must be implemented where possible.
Loss of Vegetation Communities: a. Loss of Shale Fynbos b. Loss of Shale Renosterveld c. Loss of Alien Woodland	<ul style="list-style-type: none"> Clearing must be kept to a minimum, particularly in the shale fynbos and shale renosterveld vegetation types. Top soil (20 cm, where possible) must be collected and used elsewhere on the farm and for the rehabilitation of lay down areas, the dam wall and other impacted areas. Lay down areas must not be located in the Shale Renosterveld or Shale Fynbos vegetation types. Employees must be prohibited from making fires. An alien management plan must be designed and implemented to prevent the spread of these species.
Loss of Biodiversity	<ul style="list-style-type: none"> Alien invasive species should be removed from the areas where development will not occur. The area should be actively managed to prevent the return of alien invasive species. Prohibit all employees from harvesting plants; Prohibit employees from making fires (e.g. for cooking) within this area, only controlled fires are allowed; The farm owner and contractor must demarcate areas for use during construction, and to ensure that the construction activities remain within the designated area and that no unauthorised activities occur outside of the construction footprint.

Planning, Design and Construction Phases	
IMPACT	MITIGATION MEASURES
Loss of Species of Conservation Concern	<ul style="list-style-type: none"> • Alien invasive species should be removed from the areas where development will not occur. The area should be actively managed to prevent the return of alien invasive species. • Prohibit all employees from harvesting plants; • Prohibit open fires; • An ECO must be employed to demarcate areas for use during construction, and to ensure that the construction activities remain within the designated area and that no unauthorised activities occur outside of the construction footprint.
Habitat Fragmentation	<ul style="list-style-type: none"> • Alien species around the dam edge must be actively monitored and removed as and when they appear.
Invasion of Invasive Alien Plant Species	<ul style="list-style-type: none"> • An invasive alien plant management plan must be designed and implemented to remove the alien species upstream of the dam. This plan must designate management units and prescribe the most effective method of removing the species. • Once the aliens upstream of the dam have been removed, then the individuals downstream of the dam should be removed.
Loss of Faunal habitat:	<ul style="list-style-type: none"> • Construction should take place in the dry season when hibernating species are not in hibernation. • Clearing of alien trees should take place in later winter months, to prevent birds and bats establishing nesting grounds and starting to breed and rear young in the spring and summer months. • All clearing activities must deploy search and rescue teams in-front of clearing machinery to assist in relocating slower moving faunal species e.g. tortoises.
Sedimentation and Elevated Turbidity	<ul style="list-style-type: none"> • Undertake construction activities during the dry summer months. • Prevent or strongly limit disturbance to water resources during the planning phase. • Suitable temporary berms must be constructed prior to clearing in order to contain any soils that may be eroded by heavy rainfall. These soils should be rehabilitated as soon as possible in order to prevent ingress into surrounding water courses. • Surface drainage that does not allow ponding and does not result in an increase in flow rates should be established. • Maximum vegetation cover should be maintained outside the immediate area to be cleared, particularly in riparian areas, to act as silt traps. • Natural drainage lines must not be impeded or otherwise interfered with. • Erosion should be monitored over the entire site and, where initial indications of erosion are detected, appropriate remedial measures must be taken as soon as possible. Temporary berms may be needed to direct stormwater containing eroded material away from the river.
Contamination from Pollutants	<ul style="list-style-type: none"> • Strict management of hazardous chemicals must be implemented. • Prevention of hydrocarbon spills from machinery and vehicles by the use of drip-trays and permanent bunded areas for overnight parking. This should include any temporary workshops envisaged for the project. In addition, workshops should be fitted with oil traps and sumps to ensure that no contaminated water/hydrocarbons are allowed to escape. • Domestic effluent from the construction camps should be stored temporarily in a safe manner (unlikely to leak or be breached) and should be removed by approved contractors weekly. • All contaminated water run-off from the site must be contained and treated prior to discharge.
Habitat Modification	<ul style="list-style-type: none"> • Where appropriate, slash and debris should be stockpiled above the new high-water mark to prevent materials from entering the dam during maintenance activities. This material must NEVER be disposed of in stream/river courses or in riparian zones. • Minimise the number and size of stream crossings for vehicle movement within the riparian zones outside of the dam basin area (i.e. outside of the high-water mark after construction). Where crossings are necessary, international best practice in the use of bridges, hardened fords, pipes and culverts should be adopted. Recommended stream crossing measures should include: <ul style="list-style-type: none"> ○ Minimise vehicular movement over streams (perennial and intermittent). Where crossing is necessary, a right-angle approach should be used in addition to use of bridges, fords, pipe culverts, and other techniques to minimize impacts to stream banks, flow, water quality.

Planning, Design and Construction Phases	
IMPACT	MITIGATION MEASURES
	<ul style="list-style-type: none"> ○ Crossing structures such as bridges, culverts and fords should be designed to withstand peak flows of high intensity storms, and ensure that movement of aquatic species is not impaired. ○ Vehicle movement over unprotected streambeds should be prevented. If crossing is necessary, a hard rock stream bottom is preferable. ○ Road drainage should be diverted to vegetation and not into the stream. ○ Approaches to crossing should be stabilized with aggregate to avoid increased sediment entering the stream. ○ Where possible, employ the access road to the west of the site, where one formal crossing point further downstream exists and can be utilised. This will reduce the need for vehicles to cross the existing stream area.
Flow Modification	<ul style="list-style-type: none"> ● Plan construction within the dry months of the year to reduce the sediment load and stormwater flow across site and into the stream. ● Plan construction phases and activities to minimise the disruption to the stream location and hydrological regime, by avoiding the diversion of flow as far as possible (if unavoidable, please see the measure below): <ul style="list-style-type: none"> ○ Should the stream be flowing during the construction period, ensure continuous water supply from the stream is allowed to flow past the construction zone. Should this necessitate diverting the stream, as far as possible employ non-mechanised means such as piping the flow (wide diameter pre-cast concrete or PVC piping as a temporary measure), as opposed to mechanical pumping which will harm the aquatic biota. ○ Plan access for vehicles and materials via the western access road, to reduce the amount of crossing required over the stream.

