REHABILITATION PLAN

2 Seam Mine – River Diversion Project

November 2022

WUL Reference: WU18102

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Abbreviations

AECO	Aquatic Environmental Control Officer
AMD	Acid Mine Drainage
ECO	Environmental Control Officer
KPI	Key Performance Indicator
NWA	National Water Act, Act 36 of 1998
NWRS	National Water Resource Strategy
PES	Present Ecological Status
RQO	Resource Quality Objectives
SACNASP	South African Council for Natural Scientific Professions
SANS	South African National Standards
SAWQG	South African Water Quality Guidelines
WMA	Water Management Area
WULA	Water Use Licence Application

1 INTRODUCTION

Elemental Sustainability (Pty) Ltd. (ELEMENTAL) was appointed by 2 Seam Mine (Pty) Ltd. (2 Seam) to submit a Water Use Licence (WUL) application in terms of the National Water Act (Act 36 of 1998) for the water uses triggered by the diversion of the Olifants River and the opencast mining of Block OC4A.

1.1 CONTEXTUALISATION OF THE ACTIVITY

Elemental Sustainability (Pty) Ltd. (Elemental) was appointed by 2 Seam (Pty) Ltd. (hereafter referred to as 2 Seam) to submit an environmental authorisation application in terms of the National Environmental Management Act, 1998 (Act No. 107 of 1998) and the Waste Management Licence in terms of National Environmental Management Waste Act, 2008 (Act No. 59 of 2008) as amended, and the Environmental Impact Assessment Regulations of 2014, as amended, to Mining Right (MP) 30/5/1/2/3/2/1 (405) EM to include a coal washing plant, tailings facility and pollution control dams on site. In addition, 2 Seam is applying for an additional opencast pit to be located within the approved mining right boundary. As part of the application the two existing approved Environmental Management Programme Reports (EMPR's) will be combined into a single EMPR and the new activities will be added to the EMPR. The River diversion of the Olifants River will also be applied for.

2 Seam has three approved water use licences (WULs) in terms of the National Water Act (NWA) (Act 36 of 1998) for the existing infrastructure and activities on site. The reference numbers for the three WULs are Licence No.: 06/B11B/ AICGJ/7070 approved on 06 April 2018, Licence No.: 06/B11B/ACGIJ/10048 approved on 31 March 2021 and Licence No: 06/B11B/CGIJ/29/3 approved on 12 May 2021. 2 Seam is hereby applying for a WUL for the Olifants River Diversion and the proposed opencast mining area (OC4A).The other Section 21 activities that are triggered by the proposed changes within the mining right boundary will be applied for separately in terms of Section 40 of the NWA.

The operation currently includes the following: -

- Opencast pits;
- Access and haul roads;
- Security access;
- Bulk hydrocarbon storage facilities;
- Overburden stockpiles;
- Topsoil stockpiles;
- ROM stockpiles and crusher area at Block 3;
- Dirty water management berm around the overburden stockpiles;
- Management of dirty water in the pit – pumped to the Block 3 PCD;
- A 200 mm outside diameter pipe that connects the pit with the PCD; and
- Storm water drainage.

The proposed infrastructure includes:

- A processing plant;
- A tailings facility is also proposed to be established on a previously mined area;
- Stormwater Management Infrastructure (Two pollution control dams and dirty water berms);
- Contractor's yards;
- River diversion; and
- Opencast Block4A.

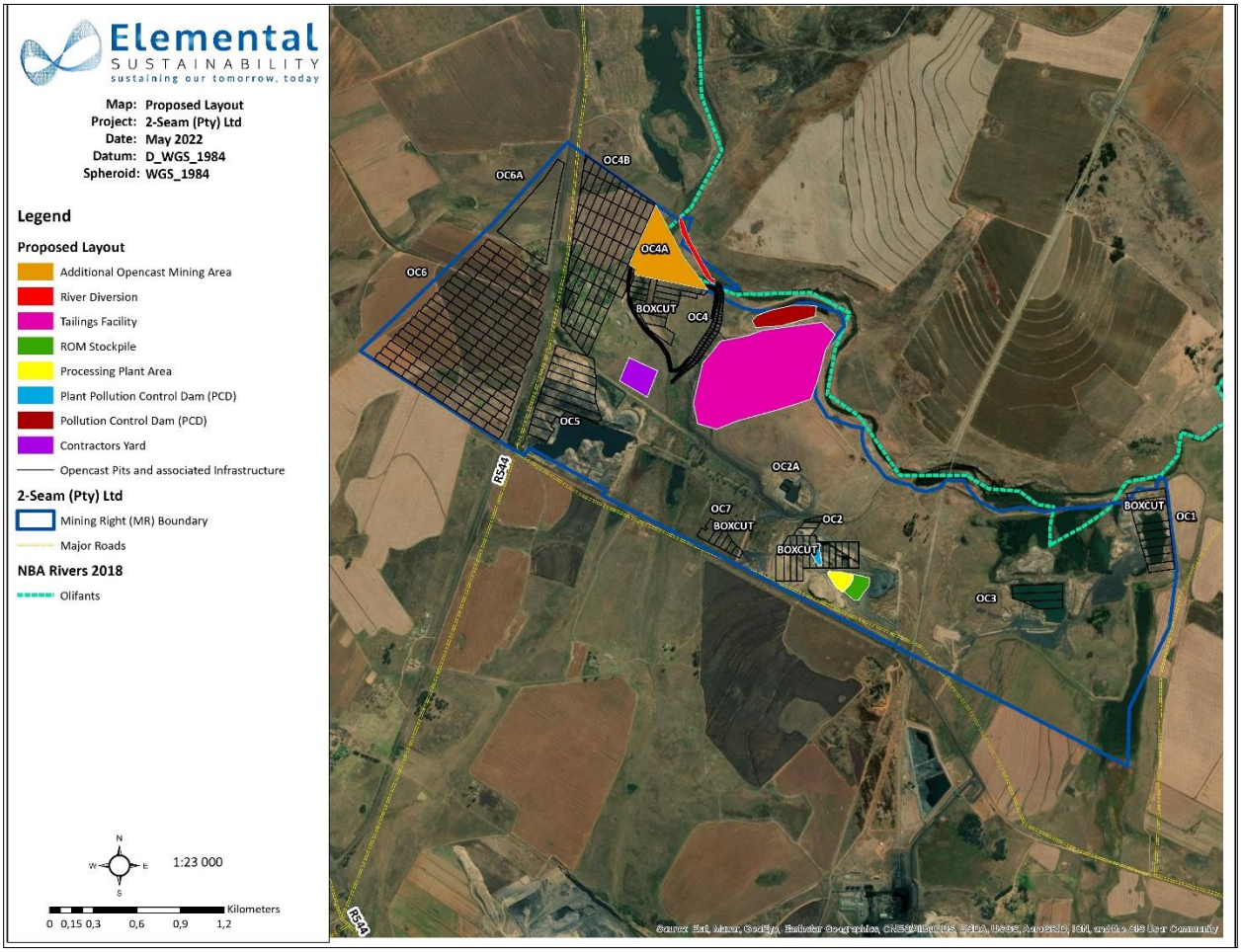

Figure 1: Infrastructure layout for the proposed 2 Seam Mine River Diversion Project

