



**ENVIRONMENTAL MANAGEMENT PROGRAMME FOR
DESILTING AND REHABILITATION OF WATERCOMBE
DAM IN THE CITY OF JOHANNESBURG, REGION C.**

REF No.

ABBREVIATIONS

EMPr:	Environmental Management Programme
NEMA:	National Environmental Management Act
EIA:	Environmental Impact Assessment
I&APs:	Interested and Affected Parties
DEO:	Designated Environmental Officer
ECO:	Environmental Control Officer
SDC:	Safe Disposal Certificate
MSDS:	Material Safety Data Sheets
SAHRA:	South African Heritage Resource Agency
SANS:	South African National Standards
DWS:	Department of Water and Sanitation

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1 INTRODUCTION

The Bill of Rights – Chapter 2 of the Constitution Act No. 108 of 1996, includes an environmental right (Section 24) according to which, *“everyone has the right to an environment that is not harmful to their health or well-being and to have the environment protected for the benefit of present and future generations, through reasonable legislative and other measures that prevent pollution and ecological degradation, promote conservation and the sustainable use of natural resources while promoting justifiable economic and social development”*. In addition, Section 28 of the National Environmental Management Act No 107 of 1998 (NEMA), requires, *“every person causing significant pollution or degradation of the environment, to take reasonable measures to prevent it from occurring, continuing or recurring”*. Therefore, in order to promote effective environmental management throughout the life-cycle of a project, it is important that management actions arising from Environmental Impact Assessments (EIAs) are clearly defined and translated into an Environmental Management Programme (EMPr) for the design, construction, operation and/or decommissioning phases of a project.

According to the Western Cape Department of Environmental Affairs and Development Planning (2005), 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”*.

1.1 Purpose of the EMPr

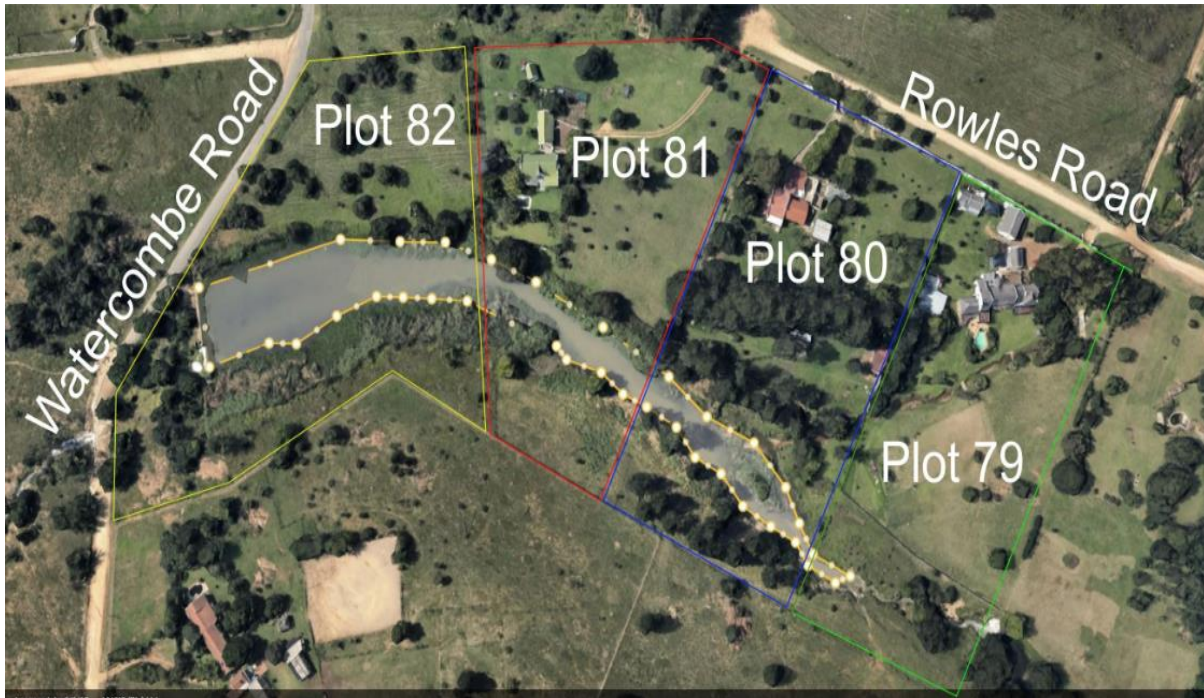
The purpose of an EMPr is therefore to:-

- Encourage good management practices through planning and commitment to environmental issues;
- Define how the management of the environment is reported and performance evaluated;
- Provide rational and practical environmental guidelines to:
 - Minimise the extent of environmental impacts and to manage environmental impacts and where possible, to improve the condition of the environment;
 - Prevent long-term or permanent environmental degradation.
 - Comply with all applicable laws, regulations, standards and guidelines for the protection of the environment;
 - Provide guidance regarding method statements which are required to be implemented to achieve environmental specifications;
 - Define the corrective actions which must be taken in the event of non-compliance with the specifications of the EMPr;
 - Describe all monitoring procedures required to identify impacts on the environment, and;

- Train employees and contractors with regard to environmental obligations.

1.2 Project Location

The is covers approximately 378.22m of the area and it is situated in Region C of the City of Johannesburg within the following portions: 79, 80, 81, and 82 of Farmall and the coordinates are as follows: Latitude: 26° 0'15.03"S Longitude 27°57'17.70".