Operational Phase	
IMPACT	MITIGATION MEASURES
Temporary Flooding due to Failure of Dam Wall	<ul style="list-style-type: none"> ● The dam must be designed by an experienced and suitably experienced registered civil engineer. ● The design must be fully compliant with all DWS dam safety requirements and must have the required registrations with DWS. ● The dam must be constructed in compliance with all engineering design specifications. ● The dam's spillway must likewise be designed by a civil engineer, and its design must be able to accommodate all possible flood events. ● The dam must be registered and have the appropriate water use licences prior to construction commencing ● The dam must be designed so that it can release water from the spillway. ● The dam must have a safe freeboard when at its specified full supply level. ● The final construction must be signed off by a dam safety engineer.
Creation of Permanent Jobs	<ul style="list-style-type: none"> ● It is recommended that where possible, the labour force required during operational phase should be sourced from the local communities.
Dam Wall Failure and Release of Invasive Alien Plant Species Seedbanks	<ul style="list-style-type: none"> ● Mitigation measures must be put in place to avoid dam wall failure. However, it is worth noting that the dam will be designed to internationally recognized best practice in respect of dam safety, and that compliance with safety standards is controlled by DWS. Hence the risk of dam wall failure is already mitigated. ● There are no mitigation measures should the seedbank be released downstream. However, the farm has an ongoing alien plant removal programme with specific attention to water courses. Any additional seed dispersal arising from possible releases from the dam itself will be included in this programme. This existing process effectively deals with this risk .
Effect of Alteration of River Flow Downstream of Dam on Faunal Habitats	<ul style="list-style-type: none"> ● As far as possible water released from the dam should replicate the natural flow of the river during operation. ● The amount of water to be released (the minimum flow) must be determined and included in the dam's operational protocol.

Increase in Dam and Vegetated Fringe Habitat	<ul style="list-style-type: none"> Remove aquatic vegetation immediately prior to inundation, replant and irrigate daily until dam has filled.
Sedimentation and Elevated Turbidity in Streams/Dams	<ul style="list-style-type: none"> The spillway must be designed to ensure an even, slow release of water from the dam when it is at full supply level (FSL), to reduce any erosion of the spillway. Appropriate engineering designs must be implemented to reduce spillway erosion and minimise flood risks, including the use of concrete step designs and geotextiles to trap ejected sediment (or another suitable design).
Flow Modification	<ul style="list-style-type: none"> Ensure that the Ecological Flow Reserve (EFR) is maintained, no matter the water level of the dam. Ensure that the design accounts for the release of water to meet the EFR.

5. ENVIRONMENTAL MANAGEMENT SYSTEM

5.1. REPORTING

5.1.1. Administration

Before the contractor begins construction in sensitive areas (e.g. river crossings and areas of indigenous vegetation), the Contractor must give the ECO and engineer a written method statement 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 or aspects that may cause an impact;
- Methodology and/or specifications for impact prevention for each activity or aspect;
- Methodology and/or specific actions for impact containment for each activity or aspect;
- Emergency/disaster incident and reaction procedures; and
- Treatment and continued maintenance of impacted environment.

The contractor may provide such information in advance of any or all construction activities provided that new submissions shall be given to the ECO and/or engineer whenever there is a change or variation to the original. The ECO and/or engineer may provide comment on the methodology and procedures proposed by the Contractor but he shall not be responsible for the contractor's chosen measures of impact mitigation and emergency/disaster management systems. However, the contractor shall demonstrate at inception and at least once during the contract that the approved measures and procedures function properly. An example of a Method Statement is provided in Annexure 1.

5.1.2. Record keeping

The engineer and the ECO will monitor the contractor's adherence to the approved impact prevention procedures and the engineer shall issue to the contractor a notice of non-compliance whenever transgressions are observed. The ECO must 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 shall be documented and reported to the engineer in the monthly report. These reports shall be made available to the authorities when requested.

The Contractor shall ensure that an electronic filing system identifying all documentation related to the EMP is established. A list of reports likely to be generated during all phases of the project is provided below, and all applicable documentation must be included in the environmental filing system catalogue or document retrieval index:

- Environmental Management Programme;
- Final design documents and diagrams issued to and by the Contractor;
- All communications detailing changes of design/scope that may have environmental implications;
- Complaints register;
- Medical reports;
- Incident and accident reports;
- Emergency preparedness and response plans;
- Copies of all relevant environmental legislation;
- All relevant permits; and
- All method statements from the Contractor for all phases of the project.

5.1.3. Document control

The Contractor and resident engineer shall be responsible for establishing a procedure for electronic or hard copy document control. The document control procedure must comply with the following requirements:

- Documents must be identifiable by organisation, division, function, activity and contact person;
- Every document must identify the personnel and their positions, who drafted and compiled the document, who reviewed and recommended approval, and who finally approved the document for distribution; and
- All documents must be dated, provided with a revision number and reference number, filed systematically, and retained for a five year period.

The Contractor shall 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.

5.2. CONSTRUCTION PHASE

5.2.1. Clearing of the Site

In all areas where the contractor intends to, or is required to clear the natural vegetation and soil, either within the construction area, or at designated or instructed areas outside the construction area, a method statement shall first be submitted to the ECO for his approval. The EMPr shall contain a photographic record and change/land reference of the areas to be disturbed. This shall be submitted to the engineer and ECO for their records before any disturbance/stockpiling may occur. The record shall be comprehensive and clear, allowing for easy identification during subsequent inspections.

The contractor shall be responsible for the re-establishment of grass within the development boundaries for all areas disturbed during construction. This includes, for example, service roads, stockpile areas, stop/go facilities, windrows and wherever material generated for, or from, road construction has to be stored temporarily or otherwise within the construction area, or at designated or instructed areas outside the construction area. This responsibility shall extend until expiry of the defects notification period.

5.2.2. Excavation, hauling and placement

The contractor shall provide the engineer with detailed plans of his intended construction processes prior to starting any cut or fill or layer. The plans shall detail the number of personnel and plant to be used and the measures by which the impacts of pollution (noise, dust, litter, fuel, oil and sewage), erosion, vegetation destruction and deformation of landscape will be prevented, contained and rehabilitated. The contractor shall demonstrate his "good housekeeping", particularly with respect to closure at the end of every day so that the site is left in a safe condition from rainfall overnight, or over periods when there is no construction activity.