Table 1: Water Uses for the proposed 2 Seam River Diversion

Water Use	Name	Purpose	Volume / Capacity / Area	Co-ordinates	Property
Section 21 c and i	Stream Diversion	Diversion of the Olifants River	Length: 500m Width: 35m	Start Point: 26°9'32.90"S 29°20'44.73"E End Point: 26° 9'19.86"S 29°20'36.94"E	Remainder of the farm Vlaklaagte 45
Section 21 c and i	Opencast mining	Opencast mining within 500m of a watercourse	Length: 580m Width:285m 11 ha	Start: 26° 9'17.28"S 29°20'31.72"E End: 26° 9'29.01"S 29°20'25.89"E	Portion 31 of the Farm Vlaklaagte 45 IS and Portion RE of the Farm Lourens 472 IS
Section 21 c and i	Dirty water berm	Dirty water berm to divert dirty water to Pollution Control Dam	Length:800m	Start: 26° 9'16.76"S 29°20'30.93"E End: 26° 9'34.64"S 29°20'44.11"E	Portion 31 of the Farm Vlaklaagte 45 IS and Portion RE of the Farm Lourens 472 IS
Section 21g	Opencast mining	Opencast mining of coal	11 ha 909655m^3/ annum	Point 1: 26° 9'17.28"S 29°20'31.72"E	Portion (Re) and Portion 31 of the Farm Vlaklaagte 45 IS and

				Point 2: 26° 9'33.94"S 29°20'43.21"E Point 3: 26° 9'30.91"S 29°20'27.00"E Point 4: 26° 9'29.01"S 29°20'25.89"E	Portion RE of the Farm Lourens 472 IS
Section 21(g)	Backfill of overburden to pit (mining right)	Backfilling of overburden to pit as rollover mining occurs	11 ha 1694044m^3	Point 1: 26° 9'17.28"S 29°20'31.72"E Point 2: 26° 9'33.94"S 29°20'43.21"E Point 3: 26° 9'30.91"S 29°20'27.00"E Point 4: 26° 9'29.01"S 29°20'25.89"E	Portion (Re) and Portion 31 of the Farm Vlaklaagte 45 IS and Portion RE of the Farm Lourens 472 IS
Section 21 j	Dewatering	Dewatering for the safe continuation of mining	472 951m^3 per annum	26° 9'29.28"S 29°20'29.94"E	Portion (Re) and Portion 31 of the Farm Vlaklaagte 45 IS and Portion RE of the Farm Lourens 472 IS

2 REHABILITATION PLAN

Rehabilitation plans for aquatic ecosystems are only as efficient as the implementers of the plan, the experience of the aquatic ecosystem specialist guiding the process and the willingness of the construction crews and developer to adhere to the rehabilitation plan. For this reason, it is of paramount importance that all parties involved be contractually bound to all aspects of this rehabilitation plan. This plan is written to be more of a practical report for the implementation of the rehabilitation measures than a purely theoretical report. For this reason, the implementation of the rehabilitation measures must be guided by an aquatic environmental control officer (AECO) with experience in implementing aquatic ecosystem rehabilitation. Also, this document is not set in prescriptive terms but rather offered as an adaptive management approach.

2.1 REHABILITATION AND REINSTATEMENT

Closure objectives, closure success criteria and relinquishment criteria are defined as:

- **"Objectives** define strategies or implementation steps to attain the identified **goals**. Unlike **goals**, **objectives** are specific, measurable, and have a defined completion date".
- **Closure success criteria** is when the objectives for closure are met with set measurable outcomes for success
- "**Relinquishment** is achieved through demonstration of achievement on closure completion criteria agreed with the primary regulator".

See Figure 2 below for a graphical presentation of the relationships.

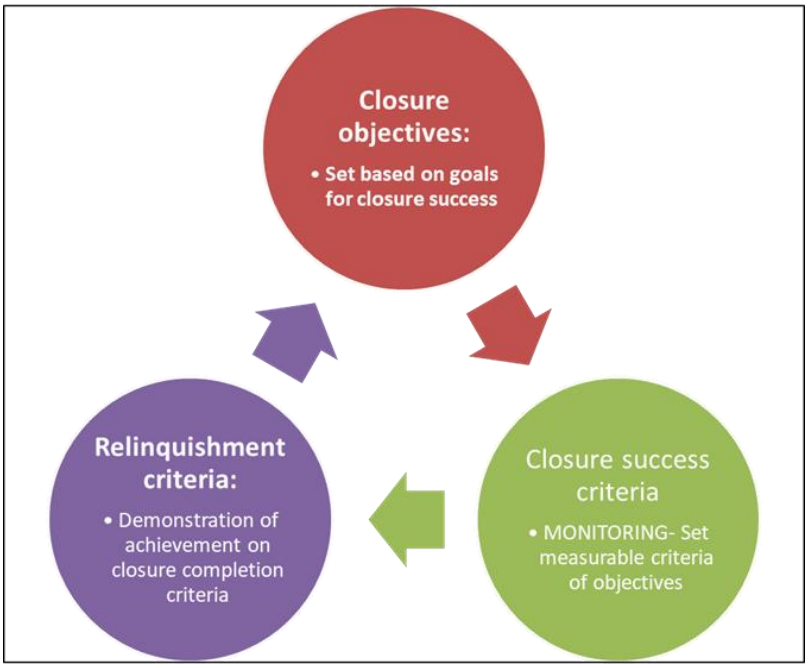

Figure 2: Relationship between Closure Objectives and Closure Success Criteria and Relinquishment Criteria

