Monitoring Requirements

1) Proposed Monitoring of Surface Water Resources

The proposed stormwater drainage and associated infrastructure is intended to improve the current scenario in terms of conveying the ash laden stormwater runoff into the ADDD via the proposed sump, interconnecting pipelines, EST, WST and the overland pipelines from the EST and the WST to the ADDD. In addition to the current surface water monitoring points that are sampled monthly, two additional sites have been identified which require monthly monitoring for the proposed development.

Recommendations have been made on what future monitoring should be conducted in order to establish changes to baseline information.

As indicated in Table 1, the Wetland Rehabilitation must be implemented for the wetland and buffer zone. Refer to the rehabilitation focus area in Figure 1.

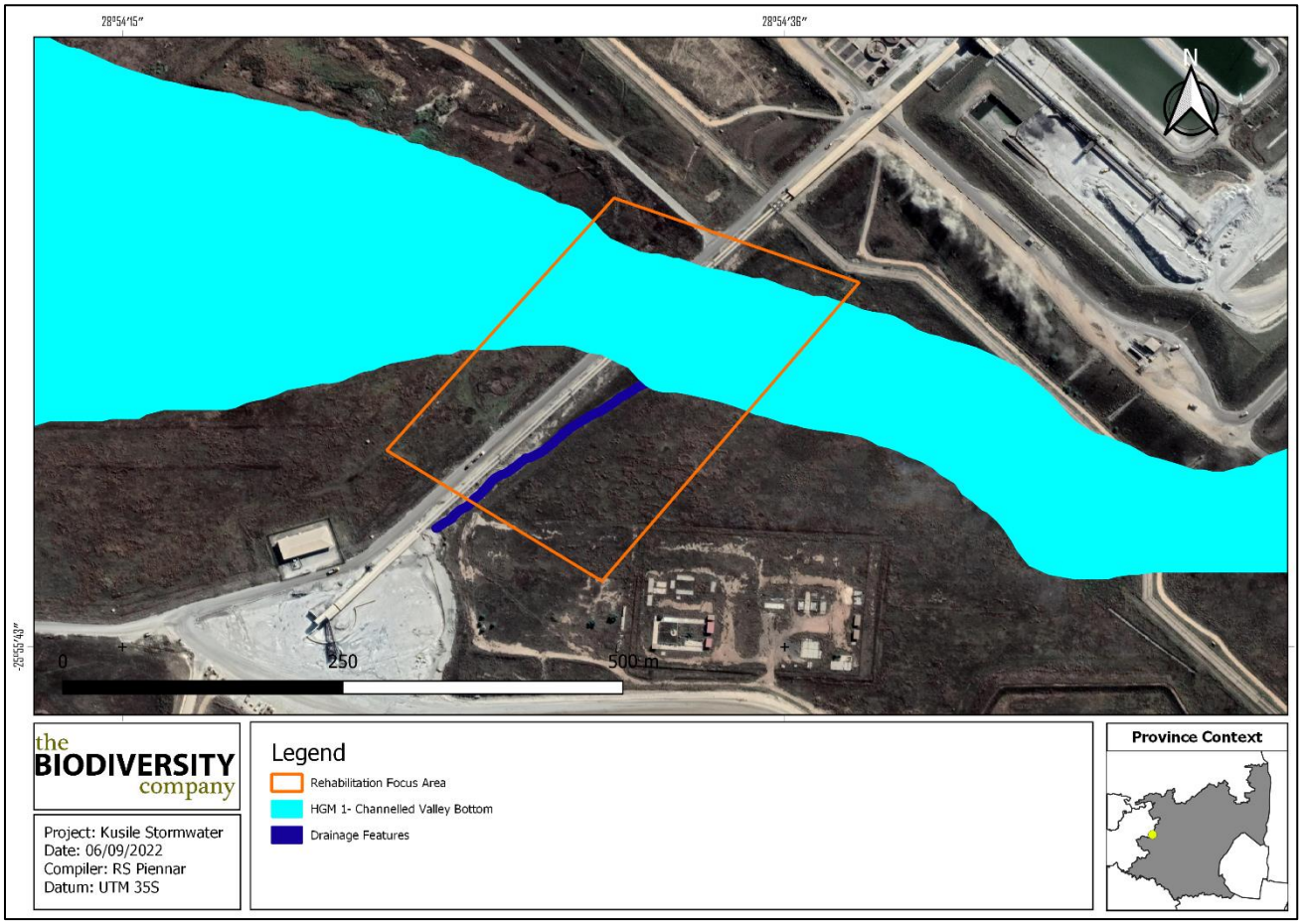

Figure 1: Rehabilitation Focus Area

The prescribed Wetland Rehabilitation Plan must be undertaken post-construction of the proposed construction of the stormwater drainage and associated infrastructure, to prevent further deterioration / loss of ecological integrity and functioning of the system.

The following rehabilitation measures must be implemented:

- The contaminated silt/material that settled into the artificial drainage line and the channelled valley bottom wetland on site must be removed.
- The areas excavated for the construction activities must be backfilled with topsoil to ensure successful rehabilitation.
- The surface of this topsoil area outside of the delineated wetland must be slightly compacted to compensate for subsidence of this material.
- Vegetation cover must be restored to decrease flow velocities, assimilate contaminants, increase biodiversity and minimise erosion.
- It is recommended that all invasive species located within wetland, as well as the rehabilitation focus area affected by the proposed activities be controlled / removed. This is to improve the conditions of the wetland as well as to, most importantly, decrease competition between the re-vegetated *Cyperus* spp./ *Imperata cylindrica* and alien invasive species.

In terms of design, the following must be implemented:

- Soft or green engineering features should be incorporated into the management of stormwater. Only clean water may be discharged into the wetland areas; and
- Stormwater diversions and channels should be vegetated swales and impermeable material must be avoided. Litter traps / nets should be attached to stormwater outlets (discharge areas). These must be monitored and managed particularly after rainfall events.