5.2.3. Construction Activities and Equipment

- Construction will be restricted to daytime working hours;
- All noise-making equipment shall be turned off when not in use;
- All equipment shall be kept in good working order;
- All equipment shall be operated within specifications and capacity (i.e. do not overload machines);
- Compliance with the appropriate legislation with respect to noise is mandatory;
- The Contractor will familiarise himself with, and adhere to, any local bylaws and regulations regarding the generation of noise;
- Construction staff must be given "noise sensitivity" training;

- The Contractor will endeavour to keep noise generating activities associated with construction activities to a minimum;
- Modern low noise emission vehicles and equipment shall be favoured on site; and
- A well planned and co-ordinated “fast track” procedure is implemented to complete the total construction process in the area in the shortest possible time.

5.2.4. Good housekeeping

The contractor shall 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 that leave the area in a safe state and must also include the care for and preservation of the environment within which the site is situated.

5.2.5. Solid waste management

- No on-site burning, burying or dumping of any waste materials, litter or refuse shall occur.
- The Contractor shall provide vermin and weatherproof bins with lids of sufficient number and capacity to store the solid waste produced on a daily basis. The lids shall be kept firmly closed on the bins at all times.
- Bins shall not be allowed to become overfull and shall be emptied at least once a day.
- The waste from bins may be temporarily stored on site in a central waste area that is weatherproof and scavenger-proof, and which the ECO has approved.
- Recyclable waste shall be disposed of into separate skips/bins and removed off-site for recycling.
- All solid waste shall be disposed of at the existing waste site on the farm.
- Any hazardous waste will need to be disposed of off-site at an approved registered landfill site. The Contractor shall supply the ECO with the appropriate disposal certificates.
- The Contractor shall submit a solid waste management plan as part of the Pollution Control Method Statement to the ECO.

5.2.6. Water use

- All sources of water for construction purposes must be sourced from existing, approved water supply points located on the farm. It is recommended that borehole water be made available.
- Where possible all wash water will be recycled for use, as wash water again or for dust suppression where applicable.

5.2.7. Contaminated water

- Materials used in the temporary river diversion must not contain any potential pollutants that may affect the water quality downstream of the river.
- Construction materials and chemicals that could be a potential pollutant of any kind and in any form shall be kept, stored, and used in such a manner that any escape can be contained and that the water table and surface water is not endangered. Water containing pollutants such as chemicals, washing detergents, sewerage, fuels, paints, solvents and hydrocarbons shall be contained and discharged into an impermeable storage facility for removal from the site or for recycling. This particularly applies to runoff from fuel depots/workshops/truck washing areas.
- Wash down areas shall be placed and constructed in such a manner so as to ensure that the surrounding areas are not polluted. The Contractor shall notify the ECO immediately of any pollution incidents on Site.
- As part of the Pollution Control Method Statement, the Contractor shall submit a plan to the ECO detailing how the contaminated water will be managed on site.

5.2.8. Hazardous substances

- The transportation and handling of hazardous substances must comply with the provisions of the Hazardous Substances Act (Act No.187 of 1993) and associated regulations as well as SABS 0228 and SABS 0229.
- The Contractor shall also comply with all other applicable regional and local legislation and regulations with regard to the transport, use and disposal of hazardous substances. Hazardous chemical substances (as defined in the Regulations for Hazardous Chemical Substances) used during construction shall be stored in secondary containers. The relevant Material Safety Data Sheets (MSDS) shall be available on site. Procedures detailed in the MSDSs shall be followed in the event of an emergency situation.
- The Contractor shall be responsible for the training and education of all personnel who will be handling hazardous materials about their proper use, handling and disposal.
- If potentially hazardous substances are to be stored or used on site, the Contractor shall submit a Method Statement to the ECO detailing the substances / materials to be used, together with the transport, storage, handling and disposal procedures for the substances.

5.2.9. Cement and mixing of concrete

- The proposed location of cement mixing areas (including the location of cement stores and sand and aggregate stockpiles) shall be indicated on the site layout plan and approved by the ECO.
- All wastewater generated from the operation and cleaning of concrete mixing equipment and other sources of concrete shall be passed through a concrete wastewater settlement system. The water from this system shall not be allowed to flow into any “no go” area or water course but must permeate through the ground before it reaches any such water course. The accumulated sludge in the settlement system must be regularly cleaned out and appropriately disposed of as solid waste.
- The Contractor shall ensure that minimal water is used for washing of concrete and cement mixing equipment.
- Washing and cleaning of equipment must also be done in berms or bunds, in order to trap any cement and prevent excessive soil erosion.
- Used cement bags shall be disposed of in weatherproof bins on site to prevent the generation of wind-blown cement dust, and the bags from blowing away.
- During construction, the contractor must ensure that concrete is mixed on mortar boards, and that all visible remains of concrete are removed and disposed of as waste, and that all surplus aggregate is removed.
- As part of the Pollution Control Method Statement, a plan detailing all actions to be taken to comply with these requirements shall be submitted to the ECO.

5.2.10. Fuel (petrol and diesel) and oil

Fuel Storage

- All fuels and oil must be stored in demarcated areas that are contained within berms / bunds to avoid spread of any contamination into nearby rivers or drainage lines. These sites must be re-vegetated after construction has been completed.
- The location of the fuel storage area will be approved by the ECO. All necessary approvals with respect to fuel storage and dispensing shall be obtained from the appropriate authorities. Symbolic safety signs depicting “No Smoking”, “No Naked Lights” and “Danger” conforming to the requirement of SABS 1186 shall be prominently displayed in and around the fuel storage area. There shall be adequate fire-fighting equipment at the fuel storage area.