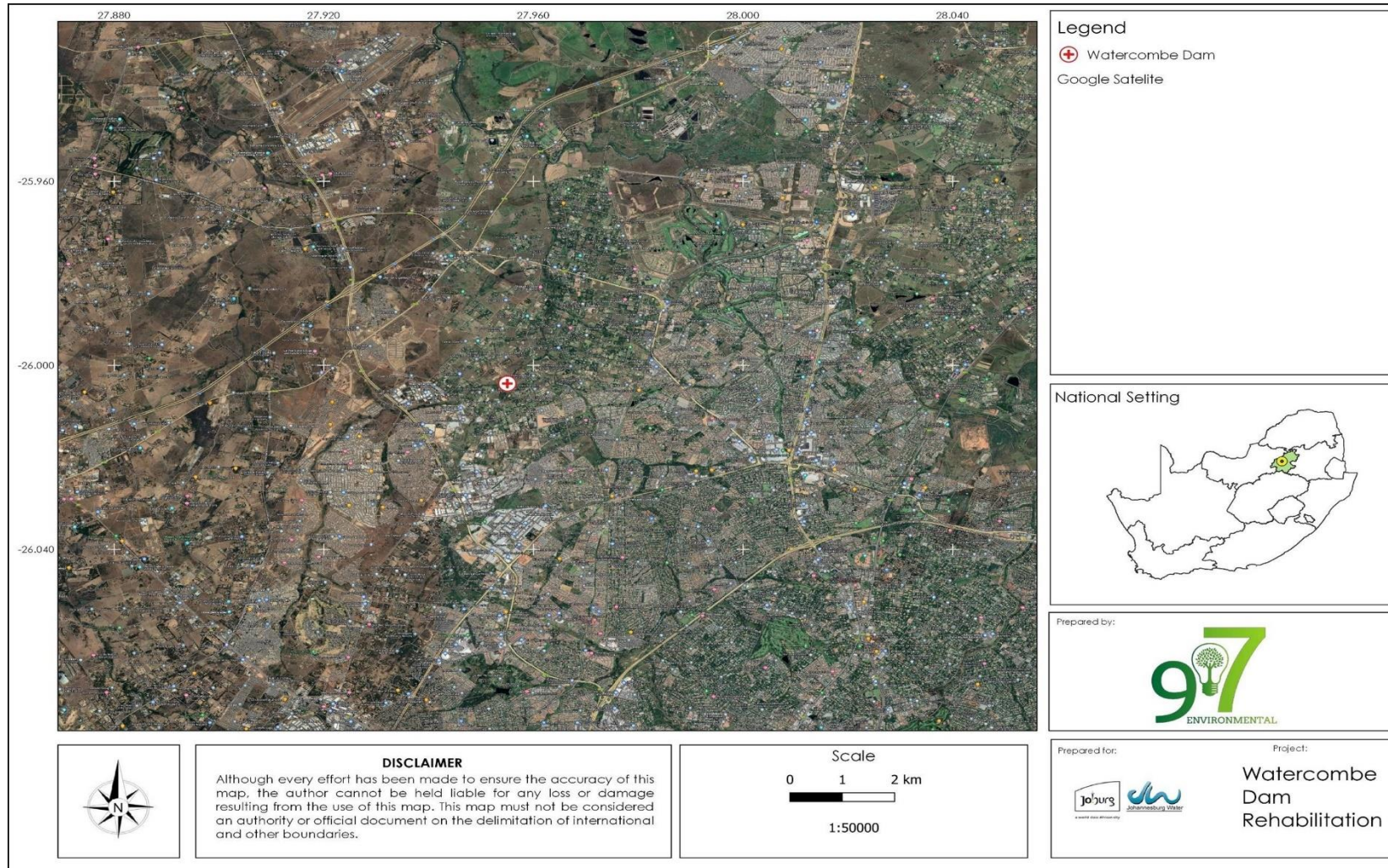


Figure 1: Project Location

2 PROJECT APPLICANT AND ENVIRONMENTAL ASSESSMENT PRACTITIONER DETAILS

Below are details of the project applicant and environmental assessment practitioner:

Table 1: EAP and applicant details

PROJECT APPLICANT	
Name	Johannesburg Water
Contact Person	Joyce Ngobebe
Contact Details:	Tel: 011 688 1443 Fax: 011 688 1528 Email: joyce.ngobebe@jwater.co.za
NAME OF ENVIRONMENTAL ASSESSMENT PRACTITIONER	
Name	NKT Consulting
Contact Person	Charles Chigurah
Contact Details:	073 565 8847 info@nktconsulting.co.za

3 PROJECT DESCRIPTION

The scope of work for this project is to remove the sand and sludge materials accumulated in the dam. The existing dam is approximately 378.22m long. The appointed contractor shall be responsible for the overall work and not limited to:

- Management of material (supply, offloading, storing)
- Resource management (people and plant)
- Clearing of the site;
- Traffic Accommodation;
- Excavation works
- Reinstatement and rehabilitation of the watercourse embankments.

All works shall comply with permits requirements and according to the specifications and the contractor should ensure that the completed works satisfy the expectations of JW, community and authorities.

Approximately 9,000 cubic meters of material will be removed. As part of its duty of care, Johannesburg Water would like to undertake the remediation process and remove all contaminated materials from the dam in order to restore the dam close to its original state and to improve the capacity, health and welfare of the dam. The is covers approximately 378.22m of the

area and it is situated in Region C of the City of Johannesburg within the following portions: 79, 80, 81, and 82 of Farmall and the coordinates are as follows: Latitude: 26° 0'15.03"S Longitude 27°57'17.70"

Desilting of the dam

- The river will be diverted from portion 79 through to portion 82 in order for the work to be undertaken.
- All materials that are within the dam will be removed and stored temporarily on portion 81 and 82 for reuse, and should there be excess material remaining on site, the materials will be disposed of at the registered landfill site.
- The test will be taken before disposal of all soil materials in order to ascertain if they will be disposed of as general or hazardous waste.
- The excavator will dig 2-3m deep near the dam wall within portion 82, one and half metres deep on portion 81 and 1m deep at portion 79 in order to restore the dam capacity.
- The sand that will be removed from the dam will be used for surfacing of roads in the neighbourhood.

4 LEGISLATIVE FRAMEWORK

The following is a summary of the environmental legislation applicable to the proposed project.

Legislation	Sections	Relates to:
The Constitution (No 108 of 1996)	Chapter 2	Bill of Rights.
	Section 24	Environmental rights.
National Environmental Management Act (No 107 of 1998 [as amended])	Section 2	Defines the strategic environmental management goals and objectives of the government. Applies through-out the Republic to the actions of all organs of state that may significantly affect the environment.
	Section 24	Provides for the prohibition, restriction and control of activities which are likely to have a detrimental effect on the environment.
	Section 28	The Client has a general duty to care for the environment and to institute such measures as may be needed to demonstrate such care.
Environment Conservation Act (No 73 of 1989) and regulations	Sections 19 and 19A	Prevention of littering by employees and subcontractors during construction and the maintenance phases of the proposed project
National Heritage Resources Act (No 25 of 1999) and regulations	Section 32	No person may, without a permit issued by the responsible heritage resources authority destroy,

Legislation	Sections	Relates to:
		damage, excavate, alter, deface or otherwise disturb any archaeological or paleontological site.
	Section 34	No person may, without a permit issued by the South African Heritage Resource Agency (SAHRA) or a provincial heritage resources authority destroy, damage, alter, exhume, remove from its original position or otherwise disturb any grave or burial ground older than 60 years which is situated outside a formal cemetery administered by a local authority. Grave is widely defined in the Act to include the contents, headstone or other marker of such a place, and any other structure on or associated with such place.
	Section 35	This section provides for Heritage Impact Assessments (HIAs), which are not already covered under the ECA. Where they are covered under the ECA the provincial heritage resources authorities must be notified of a proposed project and must be consulted during the HIA process. The Heritage Impact Assessment (HIA) will be approved by the authorising body of the provincial directorate of environmental affairs, which is required to take the provincial heritage resources authorities' comments into account prior to making a decision on the HIA.
Occupational Health and Safety Act (No 85 of 1993)	Section 8	Control of dust
	Section 9	Control of noise
National Environmental Management Biodiversity Act (Act No. 10 of 2004)		Provide for the protection of species and ecosystems that warrant national protection and the sustainable use of indigenous biological resources.
Occupational Health and Safety Act-Major Hazard Installation Regulations (GN R692, July 2001)	Sections 5 and 6	Control of offensive odours
National Water Act (No 36 of 1998) and regulations	Section 19	General duties of employers to their employees
	Section 20	General duties of employers and self employed persons to persons other than their employees
National Road Traffic Act (No 93 of 1996)		Road safety.
Town Planning and Townships Ordinance 15 of 1986		Town Planning.

