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DRAFT ENVIRONMENTAL MANAGEMENT PROGRAMME

BASIC ASSESSMENT FOR THE EXISTING PERSBERG DAM WALL ON PERSBERG FARM (PORTION LINDE NO 4733) SITUATED IN THE HELPMEKAAR AREA, LOCATED WITHIN THE MSINGA LOCAL MUNICIPALITY AND THE UMZIMYATHI DISTRICT MUNICIPALITY, KWAZULU-NATAL

EA Reference Number: DC24/0002/2019: KZN/EIA/0001069/2019

Submitted for commenting by stakeholders in terms of the 2017 Environmental Impact Assessment Regulations promulgated in accordance with the National Environmental Management Act 107 of 1998 (Act No. 107 of 1998), as amended

DOCUMENT INFORMATION

Title	Basic Assessment for the Existing Persberg Dam Wall located on Persberg Farm (Portion LINDE No 4733) within the Helpmekaar Area, located within the Msinga Local Municipality and the Umzinyathi District Municipality, KwaZulu-Natal.
Author	Miss Deshni Naicker
Reviewer	Ms Lisa Guastella
Client	Mr Eric Muller (on behalf of the Montrose Farming Trust)
EA Reference Number	DC24/0002/2019: KZN/EIA/0001069/2019
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DETAILS OF ENVIRONMENTAL ASSESSMENT PRACTITIONER, SPECIALIST AND PROPONENT

NAME AND CONTACT DETAILS OF ENVIRONMENTAL ASSESSMENT PRACTITIONERS (EAPS) ORGANISATION

Table 1: Contact details of the EAP's organisation

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Table 2: Names and details of expertise of the EAP involved in the preparation of the report

Names of the EAP	Education qualifications	Roles / Responsibility on the Project	Professional affiliations	Experience at environmental assessments (years)
Miss Deshni Naicker	MA (Geography) Environmental and Development Management	Lead EAP	IAIAsa	9.5
Mrs Lisa Guastella	MSc Oceanography	External Reviewer	Pr.Sci.Nat. 400676/15 IAIAsa	21

NAMES AND EXPERTISE OF SEPCIALISTS

Table 3: Names and details of expertise of each specialist that has contributed to this report

Name of Specialist	Qualifications	Field of Expertise	Title of specialist report/s
Mr Wayne Jackson	BSc Soil Science and Hydrology. WRYM-IMS (Water Resources Yield Model) DWAF. BASOS (Fertilizer Advisory Course)	Soils, Wetlands and Surface Water Specialist	Wetland Functionality Assessment and Rehabilitation Plan for the Constructed Montrose Farming Trust Dam on Persberg Farm Near Helpmekaar in KwaZulu-Natal.
Mr Flip Kruger	Bachelor of Engineering	Integrated Plant Management, Bulk Water Supply, Repairs and Upgrading of Dams and Weirs, Design and Construction of Roads, Bridges and Air Strips, Project Management, Mechanical Engineering, Stormwater Management, Hydrology and Water Use Licencing, Open Channel Hydraulics and Soil Conservation Structures	Persberg Farm Dam – Application for Licence to Store Water and Application for Classification of Proposed Dam.
Mr Flip Kruger	Bachelor of Engineering	Integrated Plant Management, Bulk Water Supply, Repairs and Upgrading of Dams and Weirs, Design and Construction of Roads, Bridges and Air Strips, Project Management, Mechanical Engineering, Stormwater Management, Hydrology and Water Use Licencing, Open Channel Hydraulics and Soil Conservation Structures	Reserve Determination for Water Use License Application.

Table 4: Contact Details of Proponent

Proponent	**Montrose Farming Trust**
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ABBREVIATIONS

BA	Basic Assessment
BAR	Basic Assessment Report
CA	Competent Authority
DWS	Department of Water and Sanitation
ECO	Environmental Control Officer
EDTEA	Economic Development, Tourism and Environmental Affairs
EIA	Environmental Impact Assessment
EIS	Ècological Importance and Sensitivity
ELA	Environmental Law Association
EKZNW	Ezemvelo KwaZulu-Natal Wildlife
EMPr	Environmental Management Programme
ENG	Engineer
IAIAsa	International Association for Impact Assessment
IAP2	International Association for Public Participation Southern Africa
IAP(s)	Invasive alien plant(s)
NEMA	National Environmental Management Act
NFEPA	National Freshwater Ecosystem Priority Areas
NWA	National Water Act
OEMPr	Operational Phase Environmental Management Programme
PRO	Proponent
PPP	Public Participation Process
SAQA	South African Qualifications Authority
WULA	Water Use License Application
WUA	Water Use Application

Details of person(s) that compiled the EMPr and their Expertise

Sections 33 of National Environmental Management Act (NEMA), Act No. 107 of 1998 and Environmental Impact Assessment (EIA) Regulations (2014) include a number of provisions regarding the content of the EMPr.

"A draft environmental management programme must include details of –
(i) The person who prepared the environmental management programme; and
(ii)The expertise of that person to prepare an environmental management programme; "

Environmental Assessment Practitioner:

Name:	Ms D Naicker
Qualifications:	MA Geography and Environmental Management, School of Life and Environmental Sciences
Professional affiliations and registrations:	IAIA – Kwazulu - Natal
Expertise:	Environmental Impact Assessments, Due Diligence Assessments, Public Participation Facilitator, Environmental Control Officer, Environmental Awareness, Stakeholder Engagement Training for Site Staff
Years of Experience:	9.5 years
Role on Project Team:	Environmental Assessment Practitioner

This EMPr has been reviewed by:

Name:	Ms L A Guastella
Qualifications:	BSc Geography, BSc (Hons) Atmospheric Science, MSc Oceanography
Professional affiliations and registrations:	Pr.Sci.Nat. (Reg. No 400676/15), NACA
Expertise:	Environmental Impact Assessments, Public Participation Facilitator, Environmental Control Officer, Air Quality & Oceanography Specialist
Years of Experience:	21 years
Role on Project Team:	External Reviewer

1. INTRODUCTION AND PROJECT DESCRIPTION

The Applicant Mr Erich Muller, commenced with listed activities within a watercourse on Persberg Farm (Portions Linde No 4733) in August 2015. The extent of the property is 129.5 hectares and falls within the Msinga Local Municipality, located within the Umzinyathi District Municipality of the KwaZulu-Natal Province.

As a result of non-compliance with Section 25 of NEMA, a rectification process is required for activities which have already taken place. A Section 24G Application was therefore submitted to the KwaZulu-Natal Department of Economic Development, Tourism and Environmental Affairs – Northern Region by the Applicant in February 2016 to commence this rectification process.