The Contractor shall make every effort to preserve the area, to minimise environmental disturbance and to inform employees as to the ecological sensitivity and importance of the area. The Contractor shall be responsible for any avoidable damages to the environment resulting from the actions of any employees.

The time of planting must be carried out as far as is practicable during the period most likely to produce beneficial results, but as soon as possible after the soil properties are estimated to be adequate. The seasonal period is from the beginning of April to the end of October.

The mitigation measures with regards to the following aspects of rehabilitation must be adhered to:

- Erosion;
- Establishing cover;
- Fire;
- Shaping;
- Trimming;
- Soiling and seeding;
- Watering, weeding, cutting and replanting;
- Planting/seeding of natural vegetation; and
- Preparation for grassing.

In terms of monitoring of the rehabilitation activities, the following must be undertaken:

- Regular monitoring and maintenance (*such as removing Alien Invasive Plants (AIP) /weeds and encroachment*) must be undertaken for successful revegetation/rehabilitation. Monitoring must consist of photo points and documentation of observations. It is recommended seasonally for the first two years of establishment and at least annually thereafter.
- General maintenance must involve AIP and weed control as well as thinning of encroachment. Continues weed control is critical to the success of revegetation and should be a high priority. Weeding around plants is necessary to avoid competition and stress. This must be carried out as required;
- There must be AIP and weed control during the first two years after rehabilitation and the undesired species must be controlled from spreading. As with site preparation, removal of weed can be accomplished by mechanical means. Care must be taken not to damage the emerging plants or the soil layer. Stringent weed management may eventually increase the area's resistance to further weed invasion by favouring the growth and establishment from the seedbank;
- If possible, the rehabilitated areas must be irrigated at regular intervals, taking care not to cause erosion or damage the soil surface by using an excessive force of water; and
- The rehabilitated area must be left undisturbed, and all access prohibited, except when maintenance is being undertaken.

The Monitoring Plan (Table 1) must be implemented to evaluate the success of the rehabilitation efforts in terms of vegetation cover, erosion, sedimentation, invasive plant species and solid waste management.

