

**MOKOLO AND CROCODILE
WATER AUGMENTATION PROJECT
PHASE 2 (MCWAP-2)**

TENDER NO 054/2024/PMID/MCWAP2/RFB

**PART C3.1
SPECIFICATION**

SECTION 8

DEALING WITH WATER

PART C3.1
SPECIFICATION

SECTION 8
DEALING WITH WATER

TABLE OF CONTENTS

	PAGE
SECTION 8	1
8.1 SCOPE	1
8.2 DEFINITIONS, ABBREVIATIONS AND REFERENCES	1
8.2.1 Definitions	1
8.2.2 Abbreviations	2
8.2.3 References.....	2
8.3 DEALING WITH WATER	2
8.3.1 General.....	2
8.3.2 Submissions.....	4
8.3.3 Surface and Trench Excavations	4
8.3.4 Borrow Pits	5
8.3.5 Underground Works.....	5
8.3.6 Groundwater.....	9
8.4 MANAGEMENT OF WATER	10
8.4.1 Pumping.....	10
8.4.2 Management of Polluted Runoff.....	10
8.4.3 Quality of Water Discharged from the Works.....	11
8.4.4 Sedimentation Ponds.....	11
8.4.5 Pipeline Testing.....	11
8.4.6 Water Abstraction	12
8.5 WATER MONITORING	12
8.5.1 Water Quantity.....	12
8.5.2 Water Quality Monitoring.....	12
8.6 MEASUREMENT AND PAYMENT	14

LIST OF FIGURES

FIGURE 8/1 TYPICAL SECTION THROUGH WETLAND 9

FIGURE 8/2 TYPICAL BACKFILL OF PIPE TRENCH THROUGH WETLAND..... 9

LIST OF ANNEXURES

ANNEXURE 8/1 16

ANNEXURE 8/2 17

ANNEXURE 8/3 18

SECTION 8

DEALING WITH WATER

8.1 SCOPE

This Section deals with the requirements for dealing with water including the collection, treatment and discharge of water within and from the Works arising from all natural and artificial (man-made) sources.

8.2 DEFINITIONS, ABBREVIATIONS AND REFERENCES

8.2.1 Definitions

- a) **“Sedimentation or Settlement ponds”** are ponds that retain sediment laden water from the Works for a sufficient period for the sediment to settle, and comply with the applicable discharge standards. These include small scale portable devices used to remove sediment from water.
- b) **“Oil separator”** is a trap that separates oil from water and prevents oil from being carried into the environment and ensure that the final effluent complies with the applicable standards.
- c) **“Slurry trench”** is a trench filled with bentonite or other material to create an impervious barrier.
- d) **“Pollution incident”** is any incident that may or has caused contamination of soil or water (ground or surface), and may result in measurable damage to the natural environment.
- e) **“Contaminated water”** means any water contaminated (impacting on the fitness of use or exceeding the relevant water quality discharge standards) by the Contract activities and relates to work occurring in a Watercourse / Waterbody, or any form of pollutant to surface or underground water.
- f) **“Minimum”**, when referring to environmental impact, means the best possible environmental option not exceeding excessive cost.
- g) **“Watercourse”** means:
 - i) a river or spring;
 - ii) a natural channel in which water flows regularly or intermittently;
 - iii) a wetland, lake or dam into which, or from which, water flows;
 - iv) any collection of water which the Minister of Water and Sanitation may, by notice in the Gazette, declare to be a watercourse; and
 - v) a reference to a watercourse includes, where relevant, its bed and banks, up to and including the 1:100 flood line.
- h) **“Waterbody”** means a body containing any form of water and includes dams and Wetlands, whether ephemeral or permanent.
- i) **“Wetland”** means all areas with waterlogged soils, or soils covered with a shallow layer of water (permanently or seasonally), unique types of soil formed under seasonal or permanent saturation, and distinctive plants adapted to water-saturated soils.

8.2.2 Abbreviations

CEMPr	:	Construction Environmental Management Programme
COD	:	Chemical Oxygen Demand
EC	:	Electrical Conductivity
EWR	:	Ecological Water Requirement
NWA	:	National Water Act, 1998 (Act 36 of 1998)
SANAS	:	South African National Accreditation System
SANS	:	South African National Standard

8.2.3 References

When reference is made to a Code of Practice, Specification or Standard, the reference shall be taken to mean the latest edition or replacement at time of tender of the Code, Specification or Standard; including addenda, supplements, modifications and revisions thereto. Where a previous version is intentionally used, it will be indicated as such. Where reference is made to a Code, Specification or Standard that has subsequently been withdrawn and not replaced, the intended content will remain relevant unless confirmed otherwise in writing by the Engineer.

8.3 DEALING WITH WATER**8.3.1 General**

Except as otherwise specified in the Specification, the Contractor shall bear all risks and costs associated with the management and control of water, whether from local water courses, rainwater, seepage, underground springs or any other source or cause.