2.2 OBJECTIVES OF THE REHABILITATION

To allow for the mining of the section the diversion of the river is required. The diversion is thus the primary mitigation aspect, and the rehabilitation effort needs to focus on this. The diversion of the river will be a permanent impact. Post mining the river will not be rerouted to its previous route due to the risk of acid mine drainage in the old mining areas. This influences the goals of the rehabilitation. The new diversion channel must for all aspects be similar in habitat provision to the aquatic fauna occurring naturally in the system. Thus, the goals of the diversion rehabilitation are simply:

- **"To emulate pre-diversion riparian conditions (abiotic and biotic) in the diversion"**
- **"To reduce impact of developments post mining"**

This includes form and function of the current system in the new system. The following important aspects must be kept in mind during the planning of the diversion:

- Current river channel not homogenous, varies in composition,
- Rehab aspects in place before diversion can commence,
- Water filling of new channel is of concern due to increased sediments in the channel,
- Rock boulders found in places- need to be kept if possible- this helps create habitat,
- Sectional approach to the diversion of water,
- Pumping of water from diverted area,

- Aquatic fauna relocated from old channel,
- Functional length lost in the system,
- Floodplain area impact due to loss.

2.3 Phasing of Project

To ensure the impacts of the diversion is minimised, it is proposed that the diversion of the river and wetland must be done is phases.

2.3.1 Phase 1

- All crew and personnel associated with the project receive training regarding work in and around the aquatic ecosystems.
- All sensitive areas are demarcated until impacts are to occur in the systems,
- Planning and permitting requirements completed,
- Pre-impact monitoring and sampling completed.

2.3.2 Phase 2

Establishment of soil stockpile for excavated soils from the new channel. A small berm is always required around the stockpile to prevent any stochastic event from washing the stockpile into the riparian area. Once the diversion is complete, the soils can be removed and reused.

Figure 3: Phase 2 Stockpile Establishment

2.3.2 Phase 3

Phase 3 (Figure 4) involves the excavation of the centre section of the diversion channel. No water inlets are to be completed. No machinery may cross the aquatic ecosystem at this stage. The excavations must be done and completed as much as possible. As this is an important part of the diversion, final levels must be made before the next phase.

Figure 4: Phase 3 - Excavations of Dry Area Central Area

From the in-situ studies the bank morphology requirements of the diversion can be emulated. This includes the shape and levels as well as hydrological functions. As the riparian system is currently in average 2 meters deep, excavations must be done to this depth. Spots of deeper pools must be made, with depths of up to 3 to 4 meters with a diameter of 20 meters.

The hydrological functions for the same section of diversion can be compared to the in-situ conditions. It is important that the banks are as flat as possible for the section where the river enters the diversion, to allow for overtopping during flooding. The area must have the same shape as the sample points. See **Error! Reference source not found.** for the bank shapes.

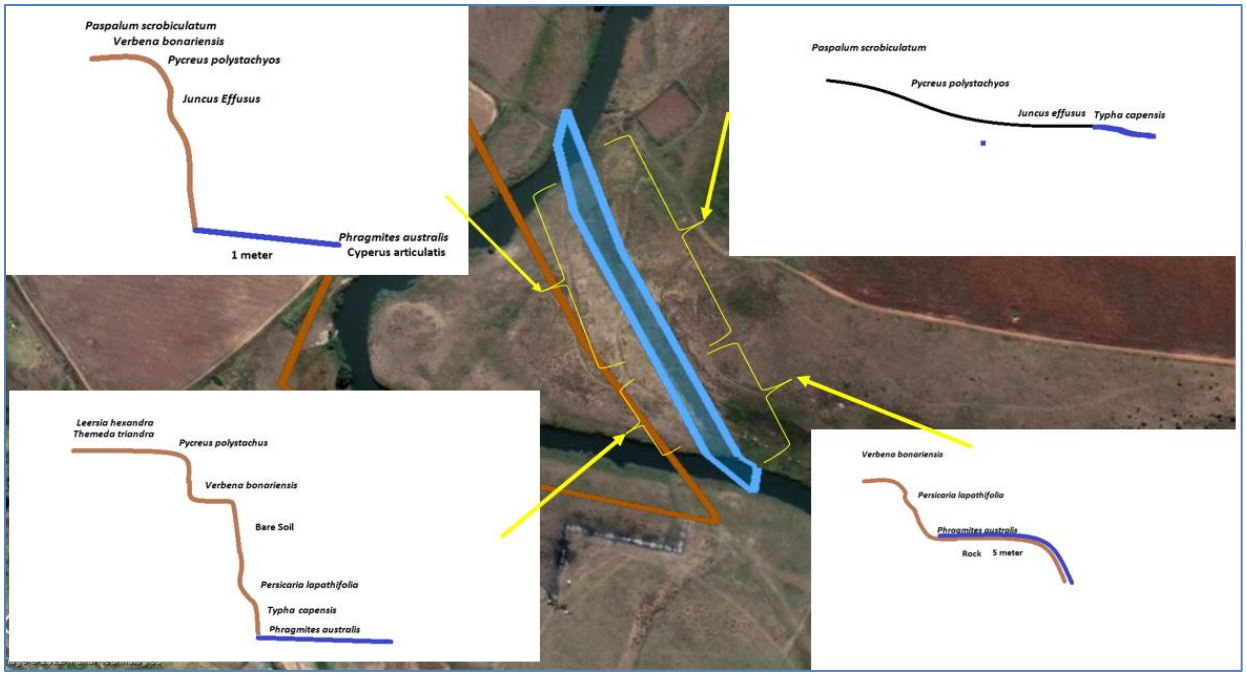

Figure 5: Bank-shape required by the New Channel to Emulate Habitat

2.3.4 Phase 4

Phase 4 is a high-risk portion of the development, as this is the inlet of water into the new diversion. Water must be allowed to enter the diversion excavation, only once the AECO signs off on Phase 3. The excavations are high risk as the required depth of the channel might be difficult to achieve. The machinery will have to extent the booms and buckets into the water of the system. It is important that the release of water into the diversion be done in segments, and not one massive flow of water with high velocity (and thus increased erosion and sediment loads in the system). Site specific planning must be confirmed by the AECO for the project before any works commence.