The KwaZulu- Natal Department of Economic Development, Tourism and Environmental Affairs issued an administration fine which was paid by the Applicant.

In terms of the directive, a rectification process i.e. A Basic Assessment Process is required to be undertaken.

Afzelia Environmental Consultants has been appointed by the Applicant to undertake the rectification process in terms of the EIA Regulations, 2014 (as amended on 7 April 2017).

The original dam was built by the Road Department (NPA) in 1960. The NPA had excavated a quarry to build the tar road and in exchange, the NPA built a dam for the farmer. The original dam covered an area of 1.2 hectares with a dam wall height of 3.5 m. The capacity of the original dam was measured to be between 25 000 to 32 500 cubic metres of water.

The water from the original dam was emptied by the Applicant and a core trench was dug to a depth of 5 meters by machinery, the core was dug down to the bottom soil which formed the natural soil structure in the centre area of the old existing dam. This reconstruction of filling the 'core' of the dam was done by moving suitable clay type soil in the vicinity of the dam wall, and as every layer of clay soil was moved by dam scoops and soil was compacted for constructing the base core of the dam. The top soil that was saved was later moved over the top of the dam wall and compacted and kikuyu and grass was planted as an erosion control measure.

The dam has been raised to a height of 8.5m with a maximum depth of 4m.and will cover an area of 8.4 hectares and is estimated to hold a capacity 152 000 m^3 (cubic meters) of water when full. The dam was designed by an Engineering Technician from the Department of Agriculture Mr Terrance Collyer.

1.2. LOCATION AND PROPOSED ACTIVITY

The dam is located on Persberg Farm (Portion Linde No 4733) and falls within the Msinga Local Municipality, located within the Umzinyathi District Municipality of the KwaZulu-Natal Province.

The GPS co-ordinates of the proposed project are:

South	**28^0**	**26'**	**01.81"**
East	**30^0**	**24'**	**36.00"**

The proposed project is located within the Quarter Degree Grid Square (QDGS) 2830AD and falls within quaternary catchment V33B which is part of the Pongola - Ntamvuna Water Management Area. The Buffels river system is the main river system within this sub-quaternary catchment.

Access to the site is via the R33. The Persberg Dam is situated within the Helpmekaar area and the nearest town, Pomeroy, is approximately 16 km south of the project site. **Refer to Figure 1 for the Locality Map**.

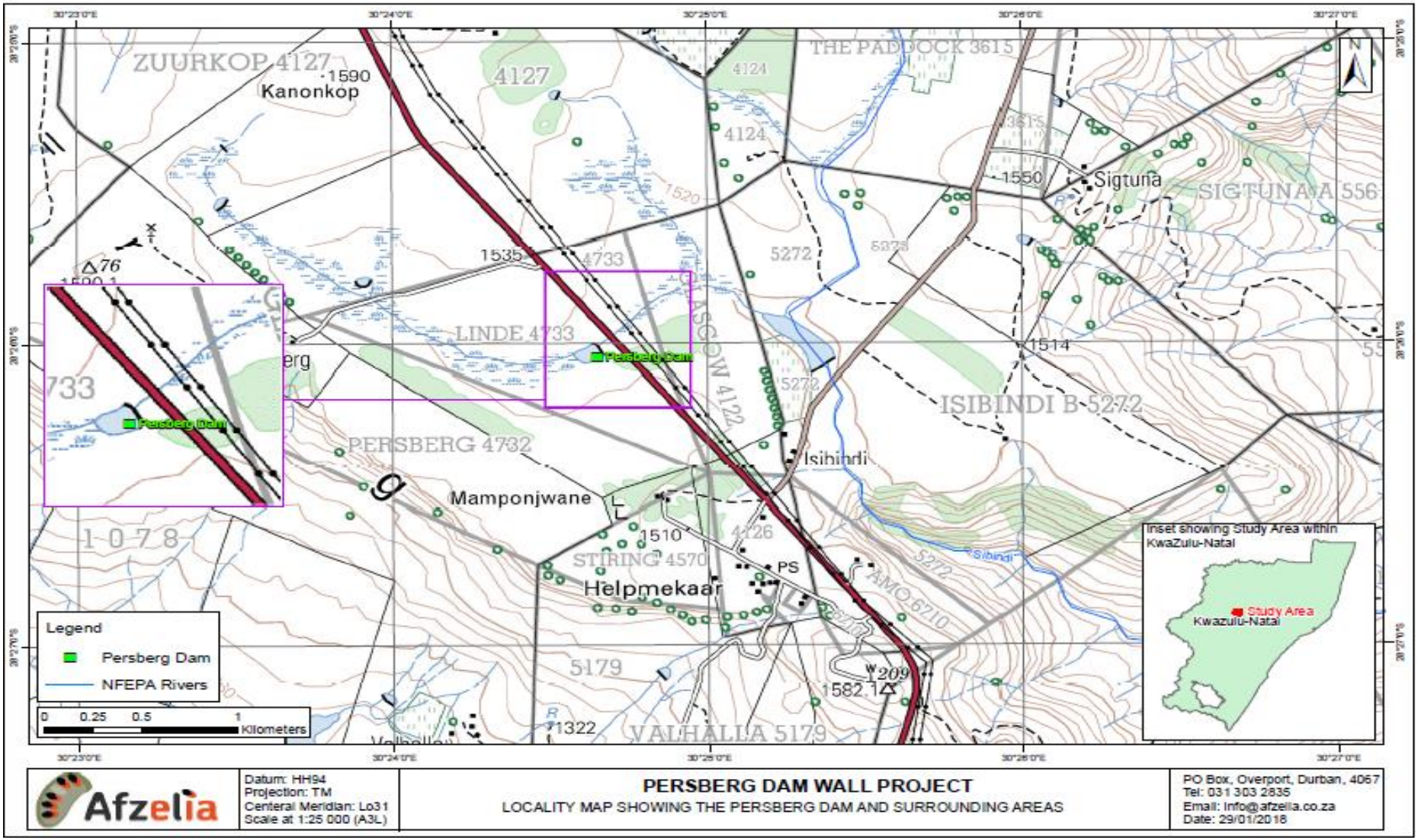

Figure 1: Locality Map showing the Persberg Dam and Surrounding Areas

1.2. NEED AND DESIRABILITY

The dam was raised to increase the water holding capacity of the existing dam for planned irrigation purposes. The raised dam will allow the adjacent farmers to access water from the dam for irrigation purposes. It is therefore imperative that the raised dam will increase surety of irrigation water supply and increase the existing irrigation of the area.

The construction activities undertaken by the applicant triggered listed activities within the 2014 EIA Regulations (as amended on 7 April 2017) and therefore required an environmental authorisation to be obtained. The applicant was not aware that an environmental authorisation was required before the commencement of such construction activities within a water course. As a result of non-compliance, the rectification process is required to be undertaken.