The Contractor shall take all precautions and properly deal with and dispose of all water to ensure that:

- a) The Works are kept sufficiently dry at all times for their proper execution;
- b) There is minimum deleterious impact on the environment and adjacent properties;
- c) Stormwater runoff as a result of storms up and including at least a 1:50 year storm is controlled effectively at all borrow areas;
- d) Stormwater runoff as a result of storms over a 24-hour period, up and including at least a 1:20 year storm, is controlled effectively at all other areas of the Works, including, but not limited to; temporary stormwater control / diversion structures, erosion control structures, river crossings, sedimentation ponds, etc.;
- e) There is minimum damage, inconvenience or interference arising from flood waters;
- f) There is compliance with all relevant legislation;
- g) All construction activities to comply with the requirements of the National Water Act, 1998 (Act 36 of 1998) (NWA);
- h) Prevent water leakages from pipes or taps under the control of the Contractor;
- i) Manage stormwater from construction sites to avoid environmental contamination and erosion; and
- j) Prevent erosion on access roads due to construction traffic.

PART C3.1 - SPECIFICATION

To ensure compliance with the above list, the Contractor shall construct sumps, furrows, drains, cofferdams, measuring weirs, settlement ponds, oil separators, slurry trenches, cut-off trenches and any other Temporary Works as may be necessary. The Contractor shall also provide, operate and maintain in sufficient quantity such pumping equipment, well points, pipes, pollution prevention and control structures or equipment, and other measures and equipment as may be necessary, subject to the environmental controls specified in this Section and Section 4 – Environmental Management. Establish a dedicated vehicle maintenance area and wash-bay, where suitable stormwater management measures are in place to prevent pollution.

Such measures shall continue for the duration of the Contract, and shall at all times be subject to the agreement of the Engineer with regard to their sufficiency and the achievement of environmental protection goals.

The Contractor shall minimise the use of water and shall immediately attend to any wastage, in order to rectify the problem and introduce additional measures to prevent its recurrence.

Natural water sources (e.g. springs, streams, open Waterbodies) shall not be used for the purposes of personal washing and the washing of equipment or clothing. Similarly, natural water sources may not be used for construction water abstraction unless valid water use licences in this regard have been submitted to the Engineer.

The Contractor shall notify the Engineer immediately of any pollution incidents as defined in Section 4 – Environmental Management, on Site. Verbal reports must be followed up by a report in writing within 24 hours of the incident in accordance with reporting criteria specified in Section 4 – Environmental Management.

Upon completion of the Works, all temporary diversions, protective works and dewatering systems shall be removed by the Contractor. Affected areas shall be rehabilitated in terms of Section 47 - Landscaping and Rehabilitation.

The following areas of MCWAP-2 is underlain by dolomite:

Location	Site Geology
Site A	
5.9 km Low Lift Rising Main	0.0 km to 3.62 km directly underlain by dolomite
Site B	
29.161 km High Lift Rising Main	26.5 km to 29.161 km directly underlain by dolomite
Break Pressure Reservoir at the end of the High Lift Rising Main	Directly underlain by interbedded dolomite and quartzite
101.3 km Gravity Main	0.0 km to 2.6 km directly underlain by dolomite

Dolomite investigations are documented in the following reports:

- MCWAP 2 Geotechnical Investigation Dolomitic Stability Assessment Report, Report No: 2A-R-111E-22 (Rev B), dated June 2020; and
- Design of pipes underlain by dolomitic rock, Report No: 2A-R-111G-28 (Rev A), dated June 2020.

The Engineer has incorporated recommendations in these reports into the design of the relevant pipelines. It is the responsibility of the Contractor to comply with all requirements applicable to the construction of MCWAP-2.

8.3.2 Submissions

The following Method Statements shall be submitted to the Engineer for approval within 28 days after the Commencement Date of the Contract:

- a) Drainage and stormwater layout and control methods;
- b) Erosion control and prevention of sediment deposition;
- c) Sedimentation ponds and the treatment of sludge;
- d) Treatment and control of all contaminated return water to natural Watercourses, Waterbodies, or land;
- e) Dewatering;
- f) Water quality and quantity monitoring, and
- g) River and stream crossings.

Also refer to Method Statements required at a later stage; detail in Section 33 – Laying and Pressure Testing Steel Pipes.

8.3.3 Surface and Trench Excavations

Wherever possible, surface works, general and trench excavations shall be protected against the ingress of surface and groundwater, and the Contractor shall take whatever precautions may be required (e.g. berms and cut-off drains). Where the ingress of water is unavoidable, the Contractor shall ensure that the excavation is free draining and that any water that does not enter the excavation does not endanger its stability or cause erosion of any portion of the Works. The disposal of any water found in the excavation shall comply fully with all relevant legislation, and applicable water quality standards.