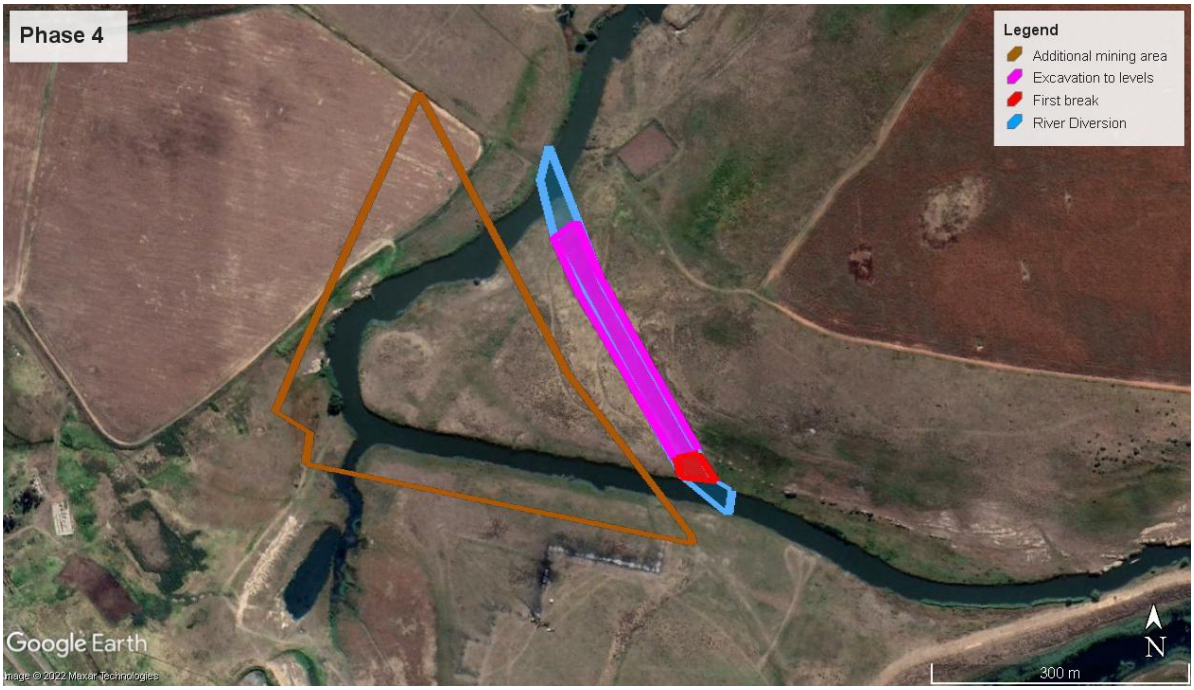

Figure 6: Phase 4 - Location and Plan

It is during this phase that all marginal flora species must be replanted in accordance with the in-situ surveys of the system. These species must be removed from the current active channel and replanted here. This includes al hydrophytes. Removal must be done with as much of the root system as possible (**Error! Reference source not found.**).

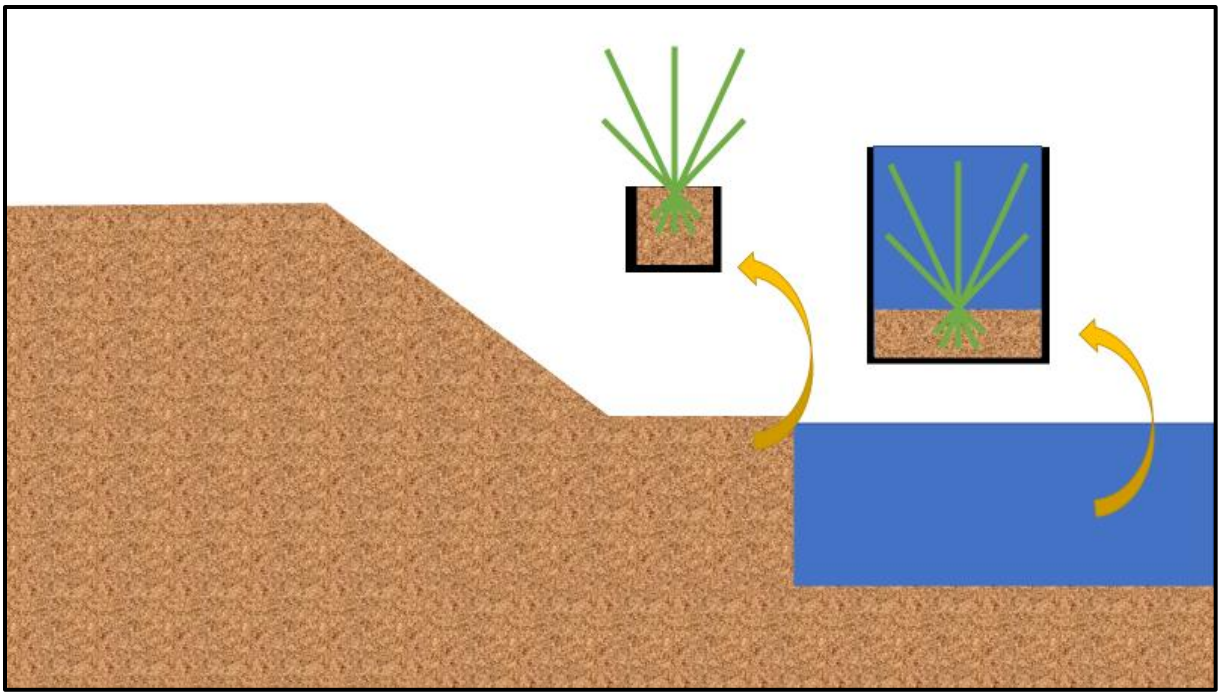

Figure 7: Plant removal and relocation

Important species that requires removal is given in Table 2 below. Most of the plants listed are not commercially available and *in site* sourcing is of paramount importance. Other grass species seed is available and must be sourced as soon as possible for the project. A total of 15 kg seed per ha is required. Species included in the list is: *Cynodon dactylon, Eragrostis curvula, Hyparrhenia hirta*[1]*, Leersia hexandra, Panicum natalensis, Paspalum scrobiculatum* and *Themeda triandra*[2]. Reference literature is available from (van Ginkel *et al.*, 2011), and the AECO must assist with this process.

Table 2: List of plants to be removed in phases 1 to 3

	Gomphostigma virgatum, Leersia hexandra, Paspalum scrobiculatum, Pycerus poystachyos, Rorippa nudiuscula, Verbena bonariensis.