- The Contractor shall ensure that all liquid fuels and oils are stored in tanks with lids, which are kept firmly shut and under lock and key at all times. The capacity of the tank shall be clearly displayed and the product contained within the tank clearly identified using the emergency information system detailed in SABS 0232 part 1. Fuel storage tanks shall have a capacity not exceeding 9 000 litres and shall be kept on site only for as long as fuel is needed for construction activities, on completion of which they shall be removed.
- Tanks on site shall not be linked or joined via any pipe work, but shall remain as separate entities. The tanks shall be situated on a smooth impermeable base with a bund. The volume inside the bund shall be 110% of the total capacity of the largest storage tank. The base may be constructed of concrete, or of plastic sheeting with impermeable joints with a layer of sand over to prevent perishing. The impermeable lining shall extend to the crest of the bund. The floor of the bund shall be sloped to enable any spilled fuel and/or fuel-contaminated water to be removed. Appropriate material, approved by the ECO that absorbs / breaks-down or encapsulates minor hydrocarbon spillage and which is effective in water shall be installed in the sump. Contaminated soil shall be taken off site to a disposal site approved by the ECO, and the material that absorbs / breaks-down or encapsulates minor hydrocarbon spillage shall be replenished.
- Only empty and externally clean tanks may be stored on the bare ground. Empty and externally dirty tanks shall be sealed and stored in an area where the ground has been protected.
- Adequate precautions shall be provided to prevent spillage during the filling of any tank and during the dispensing of the contents. The dispensing mechanism for the fuel storage tanks shall be stored in a waterproof container when not in use.
- As part of the required site layout for the construction camp, a plan shall be submitted to the ECO detailing the design, location and construction of the fuel storage area as well as for the filling and dispensing from storage tanks; and for the type of absorbing / breaking-down or encapsulating material to be used.

Refuelling

- Where reasonably practical, the plant shall be refuelled at a designated re-fuelling area/depot or at a workshop as applicable. If this is not reasonably practical then the surface under the refuelling area shall be protected and appropriately bunded against pollution to the reasonable satisfaction of the ECO prior to any refuelling activities.
- Mechanical plant and bowsers must not be refuelled or serviced within or directly adjacent to any drainage line or waterbody.
- If fuel is dispensed from 200 litre drums, the proper dispensing equipment shall be used, and the drum shall not be tipped in order to dispense fuel. The Contractor shall ensure that the appropriate fire-fighting equipment is present during refuelling operations.
The Contractor shall ensure that there is always a supply of absorbent material readily available to absorb/breakdown or where possible, be designed to encapsulate minor hydrocarbon spillages. The quantities of such materials shall be able to handle a minimum of 200 ℓ of hydrocarbon liquid spill.

Used oil and hydrocarbon contaminated materials

- Used oil shall be stored at a central location on site prior to removal off site for disposal at an approved disposal or recycling site.
- Old oil filters and oil, petrol and diesel-soaked material shall be treated as hazardous waste. The Contractor shall remove all oil, petrol, and diesel-soaked sand immediately and shall dispose of it as hazardous waste or treat it on site with material that breaks-down or encapsulates such spillages, as approved by the ECO.

5.2.11. Ablution facilities

- Washing, whether of the person or of personal effects, and acts of excretion and urination are strictly prohibited other than at the facilities provided. The Contractor shall provide the necessary ablution facilities for all his personnel prior to the commencement of work and shall ensure that his personnel make use of the facilities.
- Toilet facilities shall be supplied by the Contractor for the workers at a ratio of at least 1 toilet per 20 workers in areas approved by the ECO. Every 1-man urinal will be taken as supplying the equivalent of 5 men in addition to the 20 men per toilet on site. No toilets will be erected within 20 m of any “no go” areas. Toilets shall be situated within 200m of any area where work is taking place in numbers sufficient to meet the ratio depicted above for the workers in the area.
- The facilities shall be maintained in a hygienic state and serviced regularly. Toilet paper shall be provided. Temporary / portable toilets shall be secured to the ground to prevent them toppling due to wind or any other cause, to the satisfaction of the ECO.
- Discharge into the environment and burial of waste is strictly prohibited. The Contractor shall ensure that no spillage occurs when the toilets are cleaned or emptied and that the contents are removed from the site. Toilets shall be emptied before the Contractors’ holidays or any other temporary site closure.

5.2.12. Eating areas

- The Contractor shall designate eating area(s), subject to the approval of the ECO. No cooking is allowed outside of the Contractor’s camp area on site.
- At meal times all workers must eat in designated eating areas. These areas shall have shade for the workers. The eating areas may be in existing structures or in temporary / transportable structures that shall be well constructed using wood or metal for the frame and screened on the top and sides with shade cloth/canvas or other material to the satisfaction of the ECO. These areas shall be well demarcated and in locations approved by the ECO, and shall not be within 20 m of any “no go” areas, on or adjacent to the site.
- Sufficient bins shall be present in these areas. All disposable food packaging must be disposed of in the bins after every meal.
- The area must be cleaned after every meal.
- The feeding or leaving of food for animals is strictly prohibited.

5.2.13. Site structures

- All site establishment components (as well as equipment) shall be positioned to limit visual intrusion on neighbours and the size of the land area disturbed. The type and colour of roofing and cladding materials to the Contractor's temporary structures shall be selected to reduce reflection.
- The Contractor shall supply and maintain adequate and suitable sheds for the storage of materials. Sheds for the storage of materials that may deteriorate or corrode if exposed to the weather shall be weatherproof, adequately ventilated and provided with raised floors.

5.2.14. Lights

- The Contractor shall ensure that any lighting installed on the site for his activities does not cause a reasonably avoidable disturbance to the naturally-occurring fauna.

5.2.15. Noise

- The Contractor shall take precautions to minimise noise generated on site (e.g. install and maintain silencers on machinery).

- The Contractor shall comply with the Noise Induced Hearing Loss Regulations published under the Occupational Health and Safety Act.
- Appropriate directional and intensity settings are to be maintained on all hooters and sirens.
- Work will be limited to daylight hours
- No amplified music shall be allowed on site. The Contractor shall not use sound amplification equipment on Site unless in emergency situations.

5.2.16. Dust Control

- The Contractor shall be responsible for the continued control of dust arising from his operations. The Contractor shall take all reasonable measures to minimize the generation of dust as a result of construction activities to the satisfaction of the ECO. Appropriate dust suppression measures include: spraying or dampening with water, using a commercial dust binder (such as Hydropam or Dustex), rotovating straw bales, planting of open cleared space and the scheduling of dust-generating activities. If the conditions are such that the Contractor cannot satisfactorily dampen the dust, then the ECO may halt operations until such time as the conditions are more suitable for lower dust generating construction.
- Dampening of all gravel haul and access roads (if constructed) with water must be ongoing. Should dust still be a problem on any specific road, the allowable speed will be reduced to 20km/h. If dust is still a problem the road must be treated with a commercial dust binder, as required, to form a cohesive layer that will control the dust on the road.
- Areas that are to have the topsoil stripped for construction purposes must be limited, and only stripped when work is about to take place.
- Other activities and situations that may result in a dust nuisance include: site clearance and other earth moving operations, open cleared space, stockpiles of topsoil or sand and activities associated with concrete mixing.
- The appropriate health and safety equipment (e.g. dust masks) must be worn by workers during the phases of dust-producing construction activity.
- During periods of strong winds, construction work which tends to produce large amounts of dust must be paused until such a time that the wind subsides.