1.3. LEGISLATIVE AND REGULATORY REQUIREMENTS

As a result of non-compliance with Section 24 of NEMA, a rectification process is required for the activities which have already taken place. A Section 24G application was therefore submitted to KwaZulu-Natal Department of Economic Development, Tourism and Environmental Affairs by the Applicant on 2 February 2016 to commence this rectification process. The Application was submitted in terms of the EIA Regulations of 2014.

The Directive issued on 26 April 2016, requested that a Basic Assessment (BA) process should be undertaken in terms of General Notice R 327 of the EIA Regulations of April 2017

The following activities, under Listing Notice 1 of GN R 327 of April 2017, have been identified and are listed in the **Table 5** below:

Table 6: Listing Notice 1 of GN R 327 of April 2017

Number and Date of relevant notice	Activity Number	Description each listed activity as per the project description
No. R 983 of December 2014 as amended by No. R 327 of April 2017 (Listing Notice 1)	19	+-25 cubic metres of material were removed from the dam and was used for the raising of the dam wall.
	48	The original dam covered an area of 1.2 hectares with a dam wall height of 3.5m. The dam has now been raised to a height of 8.5m, the maximum depth is 4m which will cover and area of 8.4 hectares and it will hold approximately 152 000 cubic metres of water.

In terms of Section 24(1) of NEMA, the impact on the environment associated with the activity must be considered, investigated, assessed and reported on to the competent authority that has been charged by NEMA with the responsibility of granting environmental authorisation. As the application is located within the KwaZulu-Natal Province, the KwaZulu-Natal Department of Economic Development, Tourism and Environmental Affairs is identified as the competent authority for the application for authorisation. This project has been registered with the KZN DEDTEA through the submission of an S24G Application for Rectification.

The nature and extent of the affected area, and the environmental impacts associated with the construction activities within the watercourse, are explored in more detail in the Basic Assessment Report. This report has been compiled in accordance with the requirements of the 2014 EIA Regulations, as amended and includes details of the activity description; the site area and property description; the public participation process; the impact assessment; as well as the recommendations that are proposed by the Environmental Assessment Practitioner (EAP)

Further to the Basic Assessment process, a Water Use License Application (WULA) has been submitted to the Department of Water and Sanitation (DWS0 according to the requirements of Section 21 of the National Water Act, 1998 (Act No. 36 of 1998).

1.4. ALTERNATIVES

SITE ALTERNATIVES

No site alternatives have been considered other than the current site Persberg Farm (Portion Linde No 4733), as the applicant has already undertaken construction activities within a watercourse which is located on his property.

DESIGN, LAYOUT OR TECHNOLOGY ALTERNTIVES

There are no design, layout or technology alternatives for the project as the applicant has already undertaken the construction activities within a watercourse which is located on his property.

NO-GO ALTERNATIVES (STATUS QUO)

The “no-go” alternative means that the status quo is maintained as the dam wall has already been constructed and raised.

2. SPECIALIST STUDIES

The following specialist studies were conducted for the Constructed Montrose Farming Trust Dam on Persberg Farm near Helpmekaar in KwaZulu-Natal and are included in **Appendix C** of the Final Basic Assessment Report:

- Wetland Functionality Assessment and Rehabilitation Plans;
- Hydrology and Dam Safety Report; and
- Reserve Determination for Water Use License Application.

SUMMARY OF SPECIALIST REPORTS

Wetland Functionality Assessment and Rehabilitation Plan

The wetland survey was conducted on the 19th of July 2016 by Mr Wayne Jackson (Earth, Water and Environmental Science Company).

Two (2) FEPA wetlands (not WetFEPA) were identified within the 500m buffer of the Persberg Dam

FEPA wetlands were classified by the Wetland Specialist (Mr Wayne Jackson) as bench (flat) wetland and a Hillslope Seep wetland. The Wetland condition and rankings for both these FEPA wetlands were A/B (>75% Natural vegetation) and rank four (4) (wetlands with an A/B condition and associated with at least three other wetlands). These sites were classified as predominantly natural. The NFEPA wetland information is a coarse data set and must be ground-thruthed.

From the field assessment that was undertaken and the Google Earth historical imagery it is concluded that the wetlands were not Bench Flats and Hillslope Seeps, but rather Unchannelled Valley Bottom wetland system (HGM1). There was an existing dam in 2012 as well as evidence of cattle paths which is indicative of grazing activities within the wetland. These activities will alter the PES or wetland condition to a lower level to what can only be assumed as a Category C (Moderately Modified) state. This can only be assumed, as the wetland assessment was only conducted post-construction of the dam wall.

The PES rating after construction was classified as a Category E (Seriously Modified).

The HGM1 was assessed to have a high benefit for flood attenuation. The wetland also has a moderately high ability to improve water quality by assimilating phosphates, nitrates and toxicants as well as to control erosion.

The ecological importance and sensitivity of the HGM1 was assessed to be High (B) with regards to the Ecological Importance and Sensitivity as well as the Hydrological Functional Importance. These rates were high due to the location of the wetland within FEPA wetland layers, as well as the sensitivity of Unchannelled Valley Bottom wetlands to alteration of low flows (which will occur if the Environmental Water Requirements (EWR) is not implemented). The direct human benefit was rated to be moderately important (C).

The dam has already been constructed and the risks/impacts could not be assessed accurately, as the dam has not undergone its first filling. The operation phase was assessed, and mitigation measures have been recommended to monitor and improve wetland functionality where possible.

Three aspects were addressed in the risk assessment:

- The initial filling of the dam and its impacts on the alteration of flow volumes and patterns, as well as the loss of wetland from the extended inundation area;
- The infestation of alien vegetation post construction and how that would impact on the flow patterns and volumes of the wetlands; and
- The downstream releases and its impacts on the downstream wetland function and ecology.

The risk matrix shows that the initial flooding will have a high impact on the wetlands at the point of inundation, with the remaining aspects having a moderate impact.

The Water Use License Application (WULA) was submitted to the Department of Water and Sanitation on 13th September 2018 and a copy of the Acknowledgement of Receipt Form is attached in **Appendix K** of this Report.

Persberg Farm Dam – Hydrology and Dam Safety Report

The Hydrology Assessment and Safety Analysis for the dam was conducted by Mr Flip Krugel from GFK Consulting Engineers. The engineers had only become involved when the dam was already completed, with the tyres as 'rip-rap' already in place, etc.

The existing dam wall is 8.5 m high, the maximum depth is 4 m and it holds approximately 152 000 m³ of water.