[1] Seedlings must be propagated of the seed to ensure growth

[2] Seedlings must be propagated of the seed to ensure growth

 	*Juncus articulatus*
	*Persicaria lapathifolia*
	*Juncus effusus*
	*Typha capensis*
	*Phragmites australis and Phragmites capensis*

2.3.5 Phase 5

It is important that the planting of the marginal plants must be completed before phase 5 can start. Once this is in place the final break of the diversion can be completed (Figure 8). This will alter the water quality composition of the system, as high volumes of sediments and increased turbidity is expected. It is important that the break must be completed in segments, and the water is allowed to enter the natural channel with low velocities.

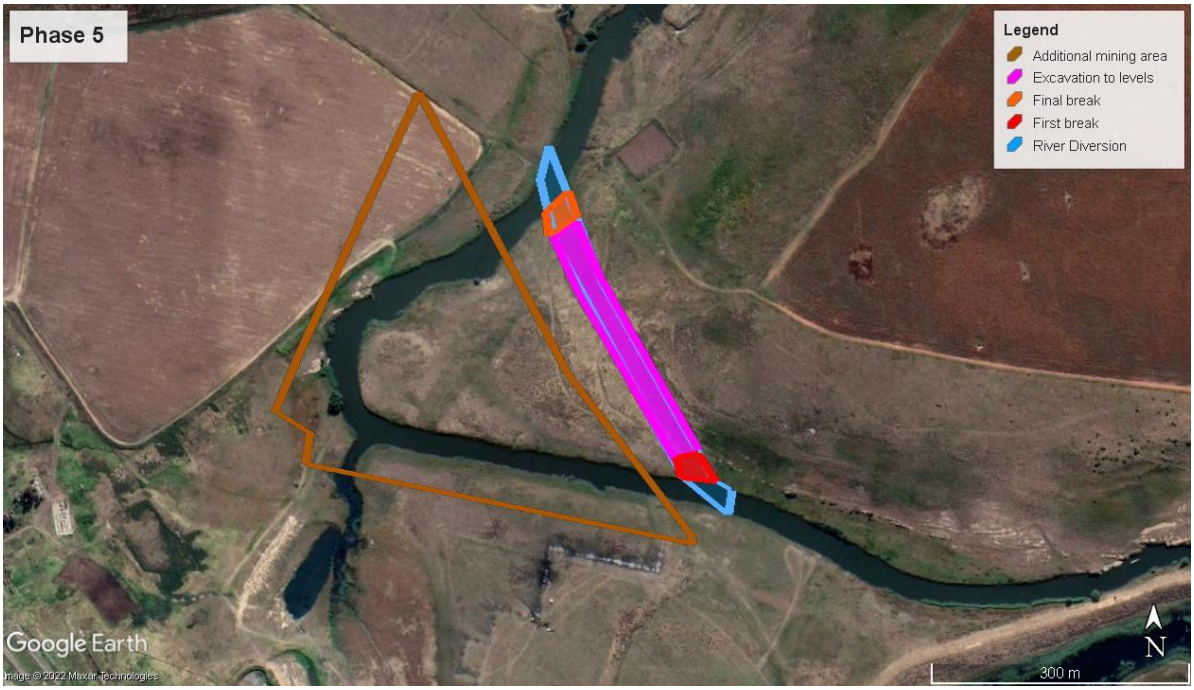

Figure 8: Phase 5 of the diversion

2.3.6 Phases 6 and 7

The next two phases will involve the placement of a berm in the existing natural channel and the reduction in flows in the old channel. The flows are very low in the system naturally, and in combination with the large volume of water in the channel, will be the most timeously process of the diversion. The closure of the system must be done using river sand, or similar material, to reduce the number of sediments and turbidity produced by the activity. The water needs to have a low flow rate- this will be difficult to achieve. Thus, the reasons for the river sand. The use of large boulders can also be used to raise the initial channel depth.

Once the downstream plug is in place (Figure 9), and the AECO signs off on the process, the upstream plug can be made in similar fashion (Figure 10).