(a) Monitoring Programme

The monitoring plan (Table) 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 project.

Rehabilitation: During rehabilitation, monitoring is essential to ensure that all recommended rehabilitation aspects are successfully applied. 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:

- Presence of contaminated silt/sediment;

- Recovery of the vegetation layer;
- Extent of alien vegetation establishment;
- Hydrology and induction of the systems;
- The formation of erosion gullies and sedimentation of the wetlands.

Table 1: The proposed monitoring plan for Wetland Rehabilitation

Variables	Methods	Monitoring Frequency	Indicator	Corrective Action
Vegetation cover	• Monitor species and cover abundance; • Monitor indigenous vs alien plant encroachment; and • Fixed point photography	• After rehabilitation; and • Seasonal for the first two years.	• Establishment of primarily indigenous plants; and • Ground cover abundance is approximately 60% after the first year, and 80% after year two and 100% thereafter.	Replanting of indigenous grass species should be implemented if natural revegetation is not successful after one year. A list of potential indigenous grass species has been indicated above.
Erosion	• On-site inspection; • Fixed point photography; and • Compare to adjacent areas	• After rehabilitation; and • Seasonal for the first two year.	• Areas with no cover; • Erosion gullies; • Stormwater infrastructure; and • Pipelines	• Short term: Rocks / boulders, and on-site debris; • Medium term: Replanting of indigenous vegetation; and • Long term: Rehab methods that may include gabion baskets, mattresses and should be discussed with specialists
Sedimentation	• On-site inspection; and • Fixed point photography	• After rehabilitation; and • Seasonal for the first two years.	Excess/contaminated sediment in wetland	Contaminated silt/sediment should be removed from the drainage area and the wetland; The stormwater infrastructure should divert the polluted water away from the wetland to the proposed collection sumps for storage. Sources of sedimentation should be monitored and addressed when needed.
Invasive Plant Species	• Monitor invasive plant encroachment; • On-site inspection; and	• After rehabilitation and follow- up clearing; and • Seasonal for the first two	Establishment of invasive plant species	Removal of invasive plants. Consult a botanist on what removal measures are best suited per species. Do not use

Variables	Methods	Monitoring Frequency	Indicator	Corrective Action
	• Fixed point photography	years.		chemicals for the removal process as far possible.
Solid waste	• On-site inspection; and • Fixed point photography	• After rehabilitation and follow- up clearing.	The presence of: • Litter; • Dumping material; and/or • Building rubble.	Removal of solid waste and disposal at a licensed facility.

(b) Monitoring Responsibilities

The responsibility for ensuring the implementation and continuation of the monitoring programme rests with Eskom. Further, it is the responsibility of the implementing service provider that the monitoring programme be conducted in a manner that is in accordance with the best practices of the Department of Water and Sanitation and as prescribed by the Monitoring Programme. The Wetland Ecologist Specialist to be appointed by Eskom to undertake the Monitoring Programme, must be registered with the South African Council for Natural Scientific Professions (SACNASP) as a Professional Natural Scientist in accordance with the Natural Scientific Professions Act (Act 27 of 2003).

In terms of surface water quality monitoring, in addition to the monthly sampling that is taking place at the Kusile Power Station, two additional monitoring points must be sampled for the proposed development. The monitoring locations and the parameters for monitoring are listed in the table below.

Table 2: Additional Monitoring locations and parameters

Monitoring Point	Latitude	Longitude
Sample Point 1	25° 55’ 27.51”S	28° 54’ 17.14”E
Sample Point 2	25° 55’ 33.88”S	28° 54’ 41.15”E

The limits prescribed in this monitoring programme is stipulated in the Target Water Quality Range (TWQR) for aquatic ecosystems (DWAF, 1996) and the Resource Quality Objectives (RQOs) for the Oliphant’s WMA (DWS, 2018). The water quality parameters are prescribed to the RQO and TWQR limits (Table 3).