Legislation	Sections	Relates to:
SANS 10103 (Noise Regulations)		The measurement and rating of environmental noise with respect to annoyance and to speech communication.

5 ADMINISTRATION AND REGULATION OF ENVIRONMENTAL OBLIGATIONS

5.1 Management Structure

The Contractor must compile an organogram illustrating the management structure for inclusion within the final EMPr. This organogram should depict the organisation structure of the Contractor and must contain supporting documentation to demonstrate the environmental responsibilities, accountability, and liability of the Contractor's employees. The Contractor should assign responsibilities for the following:

- Reporting structures.
- Actions to be taken to ensure compliance.
- Overall design, development, and implementation of the EMPr.
- Documenting the environmental policy and strategy.
- Implementing the EMPr in all stages/phases of the project.
- All the aspects which require action under the other core elements and sub-elements of the EMPr.

All official communication and reporting lines including instructions, directives and information shall be channelled according to the organisation structure.

5.2 Roles and Responsibilities

5.2.1 Johannesburg Water

Johannesburg Water (JW) is the client and will therefore be the entity monitoring the implementation of the EMPr. However, if JW appoints a Contractor to implement the project and hence implement the proposed mitigation measures documented in this EMPr on their behalf.

5.2.2 Contractor

The successful Contractor shall:

- Be responsible for the overall implementation of the EMPr in accordance with the requirements of JW;
- 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

5.2.3 Designated Environmental Officer

The Contractor shall appoint a nominated representative of the contractor as the Designated Environmental Officer (DEO) for the contract. The DEO will be site-based and shall be the responsible person for implementing the environmental provisions of the construction contract. There shall be an approved DEO on the site at all times.

The DEO's duties will include, *inter alia*, the following:

- Ensuring that all the permits required in terms of the applicable legislation have been obtained prior to construction commencing.
- Reviewing and approving construction method statements with input from the ECO and Engineer, where necessary, in order to ensure that the environmental specifications contained within the construction contract are adhered to.
- Assisting the Contractor in finding environmentally responsible solutions to problems.
- Keeping accurate and detailed records of all activities on site.
- Keeping a register of complaints on site and recording community comments and issues, and the actions taken in response to these complaints.
- Ensuring that the required actions are undertaken to mitigate the impacts resulting from non-compliance.
- Reporting all incidences of non-compliance to the ECO and Contractor.

The DEO shall submit regular written reports to the ECO, but not less frequently than once a month.

The DEO must have:

- The ability to manage public communication and complaints;
- The ability to think holistically about the structure, functioning and performance of environmental systems; and
- The DEO must be fully conversant with the Environmental Management Programme and all relevant environmental legislation.

The ECO shall have the authority to instruct the contractor to replace the DEO if, in the ECO's opinion, the appointed officer is not fulfilling his/her duties in terms of the requirements of the construction contract. Such instruction will be in writing and shall clearly set out the reasons why a replacement is required and within what timeframe.

5.2.4 Environmental Control Officer

For the purposes of implementing the conditions contained herein, JW shall appoint an Environmental Control Officer (ECO) for the contract. The ECO shall be the responsible person for ensuring that the provisions of the EMPr are complied with. 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 JW, but not less frequently than once a month. The ECO will be responsible for the monitoring, reviewing and verifying of compliance with the EMPr by the Contractor. The ECO's duties in this regard will include, *inter alia*, the following:

- Confirming that all the environmental permits required in terms of the applicable legislation have been obtained prior to construction commencing.
- Monitoring and verifying that the EMPr 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 DEO and Engineer, where necessary, in order to ensure that the environmental specifications contained within this EMPr are adhered to.
- Inspecting the site and surrounding areas on a regular basis regarding compliance with the EMPr 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.
- Undertaking a continual internal review of the EMPr and submitting any changes to JW for review and approval.
- Checking the register of complaints kept on site and maintained by the DEO 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 to the JW.
- Conducting annual environmental performance audits in respect of the activities undertaken relating to the project.
- Keeping a photographic record of progress on site from an environmental perspective.
- Recommending additional environmental protection measures, should this be necessary.
- Providing report back on any environmental issues at site meetings

The ECO must have:

- A good working knowledge of all relevant environmental policies, legislation, guidelines, and standards;

- The ability to conduct inspections and audits 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 optimisation of impacts.
 - Monitoring and evaluation of impacts.
 - Environmental Management Systems.

The ECO must be fully conversant with the Environmental Management Programme and all relevant environmental legislation. JW shall 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 shall clearly set out the reasons why a replacement is required and within what timeframe.

5.3 Emergency Preparedness

The Contractor shall 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 life cycle of the project. Such activities may include, *inter alia*:

- Accidental discharges to water and land.
- Accidental exposure of employees to hazardous substances.
- Accidental veld or forest fires.
- Accidental spillage of hazardous substances.
- Specific environmental and ecosystem effects from accidental releases or incidents.

These plans should include:

- Emergency organisation (manpower) and responsibilities, accountability, and liability.
- A list of key personnel.
- Details of emergency services applicable to the various areas along the route (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 shall 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 National Environmental Management Act, 1998 (Act No 107 of 1998), the National Water Act, 1998 (Act No 36 of 1998) and the National Veld and Forest Fire Act, 1998 (Act No 101 of 1998) as amended and/or any other relevant legislation.

5.4 Checking and Corrective Action

5.4.1 Non-Compliance

Non-compliance with the specifications of the EMPr and/or conditions of any environmental permits, both of which will be present on-site at all times, constitutes a breach of Contract for which the Contractor may be liable to pay penalties. The Contractor is deemed not to have complied with the EMPr if:

- There is evidence of contravention of the EMPr specifications within the boundaries of the construction site, site extensions and haul/access 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; and/or
- The Contractor fails to comply with corrective or other instructions issued by the Engineer and/or ECO within a specific time period.
- The contractor shall act immediately when a notice of non-compliance is received and correct whatever was the cause for the issuing of the notice.