The Contractor shall furthermore ensure that no concentration or accumulation of water occurs either within, around or above the area of any open excavation which may affect the safety of the excavation.

The Contractor shall, where possible, maintain excavations such that ponding of rain water is prevented by suitably sloping surfaces and by the construction of channels and sumps.

Where excavations are not self-draining, the Contractor shall construct sumps and install pumps of adequate capacity to keep the water level in such sumps 0.5 m below the lowest excavated surfaces for as long as required for construction of the Works. Diesel powered standby pumps shall be readily available in case of breakdowns.

Excavations for pipe drains, culverts, service ducts and similar structures shall be adequately protected against the possible ingress of water during rainstorms, and shall be free-draining, where possible, without the risk of releasing contaminated water into the environment.

The Contractor shall ensure that in areas where existing pipes / channels / canals carrying water or water containing waste that may enter the servitude and pipe excavation that the necessary agreements are reached during the pre-construction survey on how these areas will be managed

PART C3.1 - SPECIFICATION

to ensure that such water or water containing waste is kept out of the servitude and any excavation. Such agreement shall fully comply with all relevant legislation.

The Contractor shall implement measures to prevent the flooding of trenches, floating of pipes and any other damage to the Works.

Refer also Section 9 – Bulk Surface Excavations and Trenching, Section 15 – Trench Backfilling and Bedding and Section 27 – Surface Drainage and Erosion Protection.

8.3.4 Borrow Pits

Borrow pits shall be continuously protected against the avoidable ingress of surface and rain water runoff, and the Contractor shall construct such temporary cut-off and diversion measures as may be required to divert or control surface water in line with the requirements of Regulation 704 promulgated in terms of the National Water Act (Act 36 of 1998).

The Contractor shall minimise the flow of any surface water or floodwater into borrow areas. Where necessary he shall protect borrow areas by an earth berm or sandbag system to deflect clean surface runoff away from excavations.

The Contractor shall allow for the drainage of all borrow areas.

No residue or substance which causes or is likely to cause pollution of a water resource may be placed in the workings of any borrow pit.

The Contractor shall plan his borrow operations in such a way that the borrow pits above the natural water table are self-draining. Where this is not possible, these borrow pits shall be dewatered by pumping. In gaining materials from borrow areas below the water table, the Contractor shall ensure that disturbed water from within the borrow pit will not be contaminated.

In this regard the requirements of Section 14 – Spoil, Borrow and Excavated Materials are also relevant.

8.3.5 Underground Works

The Contractor shall deal with all water in underground Works whether flowing into the Works from natural water sources or as a result of construction operations. The Contractor shall keep construction areas dry for the duration of his activities in or near Watercourses, Wetlands and Waterbodies. This work shall also be done in accordance with the requirements for Sensitive Areas in Section 4 – Environmental Management.

8.3.5.1 Requirements for Working in Waterbodies and Watercourses

When working in or near Watercourses and Waterbodies, the Contractor shall take all precautions necessary to prevent contaminated water from construction activities entering the Watercourses and Waterbodies. Contaminated water, which includes water contaminated with silt, soil particles etc., shall be pumped from the construction areas and be dealt with in terms of Clause 8.4.1 and Clause 8.4.2 before it is returned to the Watercourse or Waterbody. For the duration of construction or when a Watercourse or Waterbody is disturbed in any way, the effect on the water in such Watercourse or Waterbody shall be monitored and tested in terms of Clause 8.5.

PART C3.1 - SPECIFICATION

When working in or near any Watercourse or Waterbody, the Contractor shall be cognisant of the following environmental controls and considerations:

- a) No work in or near Watercourses shall commence without the Engineer's express permission, and approval of the requisite method statement;
- b) When planning work in or near a Watercourse the Contractor shall take into account possible water levels during the period of construction. Climatic data is provided in Section 1 – General, Hydrological runoff data in Part C4.3 Hydrological Data as well as Section 33 – Laying and Pressure Testing Steel Pipes;
- c) Monitoring of water quality shall be undertaken as per Clause 8.5 for the duration of construction at all point and diffuse source monitoring sites as well as three baseline monitoring sites included in Annexure 8/3;
- d) The Contractor shall program the execution of the Works such that construction within flowing water is minimised. In this regard, the only work that will be allowed in flowing water shall be the creation of coffer dams, or installation of diversion structures. All diversions shall be in place, water diverted away from, or piped across the working area and the temporary infrastructure suitably protected against erosion and flooding prior to excavation commencing. Due to the perennial nature of the system, construction should preferably commence and be completed during the dry months in the Matlabas River;
- e) Construction equipment, including light vehicles, shall not cross any Watercourse or Waterbody or operate from within the Watercourse channel, unless it is essential to the execution of the Works and after all permissions referred to above have been obtained;
- f) When working in flowing water, the Contractor shall ensure that downstream sedimentation is controlled by installing and maintaining the necessary temporary sedimentation barriers, e.g. geo-fabric silt curtains or sedimentation weirs constructed out of suitably secured straw bales or other methods. Sedimentation barriers shall be a maximum of 25 m downstream of the construction activities, and up to a maximum of 200 m downstream of the activities in the Crocodile River (West). In all instances these barriers shall be installed prior to the commencement of construction activities in flowing water. However, in cases where the water flow may be such that these measures cannot be maintained, the Engineer may agree to suitable other measures to protect the environment;
- g) Where practical (depending on scale), temporary diversions shall be lined with 250 µm plastic or geotextile fabric to control the erosive effects of the flow and prevent the migration of fines into the Watercourse. The full cross-section of the temporary diversion shall be lined, and the plastic/ geotextile strips shall extend for a minimum of 2 m beyond the lip of the excavation and shall be anchored using sandbags. Adjacent plastic / geotextile strips shall be overlapped with the upstream section overlaying the downstream section;
- h) During the execution of the Works, the Contractor shall take appropriate measures to prevent pollution and contamination of the riverine environment e.g. including ensuring that construction equipment is well maintained and not leaking oils or fuel, placing of drip trays under pumps, installation of oil absorbent booms across the Watercourse, re-fuelling and servicing equipment outside of the Watercourse area, provision of the requisite hydrocarbon spill kits, provision of litter bins, regular monitoring etc. as indicated in Section 4 – Environmental Management;
- i) All construction roads in or adjacent to the riparian zone should be aligned and managed so as to minimise disturbance of the riparian zone and in-stream habitats;
- j) Where earthworks are being undertaken in close proximity to any Watercourse or Waterbody, slopes shall be stabilised using sandbags or geotextile to prevent sand and rock from entering the water;

PART C3.1 - SPECIFICATION

- k) The mitigation methods used should be audited during construction, and monitored for a period thereafter, until full rehabilitation is assured and stability demonstrated;
- l) Include mitigation measures identified as part of environmental sensitivity walk down survey;
- m) Appropriate rehabilitation and re-vegetation measures for riverbanks, as outlined in Section 47 – Landscaping and Rehabilitation, shall be implemented timeously. In this regard, the banks should be appropriately and incrementally stabilised as soon as construction allows;
- n) For natural Watercourses, the original geometry, topography and geomorphology in both cross-sectional and longitudinal profile should be reinstated to match the conditions that prevailed prior to construction, both upstream and downstream of river crossings;
- o) Construction areas should be demarcated and watercourses marked as “restricted” in order to prevent the unnecessary impacts to these systems;
- p) Storm water channels and preferential flow paths should be filled with aggregate and/or logs (branches included) to dissipate and slow flows limiting erosion; and
- q) See requirements in CEMPr for additional measures to manage impacts to watercourses, including:
 - Specialist Environmental Investigations;
 - Approvals, Permits and Licensing Requirements;
 - Construction Site Planning and Layout;
 - Management of Water;
 - Management of Pollution Generation Potential; and
 - Management of Reinstatement and Rehabilitation.

With regards to flow, the following should be ensured:

- a) During the excavation within watercourses, flows should be diverted around active work areas where required. Water diversion must be temporary and re-directed flow must not be diverted towards any stream banks that could cause erosion;
- b) Minimise construction footprint where the construction activities take place in-stream or in close proximity to watercourses;
- c) Prevent erosion on steep slopes;
- d) Minimise influence to downstream flow regime when diverting and impeding flow for cofferdams, temporary river crossings or for any other purposes;
- e) Do not hinder flow in natural drainage lines; and
- f) Construction activities not to adversely interfere with downstream water users.

With regards to river morphology, the following should be ensured:

- a) Reinstatement (shaping) and rehabilitate (riparian vegetation) affected areas in riparian zone and watercourse channel. Structure and function to be returned to pre-construction state;
- b) Install suitable buttressing to prevent future erosion, if required;
- c) No illegal crossing of watercourses with construction Equipment. Suitable temporary river crossing to be built. Select most appropriate crossing point based on geotechnical conditions, sensitivity of riparian habitat (e.g. protected trees, large trees that afford bank stabilisation) and instream habitat, depending on technical feasibility. Crossing points to be approved by Engineer;

PART C3.1 - SPECIFICATION

- d) No construction facilities (including storage areas, containers, chemical toilets, etc.) to be located within natural drainage lines; and
- e) A buffer zone of 32 m from the edge of a riparian zone shall be maintained between construction activities such as mixing areas, stockpiles and laydown yards and the riparian zone.