5.2.17. Environmental awareness training

- An environmental awareness induction training course shall be run for all personnel on site (See Annexure 2 for a proposed Basic Environmental Education Course). The course shall be run in the morning during normal working hours at a suitable venue provided by the Contractor. All attendees shall remain for the duration of the course and sign an attendance register on completion that clearly indicates participant's names, a copy of which shall be handed to the ECO.
- The environmental awareness training course for site staff and labour shall be presented by the Contractor's SHE Officer from material provided by the ECO unless otherwise required by the Project Specification. The course will be approximately one-hour long.
- Notwithstanding the specific provisions of this clause it is incumbent upon the Contractor to convey the sentiments of the EMPr to all personnel and Subcontractors involved with the Works.

Construction personnel information posters

- The Contractor shall erect and maintain information posters for the information of his employees depicting actions to be taken to ensure compliance with the Environmental EMPr. Construction personnel information posters shall be laminated and erected in all eating areas, workshops and site offices. The Contractor shall ensure that the construction personnel information posters are not damaged in any way, and shall replace them if any part becomes illegible.
- Examples of these posters will be supplied to the Contractor by the ECO in electronic format.

5.2.18. Fire control

- The Contractor shall take all the necessary precautions to ensure that fires are not started as a result of his activities on site.
- No open fires shall be permitted on the site.
- Smoking shall not be permitted in those areas where there is a fire hazard. Such areas shall include the workshop and fuel storage areas and any areas where the vegetation or other material could support the rapid spreading of an initial flame.
- The Contractor shall appoint a Fire Officer who shall be responsible for ensuring immediate and appropriate actions in the event of a fire and shall ensure that employees are aware of the procedures to be followed. The Contractor shall forward the name of the Fire Officer to the ECO for his approval within 7 days of being on site.
- The Contractor shall ensure that there is basic fire-fighting equipment available on site at all times. This shall include at least rubber beaters when working in natural areas, at least one fire extinguisher of the appropriate type in the mess and cooking area, and at least one fire extinguisher of the appropriate type when welding or other “hot” activities are undertaken.
- The Contractor shall be liable for any expenses incurred by any organisations called to assist with fighting fires that were started as a result of his activities or personnel, and for any cost relating to the rehabilitation of burnt areas, or consequential damages.

5.2.19. Emergency Procedures

- Emergency procedures, including the names and contact details of responsible personnel and emergency services shall be made available to all staff and shall be clearly displayed at relevant locations at the site. The Contractor shall advise the ECO of any emergencies on site, together with a record of action taken, within 24 hours of the emergency occurring.
- Telephone numbers of emergency services shall also be posted conspicuously in the Contractor’s office near the telephone.
- The Contractor shall submit a Method Statement covering the procedures for the following emergencies:

Fire

- The Contractor shall advise the relevant authority of a fire as soon as one starts and shall not wait until he can no longer control it.
- The Contractor shall ensure that his employees are aware of the procedures to be followed in the event of a fire.

Accidental leaks and spillages

- The Contractor shall ensure that his employees are aware of the procedures to be followed for dealing with spills and leaks, which shall include notifying the ECO and the relevant authorities. The Contractor shall ensure that all the necessary materials and equipment for dealing with spills and leaks are available on site at all times. Treatment and remediation of the spill areas shall be undertaken to the reasonable satisfaction of the ECO.
- In the event of a hydrocarbon spill, the source of the spillage shall be isolated and the spillage contained. The area shall be cordoned off and secured. The Contractor shall ensure that there is always a supply of absorbent material readily available to absorb/ breakdown or where possible, be designed to encapsulate minor hydrocarbon spillages. The quantities of such materials shall be able to handle a minimum of 200 ℓ of hydrocarbon liquid spill.
- Any spills must be cleared and the contaminated soil/sludge disposed of in an appropriate manner, approved by the ECO, or at a licensed hazardous waste disposal site.

5.2.20. Protection of natural features

- The Contractor shall not deface, paint, damage or mark any natural features (e.g. rock formations or trees) situated in or around the site for survey or other purposes unless agreed beforehand with the ECO. Any features affected by the Contractor in contravention of this clause shall be restored / rehabilitated to the satisfaction of the ECO.
- The Contractor shall not permit his employees to make use of any natural water sources for the purposes of swimming, personal washing and the washing of machinery or clothes.

5.2.21. Protection of flora and fauna

- All clearing activities must deploy search and rescue teams in-front of clearing machinery to assist in relocating slower moving faunal species e.g. tortoises.
- Protected plant species must be removed from the designated construction footprint and relocated to adjacent areas of similar habitat that will not be affected by construction and used in landscaping once construction is complete.
- Except to the extent necessary for the carrying out of the works, flora shall not be removed, damaged or disturbed nor shall any vegetation be planted.
- The removal and stockpiling of topsoil must also be carried out in accordance with the EMPr.
- Trapping, poisoning and/or shooting of animals is strictly forbidden. No domestic pets or livestock are permitted on site.
- The use of chemicals of all forms must be carefully controlled and monitored to avoid contamination of areas.
- The environmental education programme must explain to staff why species of concern are ecologically significance.

5.2.22. Protection of heritage features

- Construction managers/foremen must be informed before construction starts regarding the possible types of heritage sites and cultural material they may encounter, and the procedures to follow when they find sites.
- If concentrations of palaeontological/archaeological heritage material and human remains are uncovered during construction, all work must cease immediately and be reported to the Heritage Western Cape (021 483 5959) and/or the South African Heritage Resources Agency (SAHRA) (021 642 4502) so that systematic and professional investigation/ excavation can be undertaken.
- Any person who causes intentional damage to archaeological or historical sites and/or artefacts could be penalised or legally prosecuted in terms of the National Heritage Resources Act 25 of 1999.