The wall of the present dam is constructed on top of a dam wall that was constructed in the 1960's to provide water that was needed for road construction. A new cut-off trench was constructed and apparently all unsuitable material was removed from the existing wall and from the new footprint of the present dam wall. According to the client, the dam was approximately 4 m high prior to the extension and apparently held water until just before construction, when water was released from the dam for construction purposes. The previous spillway was only a fraction of the present one and very little erosion took place downstream of the old spillway. This was still evident just after partial completion of the dam.

The present spillway capacity is just short of adequate for a Category I dam. The eventual dam size will depend on the safety categorization that will be done by Department of Water and Sanitation (DWS). As an interim measure, it is proposed that the spillway be cut wider, each one at least 15 m wide (or combined 30 m, as it is 27.4 m presently).

Soil compact tests that were conducted by GFK Consulting Engineers indicates that the compact on top is less than what is generally prescribed for earth dams. However, Dynamic Core Penetrometer (DCP) tests have indicated an increase of compaction with depth and it is estimated that the general required compaction has been achieved from approximately 2 m deep from the crest and deeper, where it is most important.

A slope stability analysis indicates that both the upstream and downstream slopes are safe, as the safety factors are above the required minimum safety requirements.

Analysis indicates that the irrigation water yield of the dam for the proposed 90 ha maize and 40 ha oats will not be sufficient to meet the full irrigation demand. Therefore, it is proposed that the client plants a smaller area of both maize and oats in order to reduce the risk of the dam running dry.

A dam break analysis was conducted and indicates that “sunny day’’ dam break with a full breach developing in 12 minutes will result in flood water overtopping the downstream road by approximately 630 mm. Should the full supply level be dropped to just less than 50 000 m³ a “sunny day” dam break will cause the resultant flood to flow over the road with a depth of approximately 340 mm. The engineers are of the opinion that reducing the capacity of the dam will not result in a significantly decreased safety risk. Lowering the full supply level is therefore not recommended as it will also result in a significant loss for the client.

A 300 mm PVC pipe was installed at the bottom of the dam wall to allow for any possible environmental release, or constant surplus water to be released instead of flowing over the spillway constantly.

However, it must be noted that the dam level after two years rainfall is about 30% full due to the small catchment area of 340 hectares. The resultant dam break flood for the Persberg Dam is unlikely, as water will be released through the pipe laid in the dam wall to release water and used for the planned irrigation of the lands in area of the dam.

Persberg Farm Dam near Helpmekaar - Reserve Determination for Water Use License Application

GFK Consulting Engineers were appointed by Mr Erich Müller to undertake a Desktop Reserve Determination for the recently raised dam on the farm Persberg, for water use licencing purposes. GFK only become involved when the dam was already completed/raised.

The dam will have a positive impact on at least the drought low flow environmental water requirement as water is only flowing into the dam at irregular intervals. With the dam in place, there will be a constant stream from normal leak water intercepted by a toe drain for embankment safety, regardless of inflow into the dam, unless the dam is obviously pumped dry frequently, which is unlikely as the outlet pipe is not installed at the lowest point of the dam. In other words, there will be unusable storage capacity in the dam, which will at least provide leak water, basically at all times. Additional to the normal leak water, controlled environmental releases through the outlet valve, will improve the situation even more during dry periods. At the worst, the dam will not negatively impact on the downstream water requirement, providing the required water is released, either through leak water or a combination of leak water and releases through the outlet valve. As the required amount to be released is insignificant related to what will be required for planned future irrigation, depending on receipt of a Water Use Licence, it will be more than viable to release the required downstream demand.

A 300 mm PVC pipe is installed at the bottom of the embankment. This existing outlet pipe and valve is more than adequately sized to release the required volume for downstream maintenance as per the Environmental Water Requirement, as well as for downstream domestic and livestock requirements for the affected area.

The mean monthly spills from the dam through the spillway will automatically release more than the required high flow Environmental Water Requirements, with no additional releases required by opening the outlet valve, else than for maintenance flow as required.

It is recommended that a measuring weir is constructed downstream of the dam to measure the required maintenance flow to be released. This weir will also measure the leak water. The total maintenance flow required is the total flow from leak water and water released by opening of the outlet valve, combined. Thus, the release amount required from the dam is the additional amount required, if any, over and above the leak water, to satisfy the total maintenance release required. The high flow requirement will automatically be met by spills over the spillways, as the dam volume only comprise a small fraction of the total catchment run-off.

Regardless whether there is very seldom visible normal flow in the natural drain into the dam, it is still recommended to construct an upstream measuring weir to measure the flow during such seldom normal flow conditions. Only a maximum of the incoming flow needs to be released to satisfy the downstream requirement.
The owner of this Persberg farm dam is solely responsible for the release from this dam. It was not determined how much water is actually being released from the downstream dam by its owner, but it can be argued that the same requirements will be applicable for the Persberg Dam.

3. ENVIRONMENTAL MANAGEMENT PROGRAMME

Environmental Management Programmes (EMPr), or Environmental Management Frameworks (EMF),
Serve to ensure that environmental impacts associated with particular activities are monitored, minimised and mitigated for the duration of the project. The practical management measures that should be employed to achieve monitoring and mitigation targets are detailed in Appendix 4 of the Environmental Impact Assessment (EIA) Regulations (2014, as amended). The EMPr is a dynamic document which needs to be updated and reviewed on a regular basis so that it may be adapted to changing management styles, and to include improved impact mitigation technology as well as unforeseen environmental impacts.

This EMPr includes but is not limited to the assessment of the impacts that are likely to have occurred as a result of the expansion of the dam on Persberg Farm (Portion Linde No 4733). No future construction activities associated with the dam are proposed to occur on site and therefore no potential future construction impacts have been identified. As such, the life of the dam is only subject to operational phase impacts. Therefore, and Environmental Management Programme (EMPr) has only been prepared for the Operational Phase of this development.

The operational phase constitutes the day to day operation of the dam for the duration of its lifetime until it is discontinued / decommissioned. It is not foreseen that the dam will be decommissioned.

3.1. Roles and Responsibilities

The ultimate responsibility for the effective implementation of the EMPr lies with the proponent (applicant) if the property at the time of the initiation of the development, who in this case would be Mr Eric Muller. Responsibility may be delegated to an environmental officer, engineer or the proponent on the site during any stage.

During the operational phase of the development the implementation of the OEMPr and the conditions of the EA, as well as environmental compliance monitoring will be the responsibility of an environmental officer or a site/farm manager.

Should ownership of the project change, any EA granted in respect the development must be transferred to the new owner, upon notification of the Department (KZN DEDTEA). The EMPr, EA and conditions of Approval remain binding on the new owner / operator of the development.