With regards to water quality, the following should be ensured:

- a) Undertake water quality monitoring and biomonitoring in the affected watercourses;
- b) All diffuse pollution sources to be managed to prevent pollution of the watercourses in the project area;
- c) Storage area and ablution facilities not to be located closer than 100 m from edge of riparian habitat, unless authorised by the Competent Authorities;
- d) Where necessary, install instream silt traps during construction within the watercourse channel and along the riparian habitat. Instream silt traps are to be maintained and serviced on a regular basis. The style of silt trap will depend on materials used and the water movement patterns. If silt traps are not deemed feasible, other suitable measures need to be taken to limit unnaturally high sediment volumes in the watercourses;
- e) Implement suitable stormwater measures during construction to manage ingress of runoff into watercourses;
- f) No wastewater to be released to natural drainage, wetlands or any defined water body;
- g) Ensure proper storage of material (including fuel, paint) that could cause water pollution;
- h) Ensure proper storage and careful handling of hazardous substances with spill prevention materials at hand; and
- i) Reduce sediment loads in water from dewatering operations. All dewatering should be done through temporary sediment traps (e.g. straw bales, sediment socks, settlement ponds, etc). These are to be serviced regularly and removed when no longer in use. Materials can be re-used.

8.3.5.2 Minor Watercourse Crossings (Stormwater flows cross servitude)

Various unnamed minor Watercourses will be crossed by the pipeline. These crossings would either have no engineered erosion protection of the pipeline and would be protected by gabions and/or reno-mattresses. Since the pipeline trench will cross each of these minor Watercourses, and since several of these crossings would require the construction of erosion protection, the Watercourse will need to be diverted. The environmental controls listed in Clause 8.3.5.1 above shall also apply to these minor Watercourse crossings as appropriate.

Fill materials for gabion baskets and reno-mattresses shall be obtained from a source approved by the Engineer and shall not be sourced from within any Watercourse.

8.3.5.3 Wetland Crossings

Where the pipeline crosses a Wetland, the various soil layers shall be removed and stockpiled separately. Following the laying of the pipeline and the placing of bedding and backfill materials, all material from the various soil layers shall be returned in the reverse order to which they were removed (refer to Figures 8/1 and 8/2). Care shall be taken to ensure that the various soil horizons and impervious layers that support the Wetland area are reinstated and linked to those in the undisturbed soil.

PART C3.1 - SPECIFICATION

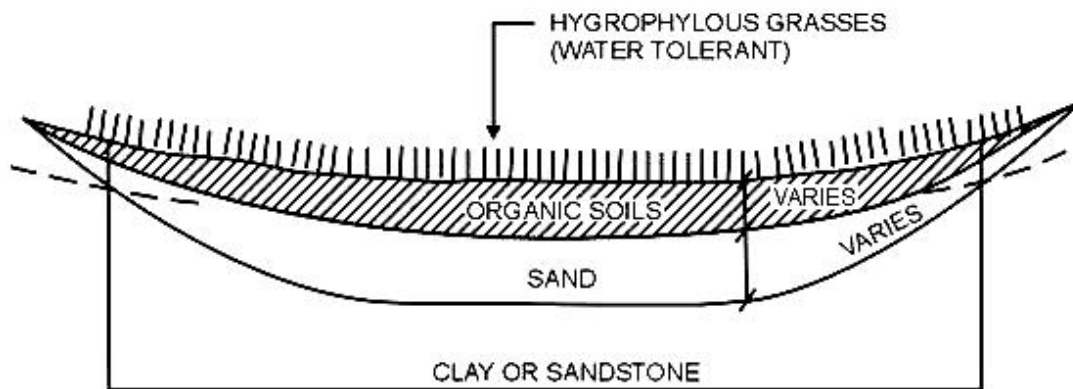


FIGURE 8/1
TYPICAL SECTION THROUGH WETLAND

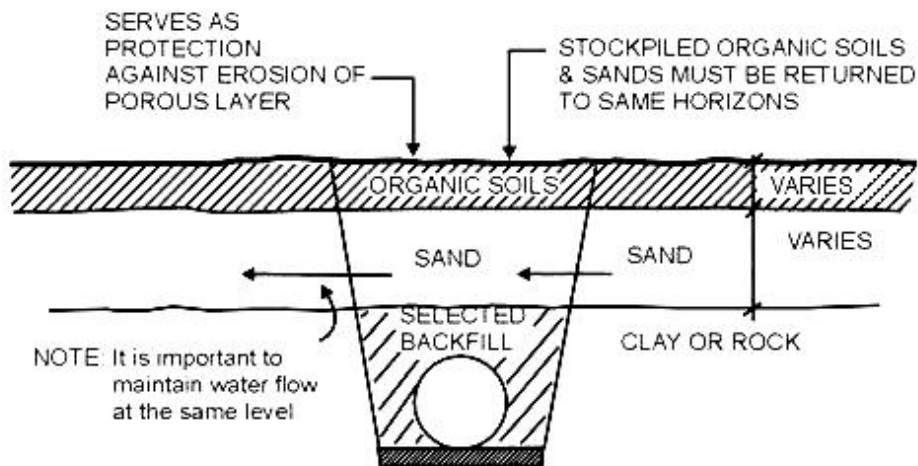


FIGURE 8/2
TYPICAL BACKFILL OF PIPE TRENCH THROUGH WETLAND

8.3.6 Groundwater

The Contractor shall deal with all water flowing into the Works from natural and artificial (man-made) water sources. The Contractor shall keep construction areas dry for the duration of the activities. In this regard, appropriate provisions like sumps, drains etc., shall be provided to collect groundwater. Water discharged from these sumps and drains in the Works shall be treated to comply with the requirements of Clause 8.4.2, Clause 8.4.3 and Clause 8.5 before being discharged into natural Watercourses.