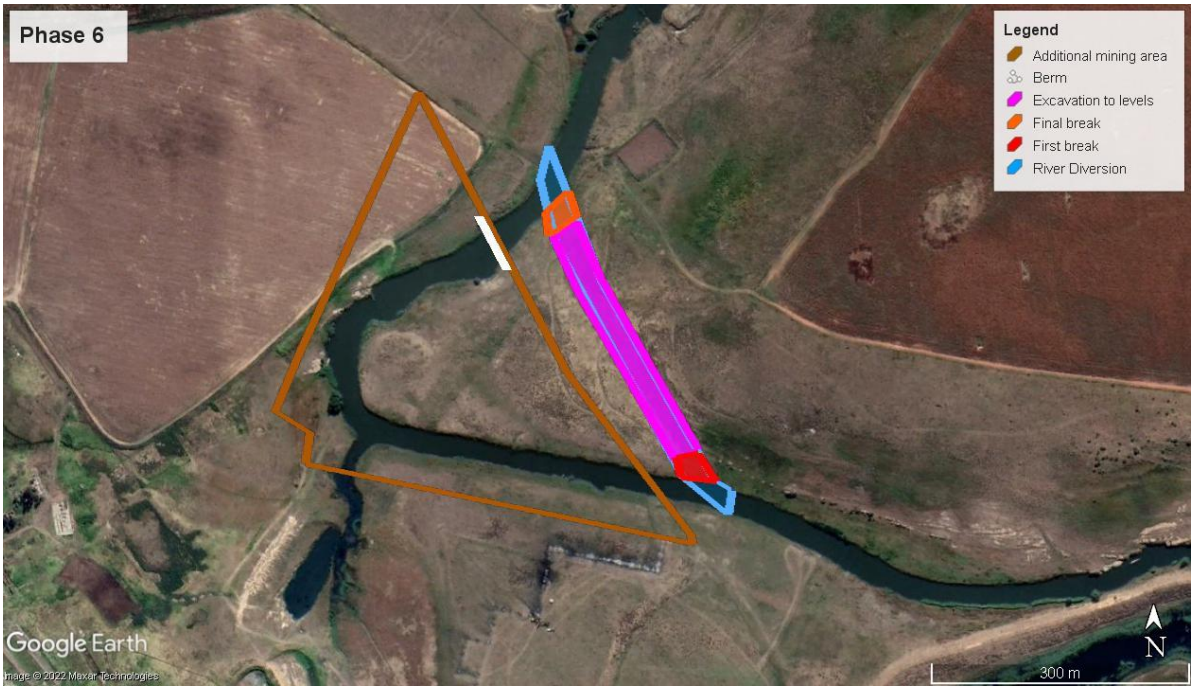

Figure 9: Phase 6

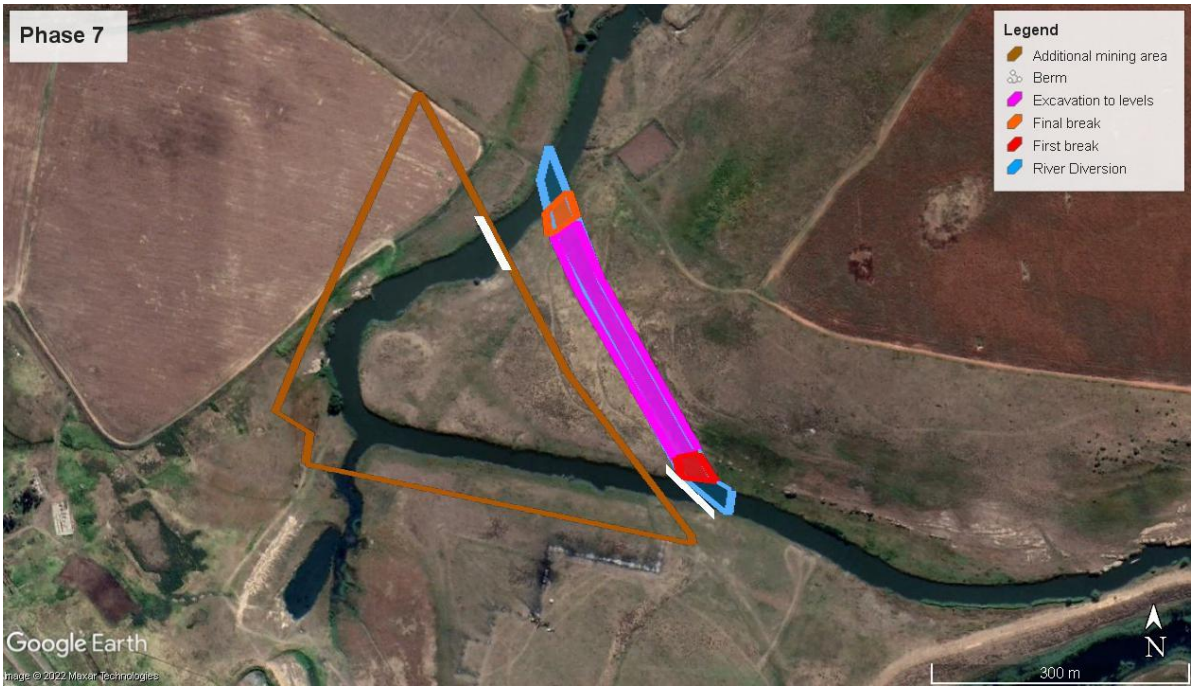

Figure 10: Phase 7

2.3.8 Active mining

The area will be mined to predetermined levels. The EMP must guide this phase of the activity. Monitoring must take cognizance of the risk of AMD and must be designed to detect and mitigate such impacts.

2.3.7 Phase 8

Once both plugs are in place, pumping of water from the old channel can commence. It is of high importance that this phase be completed with the help of a team to facilitate the removal of aquatic fauna and flora with emphasis on fish from the drying channel to the new diversion. ***Exotic species cannot be moved and must be euthanised humanely.*** **This process needs to be driven by the AECO.**

3 KEY PERFORMANCE INDICATORS (KPI'S) FOR PHASES

Key Performance Indicators for the various phases (1-7) and including Operational, Decommissioning, Closure, and post closure phases. These have been linked to relinquishment criteria for abandoning KPI's. See **Error! Reference source not found.** for the KPI's and relinquishment criteria below. These KPI's are set based on expected impacts with expansion of the KPI's expected over time.

Table 3: Key Performance Indicators and Relinquishment Criteria's

Aspect	Key Performance Indicator				Relinquishment criteria			
	Preoperational phase	**Operational phase**	**Closure phase**	**Post closure phase.**	**Preoperational phase**	**Operational phase**	**Closure phase**	**Post closure phase**
Phase 1	All crew and personnel associated with the project receive training regarding work in and around the aquatic ecosystems.				Proof of training			
	All sensitive areas are demarcated until impacts are to occur in the systems.				Demarcations must remain in place throughout the phases			
	Authorisations in place	Review of authorizations	Review requirements with closure in mind	Close out certifications must be in place	No relinquished and will remain in place			
	Pre-impact monitoring and sampling completed.	Complete monitoring with review of pre-impact baseline results			No relinquished and will remain in place			
Phase 2	Stockpiling of topsoil is done in accordance with good practice	No alien vegetation establishment allowed Topsoil remains viable and is "living"	Will include the use of the topsoil.	No topsoil left and all was used for rehabilitation	N/A- topsoil monitoring required		Use of stockpile and will be relinquished if all topsoil is used	N/A
Phase 3	Reshaping of banks to emulate riparian area	Provides habitat	Continues to provide habitat	Continues to provide habitat	Signed off by AECO	Monitoring if habitat provision is occurring naturally	Habitat provisions stable and in place	Diversion becomes stable and habitat provision is in place. Natural

Aspect	Key Performance Indicator				Relinquishment criteria			
	Preoperational phase	**Operational phase**	**Closure phase**	**Post closure phase.**	**Preoperational phase**	**Operational phase**	**Closure phase**	**Post closure phase**
								hydrology is functional
Phase 4	Excavation and shaping of channel. Disposal of waste rock/ overburden done correctly	Hydrology is functional	Hydrology is functional without human intervention	Hydrology remains functional without human intervention	Signed off by AECO			
	Replanting of hydrophytes and other terrestrial areas as part of the diversion plan	Rehabilitation becomes established and propagates itself No alien vegetation	Climax state of flora. No Alien vegetation	Stable system functional without human interventions	Signed off by AECO and ECO			
Phase 5	Breakthrough of final section into the river- slow releases of water with sediments managed	Hydrology is functional	Hydrology is functional without human intervention	Hydrology is functional without human intervention	Signed off by AECO			
Phase 6	Upper berm is installed	Berm remains functional			Signed off by AECO	N/A Remains in place		
Phase 7	Lower berm is installed							
Quantum/ Financial provision for closure or costings for rehabilitation	Review financial calculations annually	Reduction in expected costs	Reduction in expected cost.	NO additional costs required	Expenditure within calculations			NO additional costs required. Closure is