Any non-compliance with the agreed procedures of the EMPr is a transgression of the various statutes and laws that define the manner by which the environment is managed therefore any avoidable non-compliance, dependant on severity, shall be considered sufficient grounds for contact to be made with relevant provincial or national authorities.

The engineer's decision with regard to what is considered a violation, its seriousness, and the action to be taken against the contractor shall be final. Failure to redress the cause shall be reported to the relevant authority. The responsible provincial or national authorities shall ensure compliance and impose penalties relevant to the transgression as allowed for within its statutory powers.

5.4.2 Monitoring

A monitoring programme will be implemented for the duration of the construction phase of the project. This programme will include:

- **Performance Audits:** Monthly inspection reports which are performance based compiled by the ECO. This must also incorporate monitoring of compliance issues as well as permits, licenses, the EMPr and all contract documentation's conditions. These audits can be conducted randomly and do not require prior arrangement with the project manager.
- **Compliance Audits:** The auditor will initially undertake compliance audits every month. Compilation of an audit report with a rating of the compliance with the EMPr. This report will be submitted to the relevant authorities as and when required.

The following will also assist with monitoring: -

Complaints Register

The Contractor will ensure that a dedicated Complaints Register is kept on site at all times. The register will contain the details of the person who made the complaint, the nature of the complaint received, the date on which the complaint was made, and the response noted with the date and action taken. The Complaints register will be kept in accordance with the requirements of the ECO. This record shall be submitted with the monthly reports and an oral report given at the monthly site meetings.

Inspections

On-going visual inspections will be conducted daily by the DEO. The DEO will spend the bulk of his/her time on site on the lookout for any unsafe acts and activities that transgress the requirements as specified in the EMP. The DEO compiles the site register, and the ECO maintains the complaints register and any other records required (the DEO would also have input into this as well, as he/she would be site-based).

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 (within 24 hours). The following information must be provided:

- The location;
- The nature of the load; 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. The written reports may be used for training purposes in an effort to prevent similar future occurrences.

Public Communication and Liaison with Interested and Affected Parties

The Contractor shall comply with the requirements for public consultation as required by the Constitution Act, 1996 (Act No 108 of 1996) and the National Environmental Management Act, 1998 (Act No 107 of 1998). During the construction phase of the project, the Contractor shall be responsible for erecting information boards, in the position, quantity, design and dimensions approved by the Engineer.

The information boards shall contain relevant information regarding the construction activity and the relevant contact details to assist persons who wish to submit complaints regarding construction activities.

Information distribution

Copies of the EMPr will be made available to I&APs at appropriate locations. Copies will also be distributed to all senior contract personnel. All senior personnel on the construction site will be required to familiarize themselves with the contents of the document.

5.5 Management Review

A formal management review needs to be conducted on a regular basis in which the monthly internal audit reports written by the ECO and based on frequent inspections and interactions with the DEO based on the latter's daily reports, audit reports by the independent external auditor will be reviewed. The purpose of the review is to critically examine the effectiveness of the EMPr and its implementation and to decide on potential modifications to the EMPr as and when necessary. The process of management review is in keeping with the principle of continual improvement. Management review will take place monthly for the duration of the project.

6 DETAILED ENVIRONMENTAL MANAGEMENT PROGRAMME

The EMPr forms part of the Contract Documentation and is thus a legally binding document. It is also necessary for the Contractor to make provisions as part of their budgets for the implementation of the EMPr. In terms of the NEMA an individual responsible for environmental damage must pay costs both to the environment and human health and the preventative measures to reduce or prevent additional pollution and/or environmental damage from occurring. This is referred to as the Polluter Pays Principle. Section 28 of the NEMA embodies the Polluter Pays Principle. The Contractor is deemed not to have complied with the Environmental Specifications/EMPr if:

- Environmental damage ensues due to negligence;
- The Contractor ignores or fails to comply with corrective or other instructions issued by JW, the Engineer or ECO within a specified time; and
- The Contractor fails to respond adequately to complaints from the public.

6.1 Pre-Construction Phase

6.1.1 Permits and Licenses

All necessary permits and licences must be obtained by JW prior to the commencement of construction

6.1.2 Appointment of Contractor

- JW must ensure that this EMPr forms part of any Contractual agreements with the Contractor(s) and sub-Contractors for the execution of the proposed project. The Contractor must make adequate provision in their budgets for the implementation of the EMPr.
- The Principal Contractor (including sub-Contractors and suppliers) must comply with the relevant provisions of the EMPr, applicable environmental legislation, by-laws and associated regulations promulgated in terms of these laws.

6.1.3 Preparation of Method Statements

- Method Statements must be submitted by the Contractor to the ECO and must be adhered to by the Contractor and Project Engineer for the duration of the Project. These relate to water and storm water management requirements, traffic requirements, solid waste management requirements, and hydrocarbon spills, contaminated water treatment, the storage of hazardous materials, standard emergency procedures, and biohazard control, and any further activities which the ECO and Project Engineer deem necessary.
- The ECO will monitor the implementation of the Method Statements. All copies of the statements and plans must be submitted to the appointed ECO.

7 ASSESSMENT APPROACH TO ENVIRONMENTAL ISSUES DURING CONSTRUCTION PHASE

The assessment and description of identified environmental issues were conducted according to the structure and approach detailed below. The following is a brief description of how these impacts were identified and rated. The approach may be tailored and altered where required to deal adequately with the description and assessment of a specific impact.

Nature: classification of whether the impact is positive or negative, direct or indirect
Extent: spatial scale of impact and classified as: <ul style="list-style-type: none"> Onsite – Within specific site boundary (weight value – 1) Local – Within municipal boundary (weight value – 2) Regional – Outside municipal boundary (weight value – 3)
Duration: Indicates what the lifetime of the impact will be and is classified as: <ul style="list-style-type: none"> Short term – 1 Year or less (weight value – 1) Medium term – 1-5 Years (weight value –2) Long term – Longer than 5 Years (weight value – 3)
Intensity: Describes whether an impact is destructive or benign; <ul style="list-style-type: none"> Low – Natural and/or cultural processes continue in a modified way and is reversible (weight value – 1) Medium – Natural and/or cultural processes stop and is partially reversible (weight value – 2) High – Natural and/or cultural processes disturbed to an irreversible state (weight value – 3)
Probability: Describes the likelihood of an impact occurring: <ul style="list-style-type: none"> The likelihood of an impact occurring: Unlikely – 0% - 45% chance of the potential impact occurring (weight value – 1) Possible – 46% - 75% chance of the potential impact occurring (weight value – 2) Likely - >75% chance of the potential impact occurring (weight value – 3)
Significance: Based on the above criteria the significance of issues was determined. The total number of points scored for each impact indicates the level of significance of the impact, and is rated as: <ul style="list-style-type: none"> Low: the impacts are less important. Medium: the impacts are important and require attention; mitigation is required to reduce the negative impacts. High: the impacts are of great importance. Mitigation is therefore crucial.
Cumulative: In relation to an activity, means the impact of an activity that in itself may not be significant but may become significant when added to the existing and potential impacts eventuating from similar or diverse activities or undertakings in the area
Mitigation: Mitigation for significant issues is incorporated into the EMP.