8.4 MANAGEMENT OF WATER

8.4.1 Pumping

Pumps shall be placed over a drip tray in order to contain fuel spills and leaks. The Contractor shall take all reasonable precautions to prevent spillage during the refuelling and maintenance of these pumps.

The Contractor shall ensure that none of the water pumped during dewatering activities, is released into the environment without passing through the requisite sediment and oil traps to the Engineer's approval. Cognisance shall also be taken of the controls specified under Clauses 8.3, 8.4 and 8.5.

8.4.2 Management of Polluted Runoff

Pollution could result from the release, accidental or otherwise, of contaminated runoff from construction establishment and batching areas, discharge of contaminated water, chemicals, oils, fuels, sewage, runoff from stockpiles, solid waste, litter, etc. Accordingly, the Contractor shall take all precautions necessary to properly manage and dispose of runoff from the Works, and thereby ensure that any deleterious impact on the environment and adjacent properties is prevented or minimised.

Such precautions shall include, but are not limited to:

- a) Appropriate pollution control facilities necessary to prevent discharge of water containing polluting matter or suspended materials into Watercourses or Waterbodies shall be designed and implemented. Refer to Clause 8.3.6 in this regard;
- b) Runoff from concrete batching areas shall be strictly controlled, and contaminated water shall be collected, stored and either treated or disposed of off-site, at a location approved by the Engineer. The approval of the Engineer shall be required prior to the release of treated runoff from batching areas into any Watercourse or Waterbody;
- c) Runoff from vehicle wash bays, workshops and diesel and fuel tank areas shall pass through oil traps. The oil sludge thus collected shall be removed and disposed of at an approved sludge disposal facility. In the design of these oil traps consideration shall also be given to the removal of degreasing agents, emulsifiers and other substances that do not necessary float on water;
- d) All spillage of oil onto concrete surfaces and floors in workshop areas shall be controlled by the use of an approved absorbent material and spill kit, with a view to reduce the oil load entering the oil traps. Used absorbents shall be disposed of appropriately; and
- e) Water collected during the dewatering of pipe trenches shall be pumped to sedimentation ponds complying with the requirements of Clause 8.4.4.

Water that has been contaminated only with suspended solids, like soils and silt from disturbed areas may be released into Watercourses or Waterbodies only after all suspended solids have been removed from such water by settling out these solids in settlement ponds (refer to Clause 8.4.4). The release of settled water back into the environment shall be subject to the Engineers approval. Such settled water may be used for dust suppression on haul roads.

The Contractor shall notify the Engineer, immediately, of any pollution incident on Site. A verbal report shall be followed up by a written report, which shall be provided within 24 hours of the incident.

8.4.3 Quality of Water Discharged from the Works

All wastewater discharged from the Works shall comply with the requirements of Clause 8.5.2 and the legal requirements associated with the NWA, including the General Authorisation that specifically deals with S21 (e), (f) and (g) water uses before it is discharged into any natural Watercourses, Waterbody or land. Wastewater discharges to form part of the water monitoring programme. Natural stormwater run-off not contaminated by construction operations and clean water can be discharged directly to natural Watercourses and Waterbodies. Stormwater runoff from workshops, vehicle maintenance area, wash-bay and other potential pollution sources shall be collected and treated in hydrocarbon separation pits/tanks before discharged to drains and waterways.

8.4.4 Sedimentation Ponds

The Contractor shall construct, operate and maintain for the duration of the Contract, sedimentation ponds with sufficient capacity for their purpose, and with suitable oil traps at each point where contaminated water may be discharged from the Works, including at batching areas, vehicles wash areas, or as otherwise directed by the Engineer. Temporary sedimentation ponds will likely be used along the Works in dewatering applications and at the Contractor's facilities. The Contractor shall submit Method Statements and obtain the Engineer's approval to all proposals in connection with sedimentation ponds prior to the construction of such ponds. The Engineer shall be informed of the proposed size, location, layout and operation of the sedimentation ponds. The material that accumulates within the sedimentation ponds shall be disposed of in a suitable manner. The Contractor shall submit Method Statements for the Engineer's approval before commencing with the disposal of accumulated material.