3.2. AUDIT PROCEDURE AND EMPR REVIEW SCHEDULE

Once the EA is granted, the landowner must comply with all statutory legislation as well as all of the recommendations as set out in the Basic Assessment Report. An annual audit must be conducted by a suitably qualified environmental compliance auditor appointed by the landowner during the operational phase. These audits must assess the effectiveness of existing management and mitigation measures, and compliance with the OEMPr and conditions of the EA. The findings of the audit reports must feed into the EMPr, ensuring that management and mitigation measures are adjusted and updated to guarantee that impacts are managed effectively and efficiently going forward. Audit reports must be made available to KZNDEDTEA at the request of the Department.

4. LEGAL REQUIREMENTS

The representative appointed by the Applicant to manage the operational phase, and the person responsible for the implementation of the EMPr, must also familiarise themselves with the specific legal requirements that are applicable to the described activities on site. These may include but are not limited to:

- Applicable Environmental Law
- Constitution of South Africa No 1058 of 1996
- Hazardous Substances Act 15 of 1973
- National Environmental Management: Biodiversity Act 10 of 2004
- National Environmental Management Act of 1998 (as amended in 2017)
- National Water Act 36 of 1998
- Occupational Health and safety Act (Act 85 of 1993);
- Local bylaws.

5. OPERATIONAL PHASE ENVIRONMENTAL MANAGEMENT PROGRAMME (OEMPr)

This section of the EMPr outlines site specific environmental practices and mitigation measures to be adhered to during construction and rehabilitation, in order to limit and/or minimise potential negative impacts and promote sound environmental practices.

5.1 Requirements Stipulated by Specialists

The following specialist recommendations were made by Mr Wayne Jackson (Earth Water and Environmental Science) during the Wetland Assessment.

Activity **A1: – Specialist recommendations**	**Responsibility**	**Frequency / Timing**
a) It is critical that an alien vegetation control programme is implemented, as encroachment of alien vegetation will increase as a result of the construction process disturbances	Pro	Ongoing
b) Rehabilitation of disturbed areas, utilising indigenous wetland vegetation species, will assist in reducing the impact of construction	Pro	On-going
c) The Environmental Water Requirements (must be completed) for releases from the dam and must be adhered to and records must be kept verifying these releases.	Pro	On-going
d) During the Operational Phase, vehicles must remain on designated roads and must not drive in the wetland areas or the edge of the dam, as new wetland systems would have established here.	Pro	On-going
e) Reducing the proposed irrigation usage to allow the wetland to sustain some function upstream and downstream.	Pro, ECO	On-going
f) Fencing off the wetland to prevent cattle from grazing within the wetland	Pro	
g) Ensure that no erosion occurs at the dam inlet and outlet points.	Pro, ECO	On-going

5.2. Operational Related Impacts

A number of operational impacts on the dam and wetland system downstream of the dam are associated with an increase in the flooded area of the dam. This includes changes in the hydrological flow through wetlands, sedimentation and therefore erosion of the downstream channel and into wetland systems downstream of the dam

Activity	Responsibility	Frequency / Timing
B1: Sedimentation, erosion and disturbance		
a) Frequent monitoring of the dam wall must be carried out to prevent its collapse and the subsequent washing out of dam material.	Pro, Eng, ECO	Ongoing
a) Frequent monitoring of the raised dam must be carried out to ensure that any minor problems with erosion can be timeously fixed.	Pro, Eng, ECO	On-going
b) No stockpiling of any materials must take place adjacent to the wetland.	Pro, ECO	On-going
c) Minimise soil erosion and deposition of sediments into wetland and watercourse.	Pro	On-going
d) Erosion control measures must be implemented in areas sensitive to erosion, such as edges of slopes and exposed soil etc. These measures include, but are not limited to, the use of sand bags, hessian sheets, silt fences, retention or replacement of indigenous vegetation and geotextiles, such as soil savers, which should be used in the protection of slopes.	Pro	On-going
e) Erosion features that have been stabilised must be monitored at regular intervals in order to assess where and whether further protection works may be required	Pro	On-going
B2: Pollution of water resources and soil		
a) Restricted agricultural activities around the dam structure to ensure that the deposition of fertiliser into the dam does not take place.	Pro	On-going

Activity	Responsibility	Frequency / Timing
B3: Bank Destabilisation		
a) Frequent monitoring of the integrity of the dam wall must be ensured to prevent its collapse.	Pro, Eng, ECO	Ongoing
b) Any unstable banks must be identified and stabilised /protected using appropriate measures (such as gabions).	Pro, Eng, ECO	On-going
B4: Change in Hydrological Flow		
a) Regulatory compensatory flows should be provided downstream so as to meet the minimum demand required by aquatic biota downstream.	Pro	On-going
b) A flow meter should be installed within the flow release mechanism to monitor the flow release from the dam.	Pro	On-going
B5: Management of Alien Invasive Plants		
a) The eradication and management of alien invasive plants must be frequently undertaken.	Pro	On-going

6. REHABILITATION MANAGEMENT PLAN

This Wetland Rehabilitation Plan is designed to manage, maintain and/or improve the PES and EIS of the wetland areas and surrounding terrestrial areas within the Persberg dam area, with particular emphasis on the impacts that the development of the dam will have.

The rehabilitation plan will focus on the already constructed dam wall and the area that will be inundated by the FSL of the dam, as well as any aspects that need to be addressed upstream and downstream of the dam.

The HGM unit that will/has been affected is HGM 1 (Unchannelled Valley Bottom). The wetland is classified as seriously modified (PES E) as a result of the inundation of the dam.

The rehabilitation plan will need to be updated once the results of the EWR have been submitted, as this assessment will determine the viability of the dam and the effectiveness of any proposed mitigation measures.

6.1. Rehabilitation Objectives

The objectives of this plan are to:

- Ensure as far as is practicable that the measures contained in the report are implemented;
- Manage activities within identified unchannelled valley bottom in order to improve ecological integrity of the study area;
- Minimise adverse impacts on the receiving environment;
- Maximise the service provision and ecological functioning of the wetland area;
- Maximise the ecological functioning of the watercourse and wetland system; and
- Monitor the impact of the dam on the receiving environment.

6.2. Monitoring of the Rehabilitation Works

During implementation of the rehabilitation, the monitoring of the rehabilitation works must form part of the wetland implementation rehabilitation specialist scope of work. Monitoring must include, but not be limited to, the following parameters:

- Determining if the final landforms of backfilled and re-profiled areas are in line with the natural surroundings;
- Assessment of surface and slope stability;
- Measuring the depth of topsoil replaced within rehabilitated areas;
- Determining erosion levels;
- Calculating ground cover percentages within revegetated areas including vegetation basal cover; and
- Determining plant community composition and structure of rehabilitated areas.