Table 2: Impacts assessment

No.	Impact	Description		Assessment					
		Nature	Probability	Status	Extent	Duration	Significance	Intensity/Reversibility	Cumulative / non-cumulative
1	Noise: It is expected that the construction activities will create noise pollution in the area during working hours.	The current site is a disturbed land surrounded by small holding plots. Noise experienced in the area does not exceed the allowable ambient noise limit.	The probability of change is possible regarding the potential sources of noise pollution during desiltation, if the development were to go ahead.	An increase in noise pollution would be a negative impact to the surrounding environment.	Impacts would be site specific and in the local environment.	Increase in noise would be during the construction phase due to construction vehicles and machinery.	Medium	When the rehabilitation is completed the noise level would return to the initial state. Reversible.	Non-Cumulative
2.	Air Quality: When operating, the vehicles (transportation of sand from site) and excavator during desiltation will discharge air pollutants into the environment such as CO _x , NO _x , SO _x , hydrogen carbon, dust.	Dust pollution at site is at moderate level. Increasing of dust level during transportation of sand from the dam could have an impact to the air quality.	During rehabilitation period dust level could rise as a result of heavy vehicles movement.	An increase in dust would be a negative impact to the surrounding environment.	Impact would be site specific and in the local environment.	The impact would only result during rehabilitation phase.	Medium.	When the rehabilitation is completed the dust level will be lower than the initial state. Reversible.	Non-Cumulative.
3.	Soil erosion: The rehabilitation activities have the potential to create soil erosion.	There is no evidence of serious soil at the site.	The probability of change is unlikely during rehabilitation.	The site is not disturbed apart from the siltation that occurred.	The impact would be site specific.	Might occur only during rehabilitation phase. Short term	Medium	When the rehabilitation is completed, surface water flow in the area is improved, in turn soil erosion issue could be addressed. reversible	Non-cumulative.
4.	Waste disposal: Uncontrolled and random disposal of waste has a negative effect on the health status of the local environment.	Site is preserved with no illegal dumping happening on site.	The probability of change is unlikely.	An increase in waste and improper disposal might result in an encouragement of illegal dumping that could later pose serious environmental health hazard to the environment	Impacts would be site specific and in the local environment.	Only during construction phase. Short term	Medium	If well managed can be reversed or even avoided.	Non-cumulative
5.	Storage of equipment and materials: Equipment and materials if not stored in an appropriate manner could be a source of pollution.	Materials and equipment storage should be done properly to eliminate pollution.	The probability of change is unlikely.	Equipment and materials if not stored in an appropriate manner could be sources of pollution.	Impacts would be site specific and in the local environment.	Short term	Low	If well managed can be reversible.	Non-cumulative.
6.	Soil and Water Contamination: If excavated soil is hazardous, it could become sources of pollution if not	The current state of the dam is contaminated with sewer.	The probability of change is possible.	Hazardous substances if not managed or used in an appropriate manner	Impacts would be site specific.	Short term if early managed.	Low	If well managed can be reversible.	Non-Cumulative

No.	Impact	Description		Assessment					
		Nature	Probability	Status	Extent	Duration	Significance	Intensity/Reversibility	Cumulative / non-cumulative
	disposed of in an appropriate manner.			can be sources of pollution.					
7.	Vehicle Maintenance and Refueling: Spillages of hazardous liquids such as fuel, engine oil and other liquids used during vehicle maintenance and equipment handling, on the ground surface could result into contamination of soil, surface water and ground water	Due to the magnitude of the project, one or two excavators are expected.	The probability of change is uncertain.	Oil/Hydrocarbons spillages would be a negative impact to the current environment.	Impacts would be site specific and in the regional environment.	Short term.	Medium.	When the rehabilitation is completed, it could be reversed.	Could be cumulative.
8.	Visual impacts: Excavated material waste will have an unpleasant visual impact.	The site is currently clean and well taken of. The current state of the site does not pose negative visual impact to the surrounding environment.	The probability of change is possible regarding the potential visual impact, if the rehabilitation were to go ahead.	The presence of construction could pose visual impact and the operational phase could also pose visual impact to the current owners of the existing residential.	Impacts would be site specific and in the local environment.	Temporary. Waste generation only during construction	Low	Impact is reversible	Cumulative
9.	Flora and fauna: Endemic flora and fauna in and around the construction site should be protected as much as possible.	The site is not a virgin land, disturbance to the vegetation is expected during desiltation.	The probability of change is possible if the rehabilitation were to go ahead.	The current state of the site pose impact to flora and fauna through exotic vegetation.	Impacts would be site specific and in the local environment.	Permanent	Low	It could be reversible or rehabilitated	Non-Cumulative
10.	Environmental complaint register: It is expected that there could be complaints with regards to environmental non-compliance during the desiltation process. The environmental complaint register should make available to the entire community.	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable
11.	Policy compliance: The proposed development may not be consistent with relevant environmental policy and/or spatial guideline documents.	The servitude of the rehabilitation is already existing.	The probability of change is likely.	Policy compliance is when the rehabilitation proceeds without approvals from relevant authorities.	Impacts would be site specific and in the local environment.	Medium term	Medium	Irreversible	Non-Cumulative

7.1 Proposed Mitigation and Management

The table below is an illustration of the criteria utilised to identify proposed mitigation and the management of the mitigation. The table below fatherly illustrate the period of mitigation and the responsible party.