The Contractor shall ensure that sedimentation ponds are located above the 1:100 year floodplain and outside of riparian vegetation zones of Watercourses or Waterbodies, and that the area is rehabilitated on the cessation of operation of the pond. Sedimentation ponds shall be constructed using suitable materials and shall be watertight, using a liner which shall be approved by the Engineer. They shall be sub-divided to enable alternative sections to be cleaned while other sections are in operation. Temporary settlement ponds may be a combination of sections of the excavated trench and silt traps as per Clause 8.3.5.1.

All natural groundwater and stormwater must be prevented from flowing into sedimentation ponds, and must be diverted around the ponds to ensure that accumulated sludge is not washed into natural Watercourses and Waterbodies by stormwater.

All facilities constructed for the management of dirty and clean stormwater at borrow pits shall comply with the requirements of Regulation 704, promulgated in terms of the National Water Act 1998 (Act 36 of 1998).

If the Engineer is not satisfied that sedimentation ponds are adequate, he may instruct the Contractor to carry out such additional work as is necessary in order for the ponds to comply with the Specification without any additional payment.

8.4.5 Pipeline Testing

No additives of any kind shall be included in the water used for the hydrostatic testing of the pipeline. The quality of water shall be monitored prior to its release into any Watercourse or Waterbody and shall comply with the requirements of Clause 8.5. In the case of the Matlabas River, no water from any source, quality or quantity may at any stage be discharged into that system.

PART C3.1 - SPECIFICATION

Water used in hydrostatic testing in earlier sections of the pipeline shall be retained for use in the testing of subsequent sections. During draining and scour operations, water shall be released in a controlled manner avoiding erosion. In cases where permanent structures are used for draining the pipeline, all the requisite erosion protection measures, or alternative approved temporary protection measures, shall be in place prior to releasing the water.

8.4.6 Water Abstraction

The procurement and discharge of water required for construction and hydrostatic testing shall comply with the requirements of the National Water Act, 1998 (No 36 of 1998) and related regulations.

Water for construction purposes will be sourced directly from watercourses on site and groundwater (boreholes) will also be utilised, subject to the required permits / licences. Water tankers will also supply water to the site. Where authorisation has been granted to abstract water from a Watercourse or Waterbody, the Contractor shall abstract this water either from a naturally occurring scour hole or from a temporary sump, as directed by the Engineer. During water abstraction, the Contractor shall ensure the following:

- a) A vehicle abstracting water does not enter or cross the Watercourse and does not operate from within the Watercourse;
- b) No damage occurs to the Watercourse bed or banks and that the abstraction of water does not entail stream diversion activities;
- c) All reasonable measures to limit pollution or sedimentation of the downstream Watercourse are implemented e.g. construction equipment is well maintained, use of drip trays, provision of bins, monitoring of personnel and activities; and
- d) The Contractor's Equipment, such as pumps and associated equipment shall be appropriately stored in bunded areas and located above the 1:100 year flood level.

8.5 WATER MONITORING

8.5.1 Water Quantity

Water required for construction purposes and abstracted from Groundwater, Watercourses and Waterbodies, and the existing Exxaro pipeline where applicable, must be metered and recorded on a daily basis and reported to the Engineer each week in writing. The total quantity of water abstracted, and for specifically the hydrostatic testing of the pipeline, shall be recorded on a daily basis and reported to the Engineer each week in writing.

Water required for hydrostatic testing of the pipeline shall be dealt with in accordance with Section 33 – Laying and Pressure Testing of Steel Pipes.

8.5.2 Water Quality Monitoring

The Contractor shall be responsible for monitoring, testing, record keeping and compliance with water quality requirements as follows:

8.5.2.1 Point Source Monitoring

All effluent emanating from settlement ponds, sewage treatment works, batching plants, washing areas and any other areas of effluent and water discharge constructed for the purposes of this

PART C3.1 - SPECIFICATION

Contract, shall be sampled and tested for the variables indicated in Annexure 8/1 at point of source. Sampling and testing shall occur weekly for settlement ponds and dewatering of excavations and for storage sites and refuelling sites.

Quality of water at monitoring points shall comply with the criteria given in Annexure 8/1. Monitoring points for effluents shall be determined in agreement with the Engineer when the locations of specific areas and treatment works have been established in terms of the Contractor's method statements. Monitoring of point source effluent disposal into a natural Watercourse or Waterbody shall take place where the final effluent discharges into the natural Watercourse or Waterbody.