5.2.23. Vegetation Clearance

- Vegetation clearing and trampling must be avoided in areas demarcated as no-go areas.
- Temporary infrastructure such as the site camp, lay down areas and storage areas must be placed outside the 32m buffer from the river.
- Vegetation clearing must occur in parallel with the construction progress to minimise erosion and/or run-off. Large tracts of bare soil will either cause dust pollution or quickly erode and then cause sedimentation in the river.
- The Contractor must work according to a plan, which demarcates areas to be cleared. The plan must be part of the Project Layout Plan developed in the Site Design Phase.
- The minimum amount of vegetation clearance must take place.
- All plants not interfering with construction must be left undisturbed.
- Collection or wilful damage to any plants outside of the areas demarcated for clearing is not allowed.

- No breaking of branches on indigenous trees, outside of the demarcated areas, will be allowed without prior approval from the ECO.

5.2.24. Alien Vegetation Clearance

- The construction phase must employ eradication programmes to remove existing invasive species as well as the removal of any new invasive species, especially those categorized as 1, 2 and 3 on the NEMBA list. This must be undertaken in accordance with the site-specific Alien Plant Management Plan (please refer to Annexure 5);
- Long-term operational eradication programs to eradicate invasive species must be implemented if possible.

5.2.25. Revegetation

- All areas disturbed during construction shall be reinstated to a state that approximates or better the state that they were in before construction.
- Cut and fill areas must be restored and reshaped.
- Areas compacted by vehicles during construction must be scarified to allow penetration of plant roots and the regrowth of natural vegetation.
- The revegetation programme must take cognisance of the climatic and seasonal conditions with the most favourable period being in spring and early summer.
- The rehabilitated areas will be weeded by the nominated rehabilitation contractor for a period of 1 year.
- Species indigenous and or endemic to the area, and suitable for rehabilitation, must be identified and used in preference to exotic species.
- The transplanting of indigenous species within the study area must be done.
- It is also advised that the Environmental Control Officer, to be appointed during the construction phase, must have a good understanding of the local flora. The ECO must be able to make clear recommendations with regards to the re-vegetation of the newly completed / disturbed areas, using species selected by an appropriate botanist. All alien plant re-growth must be monitored and should it occur these plants must be eradicated.

5.2.26. Topsoil stripping and stockpiling

- Topsoil can only be stripped from the areas as indicated below:
 - Any area which is to be used for temporary storage of materials
 - Areas which could be polluted by any aspect of the construction activity and;
 - Areas designated for the dumping of soil.
- Stripping of topsoil will be undertaken in such a manner as to minimise erosion by wind or runoff.
- Outside of the development footprint, topsoil will be stripped to a depth not exceeding 150mm from the original ground level.
- Areas from which the topsoil is to be removed will be cleared of any foreign material including bricks, rubble, any waste material, litter, excess vegetation and any other material which could reduce the quality of the topsoil.
- The Contractor shall ensure that subsoil and topsoil are not mixed during stripping, excavation, reinstatement and rehabilitation. If mixed with clay sub-soil the usefulness of the topsoil for rehabilitation of the site will be lost.
- Soils must be exposed for the minimum time possible once cleared.
- Topsoil will be temporarily stockpiled, separately from (clay) subsoil and rocky materials.
- Topsoil will be stockpiled in areas designated by the ECO.
- Soil must not be stockpiled near the river without prior consent from the ECO.

- Stockpiles will either be vegetated with indigenous grasses or covered by a suitable fabric to prevent erosion and invasion of weeds.
- Stockpiled topsoil will not be compacted.

5.2.27. Stormwater Management

- Stormwater must be managed using suitable structures such as swales, gabions and rock rip-wrap so that any run-off from the development site is attenuated prior to discharge. Silt and sedimentation must be kept to a minimum, through the use of the above-mentioned structures.
- Natural run-off must be diverted to stormwater drains where these are available. The Contractor shall take appropriate measures to prevent sand, silt and silt-laden waters from entering the river.

5.2.28. Erosion and sedimentation control

- The Contractor shall take all reasonable measures to limit erosion and sedimentation due to construction activities.
- Re-vegetate areas that have been disturbed as soon as possible.
- Where erosion and/or sedimentation, whether on or off the site, occurs despite the Contractor complying with the foregoing, rectification shall be carried out in accordance with details specified by the ECO. Where erosion and/or sedimentation occur due to the fault of the Contractor, rectification shall be carried out to the reasonable requirements of the ECO and at the expense of the Contractor.

5.2.29. Aesthetics

- The Contractor shall take reasonable measures to ensure that construction activities do not have an unreasonable impact on the aesthetics of the area.

5.2.30. Community relations

- If so required by the Project Specification, the Contractor shall erect and maintain information boards in the positions, quantities, designs and dimensions specified. Such boards shall include contact details for complaints by members of the public in accordance with details provided by the ECO.
- The Contractor shall keep a "Complaints Register" on site. The Register shall contain all contact details of the person who made the complaint, and information regarding the complaint itself and note the date and time that the complaint was resolved.
- The ECO shall be responsible for responding to queries and/or complaints and may request assistance from the Contractor's Management Staff.
- Construction materials and other purchases relating to the project must be done, where possible, within the nearby community and at local shops.

5.3. OPERATION PHASE

5.3.1. Emergency procedures

- Emergency procedures, including the names and contact details of responsible personnel and emergency services shall be made available to all staff and shall be clearly displayed at relevant locations at the site.
- Telephone numbers of emergency services shall also be posted conspicuously in the office(s) near the telephone.
- The applicant shall undergo these procedures for the following emergencies:

Fire

- The applicant shall advise the relevant authority of a fire as soon as one starts and shall not wait until he can no longer control it.
The applicant shall ensure that his employees are aware of the procedures to be followed in the event of a fire.

5.3.2. Aesthetics

- The applicant shall take reasonable measures to ensure that operational activities do not have an unreasonable impact on the aesthetics of the area.

6. ENVIRONMENTAL MANAGEMENT PROTOCOL

6.1. ROLES AND RESPONSIBILITIES

6.1.1. Applicant/Developer

The applicant is the responsible entity for monitoring the implementation of the EMPr and compliance with the authorisation. However, if the applicant appoints a contractor to implement the project and hence implement the proposed mitigation measures documented in this EMPr on their behalf, then the successful contractor's responsibilities are outlined as per the section that follows.