Mitigation	Impact and proposed mitigation and management actions	Responsibility	Timeframe
Potential to mitigate negative impact	Description of mitigation measures. Extent to which mitigation measures could influence the significance and status of impact.	The responsible person to ensure that the mitigation measures are taken.	Implementation period for the mitigation
Potential to enhance positive impacts	Wherever possible a description of the optimization measures. Extent to which they could influence the significance of impact.		
Significant rating of impact after mitigation	Low, i.e., natural, and social functions and processes are not affected or minimally affected.		
	Medium, i.e., affected environment is notably altered. Natural and social functions and processes continue albeit in a modified way.		
	High, i.e., natural, or social functions or processes could be substantially affected or altered to the extent that they could temporarily or permanently cease.		
Comment on the overall assessment and conclusion.	Overall Assessment and concluding comments as to the predicted impacts after mitigation and their: <ul style="list-style-type: none"> ○ Severity and permanence ○ Size and relative significance ○ Ecological and socio – economic context ○ Balance between positive and negative aspect ○ Cost and benefits ○ Acceptability / Unacceptability 		

Table 3: Mitigation and management measures

No.	Impact	Mitigation	Responsibility	Time Frame	Significant Rating of Impact After Mitigation
1.	Noise:	<ul style="list-style-type: none"> SANS 10103 and the National Noise Control Regulation should be used as the main guidelines for addressing the potential noise impact on this project. During the operational phase all activities must take place in a manner that will allow as little noise as possible. Activities, which are deemed to generate high levels of noise, will be restricted to normal working hours. 	Contractor	During construction	Low
2.	Air Quality:	<ul style="list-style-type: none"> Excavations and other clearing activities must only be done during agreed working times and permitting weather conditions to avoid drifting of sand and dust into adjacent areas. Any complaints or claims emanating from the lack of dust control shall be attended to immediately by the contract and ECO. Vehicles and equipment used on site should have their service records up to date. 	Contractor	During construction	Low
3.	Soil and Surface Water:	<ul style="list-style-type: none"> Desiltation should be done during the dry season to avoid flooding risk which will increase contamination and affect construction activities 	Contractor.	During construction phase.	Low
4.	Disposal of sewage:	The contractor to install adequate portable chemical toilets to meet the sanitation needs on the construction site (14 people per toilet).	Contractor	During construction	Low or completely mitigated
5.	Storage of Equipment and Materials:	<ul style="list-style-type: none"> Choice of location for storage areas must consider prevailing winds, exposure sun, distance to water bodies and general onsite topology. 	Contractor	Through-out the life cycle of a project.	Low
6.	Waste generation and disposal:	<ul style="list-style-type: none"> Tests should be done on the sand to determine if its contaminated. If results come back positive the sand will be disposed of at a hazardous landfill site. 	Contractor	During construction	Low
7.	Visual impacts:	<ul style="list-style-type: none"> Waste (construction and domestic) must be disposed of in a proper manner and not allowed to be strewn around on site and surrounding areas. The sands extracted from the dam should be dumped in a designated area. 	Contractor.	During construction	Low
8.	Flora and fauna:	<ul style="list-style-type: none"> No endemic flora and fauna species will be deliberately destroyed or permanent alienated from their natural habitat during desiltation. Construction staff should be advised not to chase, kill or catch animals found or encountered during the rehabilitation process. 	Contractor and ECO.	During construction	Low

8 MITIGATION MEASURES FROM THE WATER SPECIALIST

Table 4: Water resource risk assessment mitigation measures

PROJECT DEVELOPMENT PHASE	MITIGATION	RESPONSIBILITY
Site Establishment	<ul style="list-style-type: none"> • The footprint area of the working area should be kept a minimum. The footprint area must be clearly demarcated to avoid unnecessary disturbances to adjacent areas; • All contractors and employees should undergo induction which is to include a component of environmental awareness. The induction is to include aspects such as the need to avoid littering, the reporting and cleaning of spills and leaks and general good “housekeeping”; • Adequate sanitary facilities and ablutions on the servitude must be provided for all personnel throughout the project area. Use of these facilities must be enforced (these facilities must be kept clean so that they are a desired alternative to the surrounding vegetation); • Have action plans on site, and training for contractors and employees in the event of spills, leaks and other impacts to the aquatic systems; 	Contractor
Rehabilitation Work	<ul style="list-style-type: none"> • The recommended buffer zones must be strictly adhered to during the construction phase of the project, with exception of the activities and structures required to traverse a watercourse. Any supporting aspects and activities not required to be within the buffer area must adhere to the buffer zone; • All construction activities and access must make use of the existing road and any access to be established must be beyond the wetland area; • A suitable storm water management plan must be compiled for the construction phase. This plan must attempt to displace and divert storm water and discharge the water into adjacent areas without eroding the 	Contractor

PROJECT DEVELOPMENT PHASE	MITIGATION	RESPONSIBILITY
	<p>receiving areas. It is preferable that run-off velocities be reduced with energy dissipaters and flows discharged into the local watercourses;</p> <ul style="list-style-type: none"> • Laydown yards, camps and storage areas must be beyond the aquatic areas. Where possible, the construction of the crossings must take place from the existing road and not from within the watercourse and associated buffer; • The contractors used for the project should have spill kits available to ensure that any fuel or oil spills are clean-up and discarded correctly • It is preferable that construction takes place during the dry season to reduce the erosion potential of the exposed surfaces; • Prevent uncontrolled access of vehicles through the water resources system that can cause a significant adverse impact on the hydrology and alluvial soil structure of these areas; • All machinery and equipment should be inspected regularly for faults and possible leaks, these should be serviced off-site; • Temporary storm water channels should be filled with aggregate and/or logs (branches included) to dissipate flows. • Contamination of aquatic systems with unset cement or cement powder should be negated as it is detrimental to aquatic biota. Pre-cast structures should be made use of (where possible) to avoid the mixing of these materials on site, reducing the likelihood of cement in the river system 	

9 Rehabilitation of the Watercombe Dam

The rehabilitation plan will seek to remediate the identified impacts brought about by the sedimentation of the dam. The aim of the rehabilitation plan is to prescribe measures to prevent the loss ecological integrity and functioning of the watercourses in proximity to the dam and restore the functionality of the dam.

9.1 Rehabilitation Goal

It is recommended that the rehabilitation does not aim to increase the original surface area of the dam but to re-establish the original surface area as presented in Figure 2. The depth of the dam must be confirmed with the farm owner and must be inline with the conditions of the Water Use Licence.