6.3. Roles and Responsibilities

The client will be responsible for the appointment of a relevant specialists to perform rehabilitation and monitoring activities as well as alien vegetation removal and control.

6.4. Mitigation and Management

The section below will define and describe the various environmental impacts affecting the integrity of the wetland areas associated with the dam activities. Proposed management and mitigation measures related to each impact will be presented.

Table 2 serves to describe and explain the rehabilitation and management measures deemed necessary to effectively manage, maintain, rehabilitate and improve the ecological characteristics and functioning of the unchannelled valley bottom.

6.4.1. Alien Plant Management

Invasive and other noxious plants must be managed as per the requirements of the appointed vegetation specialist. Appendix A provides details necessary for an effective alien vegetation control programme. The following legislations must be adhered to;

- The Department of Environmental Affairs (DEA) under the National Environmental Management: Biodiversity (NEM:BA) Act 10 of 2004.
- Conservation of Agricultural Resources Act (Act 43 of 1983, as amended in March 2001) Regulations.

6.4.2. Re-Establishment of Vegetation Assemblage

It is important to prepare the soil for vegetation rehabilitation. Once the soil has been prepared, appropriate seeds must be used for the rehabilitation process.

There are several methods / techniques available for employment in re-establishing the site. Through understanding the site and the problems posed, options have been identified as the correct methods to achieve re-establishment. The planting methods are expanded upon below. Please note that re-vegetation planting must be undertaken in spring if possible to ensure that establishment is successful.

In order to properly implement the re-vegetation component, the following general planting guidelines have been adopted to drive the rehabilitation process.

- Non-woody portions must be returned to either hygrophilous vegetation (sedges, bulrushes) or to graminoid assemblages which favour relevant specific habitats.

All plantings in riparian and wetland areas must occur in consultation with the relevant wetland and vegetation specialists, to ensure best placement within the wetland or riparian areas. In addition to the wetland/riparian specific mitigation measures:

- Removal of existing alien species must be consistently undertaken.
- Rehabilitation of disturbed areas must be done immediately;
- If it is necessary to import soil onto the site, the material; must be checked to ensure that it is not contaminated by weeds or invasive plants and that the soil type is compatible with the local environments. However, this is a last resort and existing soil must be fortified first, if possible.

6.4.3. Use of Plugs

Due to the nature of this project, a riparian/wetland plant harvesting and replanting plan is necessary. Planting riparian vegetation assists in stabilisation of degraded sites therefore the system of harvesting riparian grass plugs must be implemented.

Plugs must be harvested around the current edge of the dam and re-planted in affected areas (being areas that ae degrded or will be exposed as a result of the increased FSL). Riparian grass plugs must be safely removed with minimal damage and uprooted with the roots intact. Enough root mass must be obtained to ensure good establishment. Riparian grass plugs must be harvested using square meter transects to prevent overharvesting in one area.

A maximum of 25 % of plugs can be harvested per square meter, to avoid completely stripping the harvesting area. Riparian grass plugs can be harvested until the number of plugs available to be planted will ensure 85 % coverage of the affected area. If plugs are mature or are flowering, they must be cut to approximately knee-height to prevent withering and dehydration.

It is necessary to also consider seasonality to ensure effectiveness of rehabilitation, therefore re-planting must take place during the first rains of the rainy season. Monitoring and a good understanding of the hydrology of the site are important for the success or rehabilitation. Harvesting and re-planting is necessary for stabilisation of the banks surrounding the dam.

The riparian grass species to be used in the rehabilitation are listed below:

- *Juncus effuses;*
- *Phragmites australis*;
- *Typha capensis;*
- *Mariscus congestus;*
- *Arum lilies;*
- *Cyprus spp;*
- *Kyllinga spp*

In areas where steep slopes require stabilisation it is likely to be necessary to make use of Geotextiles. Ideally, vegetation is the best form of erosion control, with Geotextiles only used for temporary stabilisation purposes until this can establish.

- When the growing season is short or unfavourable and plants cannot stabilise a slope quickly enough;
- When surfaces are so unstable or contours so channelled that a heavy rain would result in significant and costly erosion damage.

6.4.4. Hand Seeding

Compared to hydro-mulching, manual mulching and seeding is better suited to flatter land. Like other forms of seeding it must be carried out in suitable weather conditions.

6.4.5. Hydro Seeding

Hydroseeding is applied on disturbed soil areas requiring temporary protection until permanent vegetation is established. Hydroseeding can be used for veld reclamation, turf seeding and erosion, sediment and dust control. Hydroseeding can also be used to provide temporary cover to disturbed soils that will be rehabilitated at a later stage. Hydroseeding can cover large and inaccessible areas within a short space of time. **(Refer to Appendix B).**

The benefits of hydroseeding include:

- Time and Cost effective;
- Faster effects;
- Limitation of stress caused by varying surface temperatures due to depth of seedbed;
- Erosion Control.

6.4.5. Geotextiles

Geotextiles (also referred to as erosion control blankets or mats) are any permeable textile material that is used to hold topsoil in place or hold disturbed soil on steep slopes and graded sites, in order to prevent erosion.

Good surface preparation is critical. The blanket or mat will extend beyond the edge of the area to be covered. The mat or blanket will need to be further secured with stakes. There must be maximum soil contact to prevent erosion underneath.

Although Geotextiles have historically been made of natural plant materials, they can increasingly be made from a synthetic polymer or a composite of natural and synthetic material. We do not support the usage of synthetic Geotextiles. Plant fibre-based Geotextiles are subject to decomposition and have a limited durability. However, they may be left in place to form an organic mulch to help in establishment of vegetation. Different fibres will degrade at different rates.

Coir Geotextiles degrade in 2-3 years while jute degrades in 1-2 years. Coir is therefore useful in situations where vegetation will take longer to establish, and jute is useful in low rainfall areas because it absorbs more moisture. Recommended products are BioJuteTM, which is produced by a company called Maccaferri and Geojute® which is produced by a company called Geotextiles Africa; Kaytech (based in Pinetown, Durban) also provide a variety of geotextile products.