Table 3: Proposed water quality parameter limits

	pH	Conductivity (µS/cm)	Dissolved Oxygen (mg/l)	Temperature (°C)
TWQR*	6.5-9.0		>5.00	5-30*
RQO**		≤ 1110		
***TWQR – Target Water Quality Range (DWAF, 1996)** ****RQO’s – Resource Quality Objectives (RSA, 2016)**				

2) Proposed Monitoring of Groundwater Resources

The groundwater monitoring network design should comply with the risk-based source-pathway receptor principle. A groundwater-monitoring network should contain monitoring positions which can assess the groundwater status at certain areas. Both the impact on water quality and water quantity should be catered for in the monitoring system. The boreholes in the network should cover the following:

- Contaminant sources; and
- Sensitive receptors.

Furthermore, monitoring of the background water quality and levels is also required. Groundwater monitoring should be conducted to assess the following:

- Groundwater quality trends; and
- Groundwater levels.

The proposed monitoring network is presented in Table 4. Two (2) boreholes are recommended to be installed and monitored, while water from the drain outlet pipe (MP1) should also be monitored during construction. The locations of the proposed monitoring points are presented in Figure 2.

Table 4: Proposed Monitoring Network

Name	Co-ordinates (WGS,84)		Comment
	Latitude	Longitude	
MW1	25°55'36.76'' S	28°54'28.36'' E	Proposed monitoring borehole
MW2	25°55'38.52'' S	28°54'27.94'' E	Proposed monitoring borehole
MP1	25°55'33.61'' S	28°54'33.40'' E	Monitoring of discharge water

Table 5: Water monitoring programme

Monitoring position	Sampling interval	Analysis	Water Quality Standards/Limits
All monitoring boreholes	Quarterly: measuring the depth of groundwater levels	n/a	n/a
All monitoring boreholes	Monthly during construction, and bi-annually thereafter: sampling for water quality analysis	Full analyses	Water Use License Number 04/B20F/BCFGIJ/41 limits
Monitoring point	Monthly during construction and quarterly thereafter: sampling for water quality analysis	Full analyses	Water Use License Number 04/B20F/CGI/1836 limits

a) Monitoring Parameters

The identification of the monitoring parameters is crucial and depends on the chemistry of possible pollution sources. They comprise a set of physical and/or chemical parameters (e.g., groundwater levels and predetermined organic and inorganic chemical constituents). The following parameters should be analysed for as a minimum based on constituents of concern identified during previous monitoring events.

b) Groundwater Minimum analysis

- Physical Parameters:
  - Groundwater levels
- Chemical Parameters:
  - Field Measurements: pH; EC; Temperature
  - Laboratory Analyses:
    - Anions: SO_4, F, NO_3
    - Cations and Metals: Cr^{3+}, Cr^{6+}, Mn, Mg, B, Ca, Cd, Pb, Hg, V, As, Ba

- Other: Total Suspended Solids (TSS), Total Dissolved Solids (TDS), T-Alkalinity, pH, Electrical Conductivity (EC), Dissolved Oxygen (DO), Turbidity

c) Discharge Point Minimum analysis

- Chemical Parameters:
  - Field Measurements: pH; EC; Temperature
  - Laboratory Analyses:
    - Anions: SO_4, F, NO_3, NH_4
    - Cations and Metals: Cr^{3+}, Cr^{6+}, Mn, Mg, B, Ca, Cd, Pb, Hg, V, As, Ba
    - Other: TSS, TDS, T-Alkalinity, pH, EC, DO, Turbidity, Chemical Oxygen Demand (COD), $CaCO_3$.