Aspect	Key Performance Indicator				Relinquishment criteria			
	Preoperational phase	**Operational phase**	**Closure phase**	**Post closure phase.**	**Preoperational phase**	**Operational phase**	**Closure phase**	**Post closure phase**
								self-supporting
Alien/ exotic vegetation	Zero expansion of alien vegetation	Zero expansion	Reduction in alien vegetation	Reduction in alien vegetation	Zero alien vegetation	Zero alien vegetation	Zero alien vegetation	Zero alien vegetation
Dewatering of open construction	Continuous	Continuous with reduction	Reduction to state of no dewatering	No dewatering required		Reduced pumping required	Reduction to state of no dewatering	Zero pumping required
Water quality	Zero expansion of pollution plume	Reduction in pollution plume	Reduction in pollution plume	Zero pollution	Return of water quality to normal standards	Return of water quality to normal standards	Return of water quality to normal standards	Return of water quality to normal standards
Review of KPI's	Annually by AECO and ECO				Annually by AECO and ECO			

3.1 CLOSURE OF MINING/ REHABILITATION

Once mining has been completed the area of mining must be rehabilitated. Currently (August 2022) a void will be created where mining took place. Water from the surrounding groundwater and surface water will infiltrate the area and pose an AMD risk. Phytoremediation of the sections must be investigated once the mining operations has completed. The areas of the diversion must be used as phytoremediation section. A series of dams must be created in the mining area to allow the decanting water to lay in the dams and evaporate (Figure 11 and Figure 12. The clays as expected from the old riverbed must be removed and stockpiled separately for reuse in the ponds to create linings. Bentonite can be added to aid in sealing the ponds. The exact species composition must be determined on site by the aquatic specialist appointed for the project.

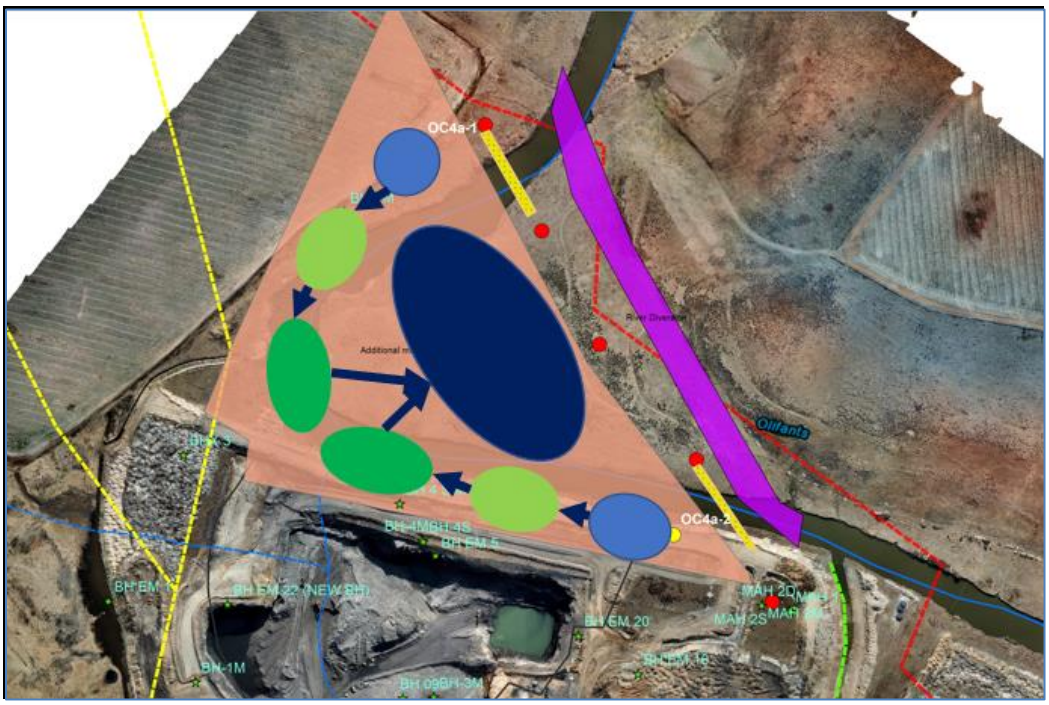

Figure 11: Proposed phytoremediation pond system

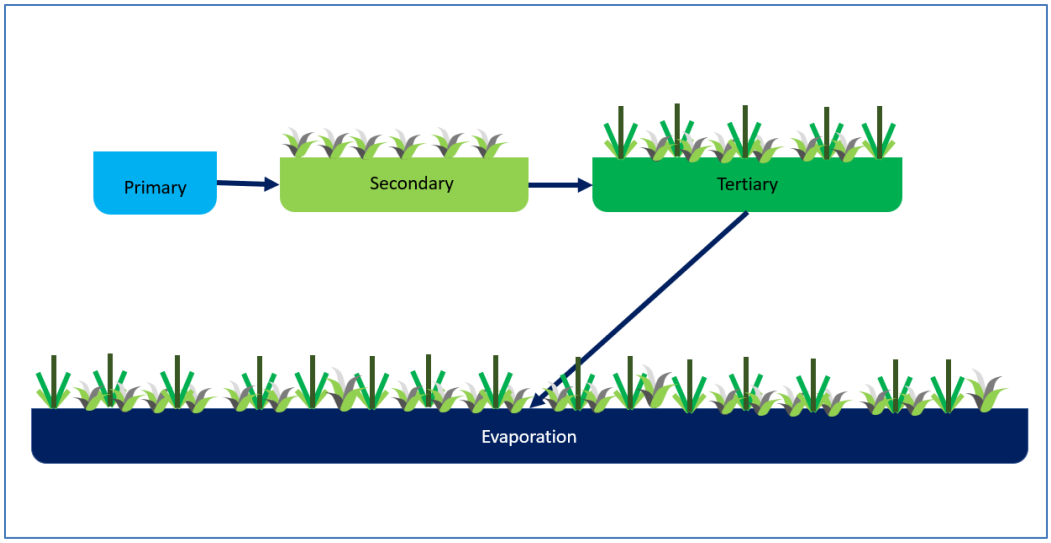

Figure 12: Layout of the Series of Dams

4 MONITORING PLAN

It must be noted that monitoring is ongoing on site. The main goal of the monitoring is to assess the efficiency of the rehabilitation process and to ensure that the methods and phases of the rehabilitation process are implemented. Most importantly the monitoring program is conducted to detect if the proposed rehabilitation methods, as designed, are efficient and operational.