Table 6: Impacts with their associated mitigation and rehabilitation guideline

Phase	Impact	Aspect	Mitigation Measure
Operational	Infestation of alien vegetation post construction	Alteration to flow volumes	■ It is critical that an alien vegetation control programme is implemented. Consult Vegetation Specialist to get a detailed list of aliens to be removed, as encroachment of alien vegetation is a certainty as a result of the disturbances resulting during the construction process. Rehabilitation of disturbed areas, utilising indigenous wetland vegetation species, will assist in reducing the impact of construction.
Operational	Downstream Releases	Increased erosion potential, from dam releases	■ During the operational phase, vehicles must remain on designated roads and must not drive in the wetland areas or the edge of the dam as new wetland eco-tones would have established there. ■ **Complete an Environmental Flow Requirement (EWR) assessment to determine the required environmental releases from the dam to sustain wetland functions downstream; if this is not done then we have a fatal flaw and the dam must be decommissioned.** ■ Reducing the proposed irrigation usage to allow the wetland to sustain some function upstream; ■ Fencing off of the wetland to prevent cattle from grazing within the wetland; and ■ Ensure no erosion occurs at the dam inlet and outlet points.
Post Rehabilitation	All	All	■ Upon completion of rehabilitation works on site, a suitably qualified specialist should continue to monitor the rehabilitation works on a monthly basis for three months. Thereafter, one monitoring site visit is recommended after 6 months from completion of rehabilitation works after which final sign-off of rehabilitation works should take place.

APPENDIX A: ALIEN VEGETATION CONTROL PLAN

1. INTRODUCTION

Invasive alien plants (IAPs) are plant species that have been introduced, to South Africa, either intentionally or unintentionally. They can reproduce rapidly in their new environments and out-compete indigenous plants for both nutrients and water thereby destroying whole eco-systems. They are usually "water-hungry" plants/shrubs/trees resulting in a much higher use of precious ground water.

2. LEGISLATIVE AND POLICY FRAMEWORK GOVERNING IAP CONTROL

National Environmental Management: Biodiversity Act No. 10 of 2004 (NEMBA)

The National Environmental Management: Biodiversity Act (NEMBA) regulates all invasive organisms in South Africa, including a wide range of fauna and flora. Regulations were published in Government Notices R.506, R.507, R.508 and R.509 of 2013 under NEMBA.

Conservation of Agricultural Resources Act No. 43 of 1983 (CARA)

Regulation 15 of CARA regulates and restricts the propagation, harbouring and sale of invasive alien plat and weed species listed in a set of Regulations publish in terms of the Act. All listed Invasive Alien Plants are divided into three categories which are:

Category 1 – Prohibited Plants

Category 2 – Invader plants with commercial or utility value

Category 3 – Primarily ornamental or 'exotic' horticultural plants

3. ALIEN PLANT CONTROL

Benefits of control

- Reduction of spread of alien plant species into non-affected areas;
- Improvement of water quality and quantity;
- Legal compliance (landowners are required to eradicate or control declared weed and alien invader plants in terms of the Conservation of Agricultural Resources Act 43 of 1983 and National Environmental Management: Biodiversity Act 2004 (Act No. 10 of 2004) as amended from time to time).
- Improvement of biodiversity in and around the construction area.
- Reduction in soil erosion. Certain species of alien invader plants reduce soil cover, leading to increased erosion.

Important factors influencing the effectiveness of a control programme

- Timeous implementation of control operations is important as alien plants are more susceptible to herbicides when they are young and lower herbicide rates can be used with less chance of accidental drift occurring.
- Selective broadleaf herbicides must be chosen where it is the intention to achieve rapid colonisation of the site by grasses. Care must be taken when applying herbicides and label prescriptions must be strictly adhered to. The Environmental Control Officer (ECO) is to advice.
- Operations must be directed towards eradicating alien vegetation.
- A reputable company must be hired to undertake herbicide application. The ECO must be available to monitor this activity.

Requirements for an effective alien vegetation control programme

- Identify the problem: extent, location and species of problem plants.
- Identify any sensitive ecosystems, rare or endangered plants etc. which may be affected by a control programme. Identify the original ecosystem applicable to the area. The method of control will be influenced by the type of vegetation to which the area must revert.
- Identify an appropriate control method: mechanical or chemical, type of herbicide, application etc. (Mechanical and biological methods are preferred, compared to chemical methods)
- Make provision for a number of follow up operations. The initial clearing operation is only part of the total programme. Failure to follow up will result in a failure of the entire programme.

4. INVASIVE ALIEN PLANT CONTROL METHODS

Control Methods	Description
Mechanical Methods	
Hand pulling / Hoeing	• Hand pulling is most effective with small (300 mm), immature or shallow rooted plants such as black jack, tall khaki weed, *Chromolaena odorata* etc. • Shake the excess sandy material from the plant, this makes the plant easier to stockpile and lighter to transport. • However, make sure there is no seed on the plant first to prevent the spread of seeds while shaking. If seeds are present they need to be cut off and bagged. • When piling the removed plants either place on a plastic sheet or put into a plastic bag to prevent seed spreading – do NOT leave it lying around.
Chopping / Cutting / Slashing	• This method is most effective for plants in the immature stage, or for plants that have relatively woody stems/ trunks, or larger root systems such as Lantana, American bramble, Bug weed, Castor Oil Bush and must be done in conjunction with chemical treatment of the cut stumps (application by painting the herbicide onto stumps cut approximately 100mm above the ground). **Note** • Cut/slash the stem of the plant at approximately 100 mm to ground level. • Paint all cut plants with an appropriate herbicide immediately after they have been cut.

	• Stockpile removed material into piles after removing seeds or pods collect all the seeds from the ground. All seeds must be put in a plastic bag that is tightly sealed. The seeds must be disposed of at a registered landfill site. • .
Ring Barking	• Remove bark until the cadmium of the tree is exposed in a 300-400 mm band and paint herbicide immediately to exposed band.
Felling This may only occur on instruction and guidance from the ECO.	• De-branch trees and remove all material. Branches can be chopped to small blocks and used as fire wood (provided that they are not poisonous) • Cut the tree down to approximately 150 mm from ground level. • Dissect the stump as much as possible to increase the surface area for the effective application of herbicide. Apply the herbicide by painting it on the stump immediately (no later than 30 mins) to the dissected stump. • Branches can be used as erosion logs for stormwater bio-engineering control measures. See photograph below. 

Chemical Control Method	
• **<u>Chemical control of alien plants must not be done in aquatic systems</u>**. • Plenum and Kaput Gel (trade names) are recommended for this project, the ECO will advise if other herbicides are needed. • No application of herbicide is to be carried out during wet or windy conditions. • The mist spraying of herbicides in STRICTLY prohibited.	
Cut Stump Application This is the preferred chemical control method.	• This is a highly effective and appropriate control method for woody vegetation or larger specimens of alien invasive vegetation. • The appropriate herbicide (after it has been mixed or diluted as per manufacturer's instructions) must be applied to the stump using a paintbrush within 30 min of being cut. • Stems must be cut to approximately 150mm above ground level. Dissect the stump as much as possible to increase the surface area for the effective application of herbicide.
Scrape and Paint This is an acceptable chemical control method.	• This method is suitable for large vines and scrambling plants i.e. creepers such as balloon vines; Ipomoea spp. and Pereskia. • Starting from the base of the stem, scrape 20-100cm of the stem to expose the sapwood just below the bark. • Immediately apply the herbicide to the scraped section. • Leave the vines to die in place. Do not try and pull them down off the tree/shrub on which they are growing.