6.1.2. Contractor

The successful contractor shall:

- Be responsible for the finalisation of the EMPr in terms of methodologies which are required to be implemented to achieve the environmental specifications contained herein, and the relevant requirements contained in the EA;
- Be responsible for the overall implementation of the EMPr in accordance with the requirements of the developer and the EA;
- Ensure 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; and
- Ensure that the appointments of the ECO are subject to the approval of the developer.

6.1.3. Environmental Control Officer

For the purposes of implementing the conditions contained herein, the contractor shall appoint an ECO for the contract. The ECO shall be the responsible person for ensuring that the provisions of the EMPr as well as the EA are complied with during the construction period. The ECO will be responsible for issuing instructions to the contractor and where environmental considerations call for action to be taken. The ECO shall submit regular written reports to the applicant and the environmental authority as required.

The ECO will be responsible for the monitoring, reviewing and verifying of compliance with the EMPr and conditions of the environmental authorisation by the contractor. 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, EA 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 with input from the engineer, where necessary, in order to ensure that the environmental specifications contained within this EMPr and EA are adhered to;
- Inspecting the site and surrounding areas on a regular basis regarding compliance with the EMPr, EA and 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 issuing 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 for applicant and authority review and approval as applicable;

- Checking the register of complaints kept on site and ensuring that the correct actions are/were taken in response to these complaints;
- Checking that the required actions are/were undertaken to mitigate the impacts resulting from non-compliance;
- Reporting all incidences of non-compliance;
- Conducting monthly environmental performance audits in respect of the activities undertaken relating to the project. The ECO shall also submit compliance audit reports to the competent authority, in accordance with the requirements of the environmental authorisation. Such reports shall be reviewed by the applicant, prior to submission;
- Keeping a photographic record of progress on site from an environmental perspective;
- Recommending additional environmental protection measures, should this be necessary; and
- Providing report back on any environmental issues at site meetings.

Given the relatively small scope of the construction activities, a full time ECO will not be required. It is anticipated that upfront activities would include defining laydown and no-go areas, assisting with the development of method statements, presenting the environmental awareness and training programmes and revising this EMPr if details on the construction programme necessitate such changes. Thereafter monthly site audits will likely be sufficient to ensure compliance with this EMPr, provided the developer’s Resident Engineer has been capacitated to identify any non-compliances.

6.2. AQUATIC SYSTEM MONITORING

In order to address the concerns related to habitat and flow modification (as per the Aquatic Impact Assessment), the following monitoring programme should be implemented. Should monitoring results indicate a significant increase in turbidity levels and/or a change in Ecological Flow Reserve (when compared to the pre-construction monitoring findings), immediate corrective action should be taken to reduce the impacts on the stream and the aquatic environment.

Pre - Construction phase			
Monthly wet season turbidity monitoring for 2019.	S1	34° 3'50.23"S	19°40'33.02"E
	S2	34° 4'3.12"S	19°40'27.06"E
	S3	34° 4'16.99"S	19°40'21.93"E
	S4	34° 4'24.36"S	19°40'20.21"E
	S5	34° 4'35.91"S	19°40'14.39"E
Operation phase			
Monthly wet season turbidity monitoring for the first two years following inundation.	S1	34° 3'50.23"S	19°40'33.02"E
	S3	34° 4'16.99"S	19°40'21.93"E
	S5	34° 4'35.91"S	19°40'14.39"E
Monthly monitoring of dam release quantity.		At dam outlet	
Monthly rainfall monitoring.		At proposed dam site	

The above locations will allow for immediate, fine scale monitoring of impacts during the construction phase, as well as allowing for longer term monitoring of sediment and flow for two years after construction.

6.3. ADDITIONAL MITIGATION MEASURES

As part of the implementation and monitoring requirements, the employees involved in the proposed development must be trained in implementing and monitoring compliance with the EMPr and EA and to undertake the necessary monitoring and implementation of the prescribed mitigation measures detailed here.

6.3.1. Pre-Construction

Notice must be given to surrounding land owners and businesses informing them of the intended date of commencement of construction.

6.3.2. Construction Phase

- An ECO must be appointed to ensure that the construction activities remain within the designated area and that no unauthorised activities occur;
- The ECO must submit site audits detailing the applicant's compliance with the EMPr;
- An efficient stormwater management system must be implemented during construction; and
- Workers must be educated on environmental management aspects.

6.3.3. Operational Phase

- Eradication of the already established alien invasive species onsite within the demarcated construction footprint; and
- An ECO must be present during maintenance work

7. CONCLUSION

Although all foreseeable actions and potential mitigations or management actions are contained in this document, the EMPr must be seen as a day-to-day management document. The EMPr thus sets out the environmental standards that are required to minimise the negative impacts and maximise the positive benefits of the proposed dam, as detailed in the BAR. The EMPr is a “live document”, and if continuously reviewed and managed correctly can result in successful construction and operation of the proposed development.

All attempts must be made to have this EMPr available, as part of any tender documentation, so that the contractors are made aware of the potential cost and timing implications needed to fulfil the implementation of the EMPr, thus adequately costing for these. Further guidance must also be taken on any conditions contained in the EA, if the project is granted approval, and that these conditions must be incorporated into the final EMPr.

ANNEXURE 1: METHOD STATEMENTS

Method statements need to be compiled by the Contractor for approval by the ECO. For the purposes of the environmental specification, a method statement is defined as a written submission by the Contractor to the ECO setting out the plant, materials, labour and method the Contractor proposes using to carry out an activity, in such detail that the ECO is enabled to assess whether the Contractor's proposal is in accordance with the EMPr and / or will produce results in accordance with the EMPr.

The method statement shall cover applicable details with regard to:

- Construction procedures,
- Materials and equipment to be used,
- Transporting the equipment to and from site,
- How the equipment/ material will be moved while on site,
- How and where material will be stored,
- The containment (or action to be taken if containment is not possible) of leaks or spills of any liquid or material that may occur,
- Timing and location of activities,
- Compliance/ non-compliance with the Specifications, and
- Any other information deemed necessary by the Engineer.

The Contractor shall abide by these approved method statements, and any activity covered by a method statement shall not commence until the ECO has approved the method statement. The method statement shall be submitted to the ECO not less than 20 days prior to the intended date of commencement of the activity, or as directed by the ECO.