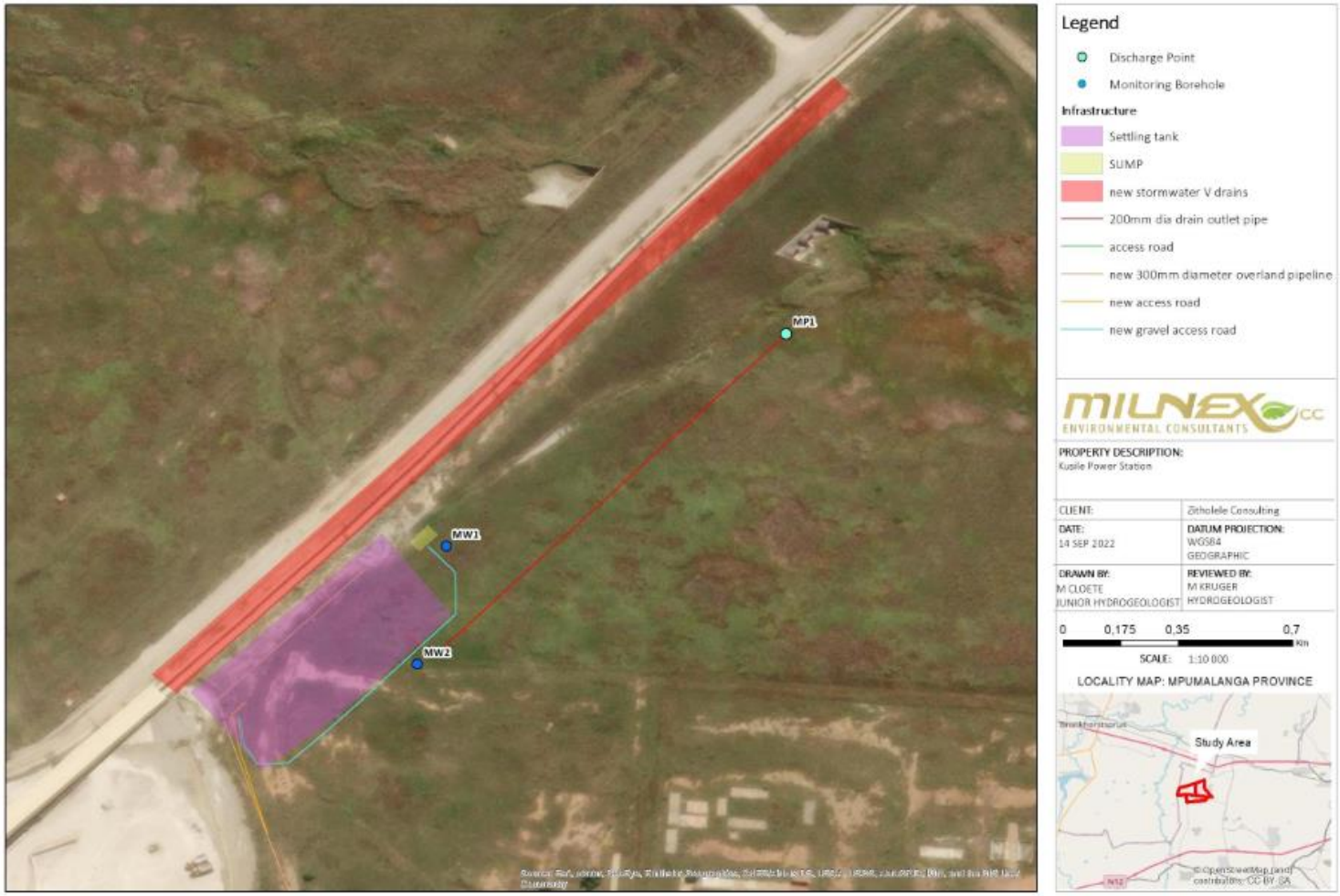

Figure 2: Proposed Monitoring Programme

d) Monitoring Responsibilities

Laboratory analysis techniques should comply with SANAS guidelines. The groundwater monitoring database should be updated to include new monitoring points and be updated as information becomes available. The database should be used to analyse the information and trends should be evaluated by a qualified and SACNASP registered hydrogeologist. These records will need to be made available to the Department of Water and Sanitation or any other regulatory bodies upon request.

3) Audit and Report on Performance of Measures

Reports outlining the results of the surface and groundwater monitoring, are to be compiled after each monitoring and each sampling activity. These reports will highlight any negative impacts on the wetland and groundwater due to operations as well as determine the sources of the impacts. The reports should also discuss possible actions which can be used to mitigate any negative impacts. Relevant results will be graphed so that trends may be visually observed.