Due to the complexity of the rehabilitation process, it is proposed that a specialist Aquatic Environmental Control Officer (AECO) be on site for the duration of the process. This is advised as the possible impacts on the aquatic ecosystem are of such a concern that a trained person be instated for the full length of the diversion process and pre and post phases. This period length is at the discretion of the ECO, the Developer, and the AECO and the Department of Water Affairs as seen in the WUL (tbc when WUL has been received). The AECO will be tasked with the health of the aquatic ecosystems through the identification and mitigation of any environmental problems encountered and will have the power to stop any activities impacting negatively on the aquatic and terrestrial ecosystems. This must be in line with the current state of the environment and targets to improve on the state of the environment through rehabilitation.

To assign a timetable for the monitoring of the impacts is not achievable since the duration of the various periods are not known. It is therefore suggested that at the discretion of the AECO, the developer and the contractor, the timetable be decided on an adaptive time basis to adjust to the needs of the parties. It is proposed that a weekly inspection and reporting be conducted. It is important to ensure the correct aspects are adhered to during the monitoring of the site (Table 4). This is only recommended and may differ in the water use licence.

Table 4: Aspects and Monitoring requirements for the Study Site

ASPECT	MONITORING REQUIREMENTS
Baseline condition prior to the impact	This report
Aspects requiring monitoring	Water quality parameters (WQP) if possible, General diversion related impacts, SASS 5, Fish population assemblage,
Monitoring location	Up and downstream of the diversion, At the outlet from Mistake Lake
Biomonitoring frequency	Six monthly/ Biannual
TWQR PARAMETERS	In situ as per **Error! Reference source not found.**
TWQR FREQUENCY construction	Monthly
TWQR FREQUENCY operational	Monthly
TWQR	As for aquatic ecosystems guideline by the Department of Water Affairs. Maximums can also be given in the WUL.
Responsible Party	Owner and construction company creating the diversion should appoint the AECO. Remediation work is the responsibility of the construction crews.
Frequency of Monitoring, and/or Timeframes	6 Monthly assessments of the Fish population, SASS 5 (or aquatic macroinvertebrate assessment)
Targets for Each Aspect Monitored	The mining should have a neutral impact on the system and thus the *in-situ* conditions
Photographic Record of Construction and Impacts	A fixed-point photographic record must be kept of the area. Reference images should be taken from a fixed point, before, during and after the construction.
Indicators for Measuring the Progress of Each Target	Water Quality: the indicators should not exceed the parameters set out in the in-situ conditions. Photographic image references: should be used based on visual observations of change
Environmental Driver Monitoring	Rainfall, temperature
Corrective Actions Implemented If Monitoring Is Not Progressive	As per the AECO monthly reports.

5 MONITORING REPORTING

5.1 MONITORING AND TIMETABLE

The AECO will also be tasked with the following timetable (Table 5). Proper follow up programs for the eradication of alien vegetation are important. If the program neglects to do follow-ups the initial eradication work would be in vain, and the problem will increase in scale.

Table 5: Monitoring time table

Daily	• Ensure wetland areas outside the construction areas are not being unduly imposed on by construction activities or accessed by any means. • Ensure no species of fauna and flora is being utilized by the construction workers or destroyed. • Any reported problems to be inspected immediately and mitigating actions taken to ensure no prolonged damage occurs to the site. • Rainfall and temperature (can be provided by the construction crews).
Weekly	• Inspection of sedimentation traps. • Inspection of aquatic plants occupying the wetland areas to make sure the plants is not disturbed. • Inspection of aquatic plants removed and kept for later reintroduction, to ensure their health. If any problems are found with the plants a solution should be sought as soon as possible.
Monthly	• Monthly dated photographs should be taken from fixed high importance spots (marked on a map) and should be compared to the in-situ situation and if the need arises the correct mitigating actions should be taken. • Ensure environmental training of construction workers is up to date. • Report on the state of the environment during construction.

5.2 REPORTING

Reporting frequency should be at the discretion of the AECO based on needs in terms of compliance, but no less than one report per week for all phases is recommended. See Table 6 for a reporting format on the impacts identified during this period. The water quality results should be indicated on a spreadsheet with date of sample, maximum and minimum TWQR and the results clearly indicated. If any major aspects occurred, such as high rainfall events, this must also be indicated. Photographic records of fixed points should include first image taken (before construction) and latest image on the same page for comparative ease.

Table 6: Proposed reporting format for the wetland ECO

Activity	Comments	Action to be taken	Date for compliance	Action group	Frequency of action	Impact description	Penalty	Progress of reported impact

6 CONCLUSION AND RECOMMENDATIONS

The diversion of any aquatic ecosystem must not be taken lightly and is the most detrimental activity that can be undertaken by a developer. The exact location and magnitude of impacts are very difficult to assess- especially considering the dissolving effect of impacts in water and the transportation of the impact from the impact area to a secondary location.

The monitoring of the rehabilitation process is of paramount importance to ensure the efficiency thereof. If rehabilitation does not occur as stipulated, then corrective measures must be enforced through the audit findings and reports. Communication between the rehabilitation implementer, the author of the rehabilitation plan, the developer, and the construction contractor is of principal importance to ensure execution of the rehabilitation plan. If any areas of concern are found, then they must be explored to determine the extent of and solution to the problem.

Due to the complexity of the rehabilitation process, it is proposed that a specialist Aquatic Environmental Control Officer (AECO) be on site for the duration of the process. This is advised as the possible impacts on the aquatic ecosystem are of such a concern that a trained person be instated for the full length of the diversion process and pre and post phases.

6.1 GO/ NO GO

Many years of mining on site and in the catchment has reduced the condition of the aquatic ecosystems on site. The risk of acid mine drainage will increase each year of operation. The diversion of the river system as proposed will decrease this risk and remove the coal creating AMD conditions. It is important that the activity on site is monitored by a suitably qualified (SACNASP register in the field of aquatic sciences) aquatic ecologist on a quarterly basis to ensure non- and stochastic events and impacts are mitigated.

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