Droplet Application	• Droplet application deposits herbicides directly where it is needed / wanted. • A small amount of herbicide is used per plant. • This is a good application for regrowth onto young leaves below knee height.
Disposal Methods	
Landfill Site	• If alien plant vegetation is to be disposed of at a landfill site, seeds are to be placed in sealed plastic bags to minimise contamination of the environment.
Stacking (**Do not stack for more than a week, the ECO will advise)**	• Stack light branches separately from heavy timber (75mm and more). Remove heavy branches to reduce long burning fuel loads that can result in soil damage from an intensely hot fire. • Do not make stacks under trees, power and telephone lines, within 30 meters of a fire belt or near watercourses, houses and other infrastructure. • The local municipality must be informed of the alien vegetation burning exercise prior to implementation. Burning must not take place during windy conditions and/or after 3 pm, • Firefighting equipment must be available at all times during this exercise.

5. SITE SPECIFIC INVASIVE ALIEN PLANT CONTROL PROGRAMME

Please note: the alien invasive plants present are not limited to the ones shown in the table below.

Species Name	Common Name	Mechanical Method	Chemical Method	Herbicide
Tagetes minuta	Tall Khaki weed 	Hand Pull	Droplet (spray)	Plenum (as tri-isopropanolamine salt)
Solanum mauritianum	Bugweed[1]		Droplet (spray)	Plenum (as tri-isopropanolamine salt)

[1] When removing *Solanum mauritianum* (bugweed) workers must wear protective clothing, gloves and facemasks to prevent skin irritation by and inhalation of the fine hairs that cover this plant.

Species Name	Common Name	Mechanical Method	Chemical Method	Herbicide
		Slashing / Chopping / Cutting	Stump paint / Droplet	Kaput Gel (pyridine carboxylic acid-as potassium salt)
Lantana camara	Lantana 	Slashing / Chopping / Cutting	Droplet	Plenum (as tri-isopropanolamine salt)
Rubus cuneifolius	American bramble 	Cut long branches and apply herbicide to main stems	Droplet Spray	Plenum (as tri-isopropanolamine salt)

Species Name	Common Name	Mechanical Method	Chemical Method	Herbicide
Bidens Pilosa	Black Jack 	Hand Pull	Droplet Spray	Plenum (as tri-isopropanolamine salt)
Solanum mauritianum	Bugweed[2] 	Slashing / Chopping / Cutting	Droplet (spray)	Plenum (as tri-isopropanolamine salt)

[2] When removing *Solanum mauritianum* (bugweed) workers must wear protective clothing, gloves and facemasks to prevent skin irritation by and inhalation of the fine hairs that cover this plant.

Species Name	Common Name	Mechanical Method	Chemical Method	Herbicide
Tagetes minuta	Tall Khaki weed 	Hand Pull	Droplet (spray)	Plenum (as tri-isopropanolamine salt)

Please Note: This Invasive Alien Plant Programme does not cover aquatic IAPs as control of these needs specialised input, equipment and herbicide

APPENDIX B: HYDROSEEDING

DEFINITION:

Hydroseeding is a process of applying a mixture of water, seed, fertilizer and mulch to the ground by means of direct spraying using hydromulch equipment. The mixture temporarily protects soils from water and wind erosion, allowing seeding to take root. Hydroseeding is also referred to as hydraulic seeding, hydra-seeding or hydro-mulching.

USE:

Hydroseeding is applied on disturbed soil areas requiring temporary protection until permanent vegetation is established. Hydroseeding can be used for veld reclamation, turf seeding and erosion, sediment and dust control. Hydroseeding can also be used to provide temporary cover to disturbed soils that will be rehabilitated at a later stage. Hydroseeding can cover large and inaccessible areas within a short space of time.

PROCESS:

The seeding process involves the use of highly specialised equipment, including four-wheel drive vehicles that can access almost any type of terrain. The slurry is transported in a Hydroseeding Unit, either truck or trailer-mounted and sprayed over a prepared soil surface in an even layer. Powerful pumps and extension hoses generate a spray range in excess of 100 meters. In general, hydroseeding is a dry land rehabilitation method, which does not require any form of additional irrigation. The use of scarifying drills, soil binder and mulch will retain the application slurry in situ, binding the surface layer. A micro-climate forms as the climate and soil moisture conditions for germination improves, and vegetation establishes.

BENEFITS:

Time and Cost effective

The mixture used for the hydroseeding process is relatively cheaper than traditional broadcast seeding and sodding. When the process is carried out correctly, hydroseeding is time efficient as large and/or inaccessible areas of land can be covered within short spaces of time. An area of up to four hectares can be completed per hydroseeding unit in a single day. This results in a high production rate, particularly where dust pollution and erosion control is of concern.

As germination occurs rapidly, maintenance is nominal.

Faster effects

As a site specific hydro-mulch mixture is used, hydroseeding vegetation generally comes in quicker than comparative broadcast seeding and sodding. Early growth is usually visible within five to six days. Furthermore, initial weed growth is restricted. Suitable grass cover is established within two to three months.

Limitation of stress caused by varying surface temperatures due to depth of seedbed

This also ensures successful germination of seedlings. This also limits the loss of seed and material by wind and water erosion.

Erosion control

Hydroseeding offers built in erosion control. Erosion issues are often addressed by simple application of the hydroseeding mixture, as the mulch and slurry harden, erosion issues are contained until seed establishes itself and becomes a permanent erosion inhabitant.

APPENDIX C: EMPR ACKNOWLEDGEMENT FORM

BASIC ASSESSMENT FOR THE EXISTING PERSBERG DAM WALL ON PERSBERG FARM (PORTION LINDE NO 4733) SITUATED IN THE HELPMEKAAR AREA, LOCATED WITHIN THE MSINGA LOCAL MUNICIPALITY AND THE UMZINYATHI DISTRICT MUNICIPALITY, KWAZULU-NATAL

Record of signatures providing acknowledgment of being aware of and committed to complying with the contents of this Environmental Management Programme (EMPr), which relates to the environmental management, mitigation and rehabilitation measures for the project outlined above, and the environmental conditions contained in the civil and other construction contract documents.

PROPONENT – MR ERIC MULLER:

Signed: ……. Date: …….....

ENVIRONMENTAL CONTROL OFFICER:

Signed: ……. Date: …….....