Eskom's safety, health and environmental policy commits the organization to excellence in all these areas and assures employees, contractors, visitors, stakeholders and the public that they will conduct their business in a caring and responsible manner. An environmental management system is in place to ensure legal compliance, reduce risk and demonstrate due diligence as well as monitor environmental performance. The objective is continual improvement.

Environmental inspections, internal audits and third-party audits are conducted as per the audit programme. In addition, an Environmental Control Officer (ECO) will be appointed to monitor compliance to the Water Use Licence, Environmental Authorisation (EA) and Environmental Management Programme (EMPr's) during the construction, rehabilitation and post-rehabilitation phases.

The Kusile Power Station follows operational procedures and maintenance practices to ensure consistent and effective performance of water management onsite. All dirty water containment facilities will be designed in accordance with the specifications as contained in GN 704 Regulations. Adherence to the Environmental Management System (EMS) as endorsed by Eskom, coupled with the internal water management protocol of the Station, as culminated in the plan as well as compliance with the conditions of the Existing Water Use Licences will ensure that impacts on the environment will be minimised.

Please refer to detailed EMPr attached as Appendix 8 of the IWWMP.

Construction of the proposed stormwater drainage and associated infrastructure will be undertaken upon receipt of the Water Use Licence (WUL) by the DWS and an Environmental Authorisation (EA) to be issued by the DFFE. Construction must be undertaken as per the conditions of the EA, WUL and the Environmental Management Programme (EMPr).

The purpose of the EMPr is to ensure a proactive rather than reactive approach to environmental performance by addressing potential problems before they occur. This will limit corrective measures needed during the construction phase of the project. Therefore, the purpose of an EMPr is to provide management measures that must be implemented by Applicant, Engineers and Contractors alike, to ensure that the potential impacts of the proposed development are minimised. It must also be ensured that the EMPr is maintained and upheld as a dynamic document in order for the project team to add or improve on issues that might be considered left out or not relevant to the project. In such

instances, the approving authority may authorise the Environmental Control Officer (ECO) to make such changes.

During the construction phase, the applicant must employ the services of an Independent ECO to monitor compliance with the conditions of the EA, WUL and the EMPr, prior to any site establishment and during the course of the construction activities. The ECO will be responsible to audit the construction site and provide reports at a frequency as stipulated in the WUL and EA. Specific conditions of the EA and WUL will be written into the amended EMPr for measurement of performance of the Applicant, Project Engineers and construction crew during the construction phase of the project.

The roles and responsibilities of the ECO are as follows:

- To objectively monitor implementation of relevant environmental legislation, conditions of EA, WUL and the EMPr for the project. The ECO must be on site prior to any site establishment and must endeavour to form an integral part of the project team.
- The ECO must be proactive and have access to specialist expertise as and when required, these include Geohydrologists and Freshwater Ecologists, etc.
- The ECO must conduct audits on compliance to relevant environmental legislation, conditions of EA, WUL and the EMPr for the project. The EA will determine the frequency at which the ECO will be required to conduct audits. (Weekly site inspections must be undertaken).
- The ECO must be the liaison between the relevant authorities and the project team. The ECO must communicate and inform the developer and consulting engineers of any changes to environmental conditions as required by relevant authoritative bodies. The ECO must ensure that the registration and updating of all relevant EMPr documentation is carried out.
- The ECO must be suitably experienced with the relevant environmental management qualifications and preferably competent in construction related methods and practices.
- The ECO must handle information received from whistle blowers as confidential and must address and report these incidences to the relevant Authority as soon as possible.

Refer to the EMPr in Appendix 8 of the IWWMP, for a detailed monitoring programme, description of the auditing, compliance and reporting mechanisms to ensure execution of the mitigation measures and for informing DWS of incidents. Detailed mitigation measures are provided in the EMPr which must be strictly adhered to by the Project Team and audited by the ECO.