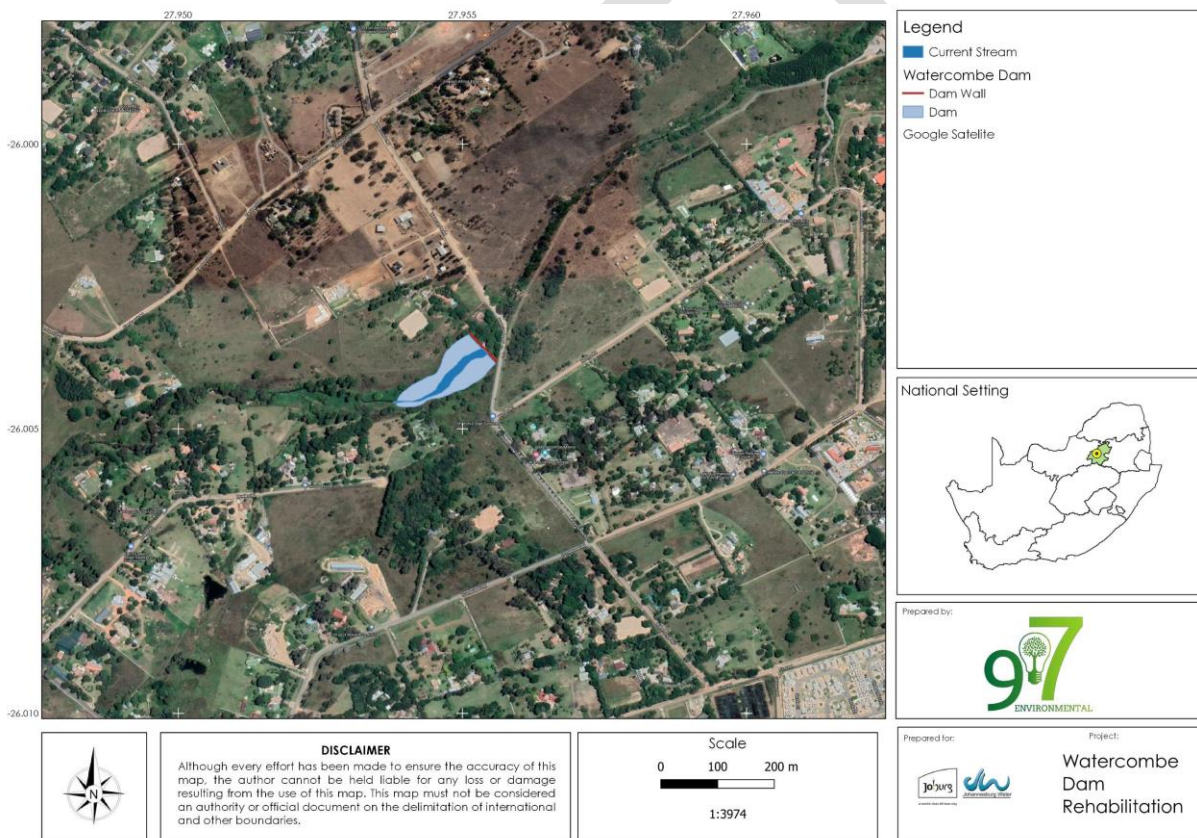


Figure 2: The surface area of the Watercombe Dam in relation to the current stream

9.2 Rehabilitation Strategy

The rehabilitation strategy is developed to guide the rehab process so as to address each aspect of the rehabilitation process.

9.2.1 Site Establishment

The first phase of the rehabilitation process will be the site establishment. In this phase work will be done to prepare the project site for the following steps. The aim in this phase is to get the site as close to possible to the final stage as possible. The main factors will be the earth movement works and the placement of sediment stockpiles to dry out and be transported. Figure 3 presents the placement of the sediment stockpiles and the direction of work. The **YELLOW** arrow presents the general direction of working, earthmoving must commence closest to the dam wall and progress towards the edge of the water. A depth of 4m is approximated at the deepest part of the dam (at the dam wall). The **BLACK** arrows indicate the direction that the sediment must be pulled out of the dam on either side (Figure 3). It is imperative that no heavy machinery crosses the stream at any point and must perform work on either side of the stream.

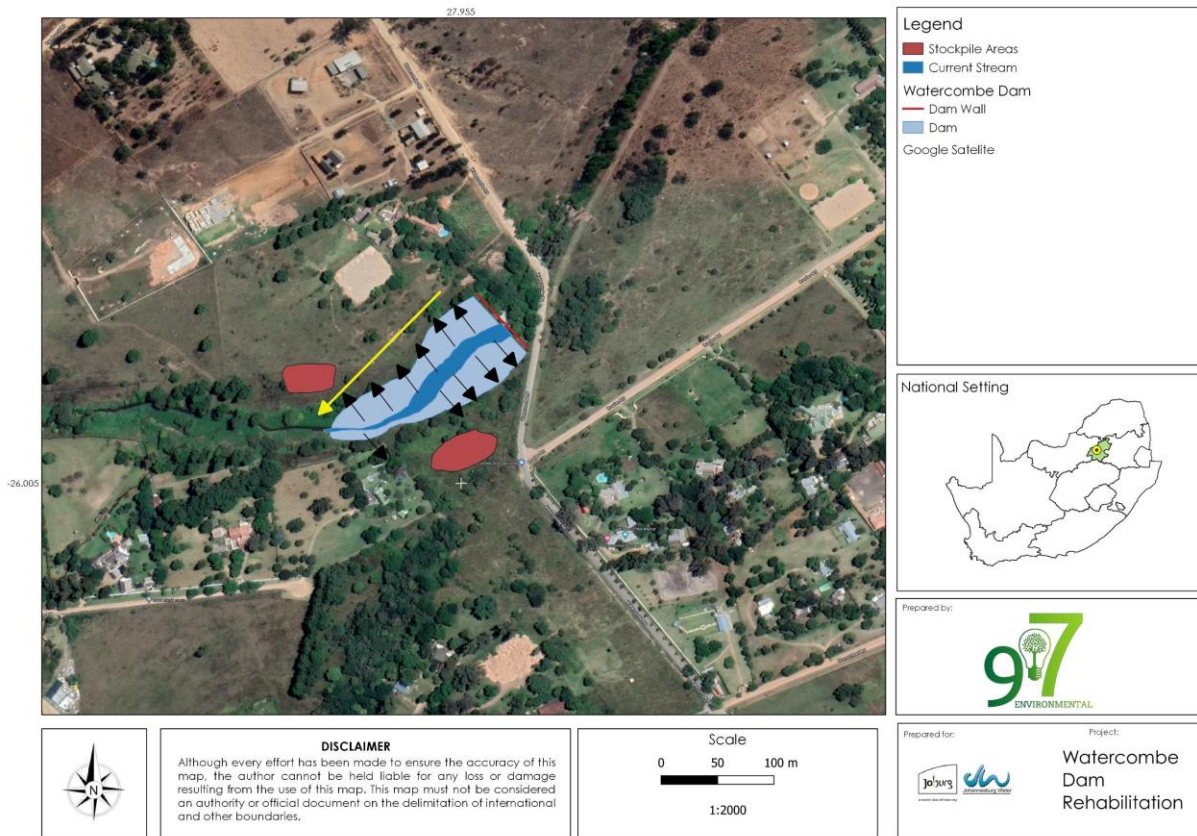



Figure 3: The workflow and direction of earth movement works to rehabilitate the dam

9.2.2 Embankment Stabilisation

The re-establishment of the dam may require the installation of reno mattresses in order to stabilise the adjacent slopes. Table 5 presents the proposed materials for the construction and stabilisation of the dam slopes

Table 5: The proposed rehabilitation interventions

	Image (examples)	Use
Reno Mattress		Protection of the slope
		Stabilisation of the embankments
		Erosion control and water management
		Increased erosion potential downstream of the dam wall

The reno mattress must be lined on the slope at angle not exceeding 1:5 so as to slow the flows of water as much as possible. It is therefore recommended that some of the sediment be spread over the reno mattresses so as to allow for vegetation establishment and to make the wetland as natural as possible.