METHOD STATEMENT

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

PROPOSED ACTIVITY (give title of method statement):

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 Date:	End Date:

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

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

* Note: please attach extra pages if more space is required

DECLARATIONS

1) ENVIRONMENTAL CONTROL OFFICER

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: _____



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

Reasons why should we look after the environment

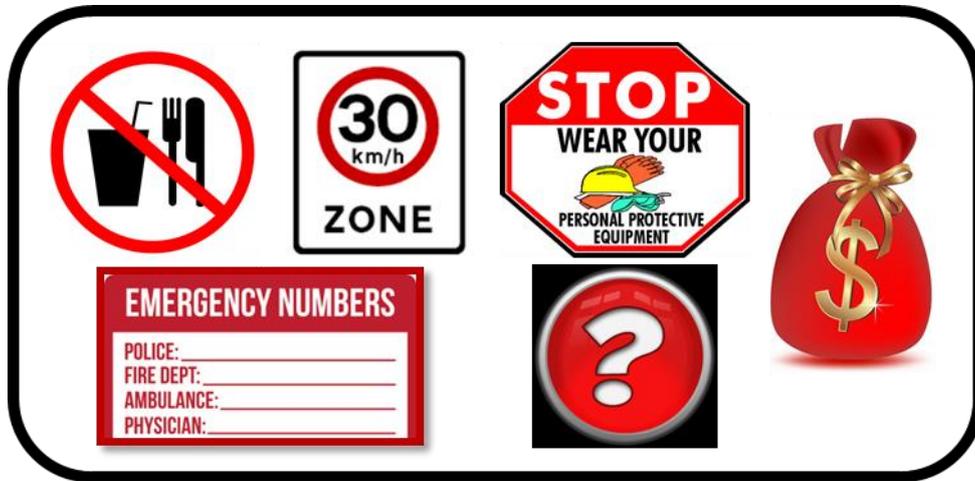
- We have a right to a clean environment
- A clean environment is essential to healthy living
- All our basic needs come from the environment
- A contract has been signed – development vs the environment
- Penalties / fines could be issued

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

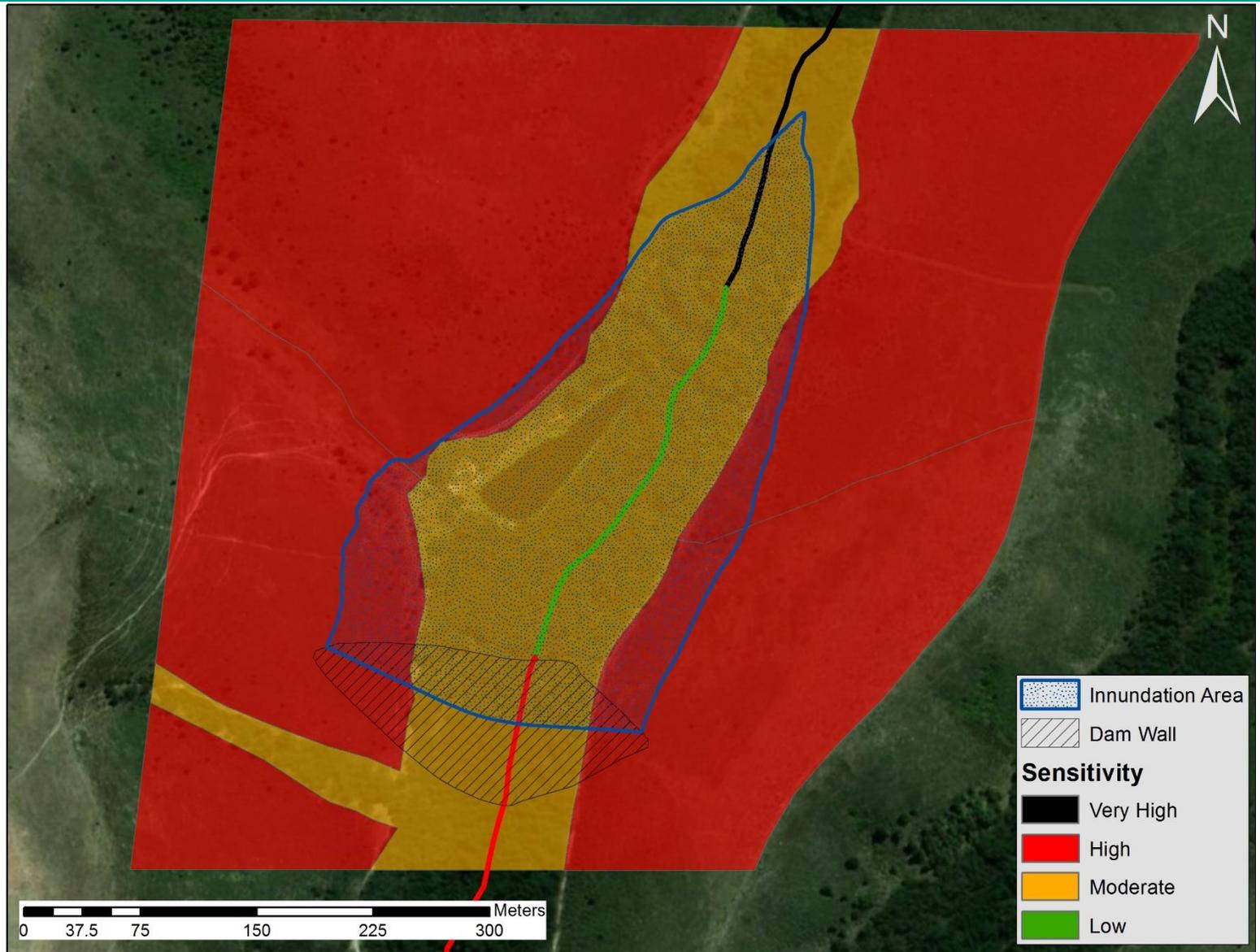
-  Workers and equipment should not be allowed outside demarcated areas
-  No swimming or polluting of water bodies allowed
-  No damage / disturbance to vegetation or water bodies without consent / permits
-  No disturbance allowed in no-go areas
-  No hunting of animals
-  Report all fires
-  No burning 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



ANNEXURE 3: DETAILS AND CVS OF THE PROJECT TEAM

Please refer to the Basic Assessment Report for details and CVs of the project team.

ANNEXURE 4: SITE SENSITIVITY MAP



ANNEXURE 5: ALIEN PLANT REMOVAL PLAN

Please refer to the Basic Assessment Report (Appendix K2) for the alien plant removal plan.