9.2.3 Revegetation

The vegetation within a wetland ecosystem plays various important roles, one of which is to slow water velocities, disperse flows and increase the retention time of water within a wetland. Furthermore, the ground cover protects the wetland from erosion resulting from intense and concentrated flows. It is important to ensure that slopes are well vegetated to increase the chances of a successful rehabilitation plan. For the purpose of the rehabilitation, the plant species most suitable for each identified the embankments are presented in Table 6.

Table 6: The proposed revegetation plant species

Risks	Objectives	Plant species
<ul style="list-style-type: none"> Erosion Bank collapse Steep embankments, 	<ul style="list-style-type: none"> To slow water flows Provide soil stability Improve habitat structure 	<ul style="list-style-type: none"> <i>Cynodon dactylon,</i> <i>Eragrostis gummiflua,</i> <i>Aristida congesta subsp. congesta,</i> <i>Aristida junciformis,</i> <i>Eragrostis tef</i>

The target for the vegetation is for plant establishment and slowing of water flows down the slopes. It is imperative that seed be sowed in a mix to avoid oversaturation or monospecificity of species within an area. Seed should be sowed towards the end of the dry season so as to begin vegetation establishment before the heavy rains during the wet season. Only a few species have

been recommended to avoid saturation and competition of species; it is expected that natural seed bank will re- establish itself over time.

10 MONITORING PLAN

The monitoring plan (Table 7) has been designed to be achievable and realistic for the nature of the project. The plan will provide details as to the frequency of the monitoring efforts, the location of these efforts and what should be monitored. The primary focus for the monitoring plan is to evaluate the success of the rehabilitation efforts. Numerous monitoring frequencies have been proposed for this aspect of the projects. Further descriptions (clarity) of the referred to frequencies is discussed below.

Rehabilitation: Rehabilitation will commence at the onset of the project, for the restoration of the Watercombe Dam. Monitoring will be required during the rehabilitation period in order to determine if the measures are being applied correctly, and if any unforeseen issues need to be addressed. This monitoring must be undertaken by the (Environmental Control Officer) ECO appointed to oversee the rehabilitation process.

Post-rehabilitation: After completion of the rehabilitation phase wetland areas should be monitored to evaluate the success of the rehabilitation efforts. In the unlikely event of potential “risks” to the systems being identified, this inspection may allow for corrective measures to be applied. This monitoring must be undertaken by the appointed ECO.

Seasonal monitoring: The applicant must appoint an independent contractor to conduct seasonal (wet season) monitoring for a period of two years after the completion of the rehabilitation measures. The monitoring should be conducted during October or shortly after the first summer rains, and then towards the end of the growing season. The monitoring should inspect the following:

- Recovery of the vegetation layer;
- Extent of alien vegetation establishment;
- Hydrology and sediment deposition; and
- The formation of erosion gullies on embankments and canalisation of the dam.

Annual monitoring: After completion of the season monitoring, it is recommended that the areas be monitored on an annual basis, preferably in the middle of the rainy season. This inspection

should include aspects from all the above-mentioned monitoring efforts; however, should also include a general inspection of the dam and the downstream watercourse area.

Some best practice recommendations that should be incorporated into all monitoring efforts include the following:

- In the event of issues being noted, these may include erosion gullies, poor vegetation recovery, sedimentation etc., these must be reported, and corrective measures applied immediately.
- Corrective measures may include the full suite of rehabilitation efforts or part thereof, this will be dependent on the issues being recorded. It is recommended to consult the relevant specialist (wetland / engineer) for the best possible solution.
- In the event that issues not pre-empted in this report are identified, similarly, it is recommended to consult the relevant specialist (wetland / engineer) for the best possible solution.
- The discretion of deciding when to consult a specialist should lie with the ECO during the construction phase and the appointed independent environmental auditor during the monitoring phase.
- Monitoring should include fixed-point photography so that trends can be monitored, and progress recorded. Photography may also help to identify potential issues or risks that would need to be addressed. The use of aerial imagery is recommended to compare trends.

Table 7: Proposed monitoring plan for the project

Variables	Methods	Monitoring Frequency	Indicator	Corrective Action
Integrity of rehabilitation structures (reno mattresses / gabions)	On-site inspection Fixed point photography.	After rehabilitation Seasonal for the first two years and rapidly after heavy rainfall Thereafter annually	Extent and duration of attenuation. Establishment of vegetation	Structures should be fixed where possible or new structures should be implemented or constructed where required
Vegetation cover	Monitor species and cover abundance Monitor indigenous vs alien plant encroachment Fixed point photography	After rehabilitation Seasonal for the first two years Thereafter annually	Establishment of primarily indigenous plants Ground cover abundance is approximately 60% after the first year, and 80% after year two and 100% thereafter.	Replanting of indigenous plants should be done at sites of concern
Erosion	On-site inspection Fixed point photography Compare to adjacent areas	After rehabilitation Seasonal for the first two years and soon after heavy rainfall events	Areas with no cover Erosion gullies Wetland outlet	Short term: Rocks / boulders, and on-site debris Medium term: Replanting of indigenous vegetation Long term: Rehab methods that may include gabion baskets, mattresses and should be discussed with specialists
Sedimentation	On-site inspection Fixed point photography	During & after rehabilitation Seasonal for the first two years and soon after heavy rainfall events Thereafter annually	Excess sediment in wetlands	Sources of sedimentation should be noted and addressed If possible, excess sediment can be removed manually.

<p>Exotic Invasive Plant Species</p>	<p>Monitor exotic invasive plant encroachment On-site inspection Fixed point photography</p>	<p>After rehabilitation and follow- up clearing Seasonal for the first two years Thereafter annually</p>	<p>Establishment of exotic invasive plant species</p>	<p>Removal of exotic plants. Consult a botanist on what removal measures are best suited per species Do not use chemicals for the removal process</p>
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11 GENERAL

This EMPr will be accepted by the applicant and its appointed representatives such as engineers, contractors and project managers will be represented by their signatures herein under. All conditions and recommendations will be implemented, and the necessary records kept for referral

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