8.5.2.2 Diffuse Source Monitoring

Diffuse source monitoring shall be undertaken whenever there is a disturbance to any Watercourse or Waterbody caused by construction within or adjacent to said Watercourse or Waterbody. Sampling and monitoring shall take place 50 m upstream and 50 m downstream of the area where disturbance to the Watercourse or Waterbody has occurred, and shall comprise a composite water sample collected from 4 points equidistant across the Watercourse or Waterbody at each location. Samples shall be tested as indicated in Annexure 8/2 using hand held equipment, and based on a comparison of the monitoring criteria, the quality of the water in the Watercourse or Waterbody downstream of the activities in the Watercourse or Waterbody may not be worse by no more than 10% when compared to the quality of the water upstream of the activities. Sampling and testing for diffuse sources shall occur daily for the duration of any such activity. The Engineer may require more detailed testing (as per Annexure 8/1) where there is evidence of contamination. This more detailed testing will be designed to identify the source of any contamination and forms the basis for the design of suitable preventative and remedial measures.

8.5.2.3 Sampling Techniques

The Contractor shall ensure that persons taking samples are correctly trained and standard sampling techniques are followed. As a minimum, the water quality monitoring programme shall involve:

- a) Collection of water samples for chemical and biological analysis;
- b) Taking in-situ measurements of dissolved oxygen, temperature, pH and electrical conductivity;
- c) Visual observations;
- d) Recording; and
- e) Reporting of the status quo and any deviations from expected or allowed conditions.

Samples requiring laboratory analysis are to be labelled and stored in a cool box cooled by ice-packs until they are transferred to a refrigerator or directly to the laboratory. The period of sample storage shall not exceed 24 hours. Labelling shall include the date and number of the sampling station and the name of the person taking the samples.

In-situ measurements of dissolved oxygen, temperature, electrical conductivity and pH shall be carried out with handheld instruments.

Duplicate samples may be required to be taken under the direction of the Engineer and analysed as a quality assurance measure.

PART C3.1 - SPECIFICATION

The Contractor shall arrange to take water samples, in the presence of the Engineer, in accordance with the sampling procedures of SANS 241: 2015 at each point of testing at the frequency outlined in Clauses 8.5.2.1 and 8.5.2.2.

The Contractor shall utilise sampling bottles as required by the analysing laboratory. Samples shall be delivered to the laboratory within 24 hours of being taken.

All analysis shall be carried out by a laboratory accredited according to the South African National Accreditation System (SANAS) in terms of SANS 17025.

8.5.2.4 Monitoring and Sampling Equipment

The Contractor shall provide all the necessary equipment to carry out water quality monitoring as required. In this regard he shall be responsible for the requisite calibration of all meters and equipment, and keeping of calibration records.

For collecting water samples, the following is required:

- a) Plastic beaker(s);
- b) Plastic sampling bottles;
- c) Labels for sampling bottles to record sampling date, time, location and other appropriate information;
- d) Plastic crate(s) for the transport of sampling equipment and for carrying equipment to the Watercourse or Waterbody monitoring point;
- e) Preservative (if samples are to be stored for an extended period of time); and
- f) Cool box and ice packs for keeping samples out of the sun and cool.

8.5.2.5 Sampling by the Engineer

The Engineer will, at his discretion, take samples and test the quality of water. The Contractor shall make his equipment available for this purpose.

8.6 MEASUREMENT AND PAYMENT

The rates tendered under this Section shall not include for the general obligations, Contractor's Equipment and work deemed to be covered by the items provided in Section 1 - General.

8.001 Dealing with water

Unit : lump sum (Sum)

The rate tendered shall include full compensation for all the Contractor's costs in complying with the requirements of Clause 8.3 and Clause 8.4.

8.002 Treatment of water

Unit : lump sum (Sum)

The rates tendered shall include full compensation for the provision and subsequent removal of the treatment facility(ies) and rehabilitation including chemicals, flocculating agents, operation and maintenance of all settlement ponds, oil traps and any other water treatment facilities and equipment that may be required for the effective treatment of water returned to Watercourses and Waterbodies during the construction of the Works.

PART C3.1 - SPECIFICATION

75% of the sum tendered shall be paid on completion of these facilities provided they are suitable for operation with the balance being paid after all necessary rehabilitation measures have been completed.

8.003 Water monitoring Unit : lump sum (Sum)

The rate tendered shall include full compensation for all the Contractor’s costs in complying with the requirements of Clause 8.5 including water measurement, monitoring, sampling, testing and quality control.

8.004 Sampling equipment and reagents for the Unit : lump sum (Sum)
Engineer

The rate tendered shall include full compensation for all the Contractor’s costs in providing equipment and reagents for the use of the Engineer as per the requirements of Clauses 8.5.2.3 and 8.5.2.4.

PART C3.1 - SPECIFICATION

ANNEXURE 8/1

VARIABLE	REQUIRED EFFLUENT STANDARD
Arsenic (as As)	Not to exceed 0.1 mg/l
Boron (as B)	Not to exceed 0.5 mg/l
Cadmium (as Cd)	Not to exceed 0.05 mg/l
COD	Not to exceed 5 mg/l
Colour, odour, taste	Free of any substance in a concentration capable of producing any colour, odour
Conductivity	Not to be increased by more than 15% above influent, and shall not exceed 250 mS/m
Copper (as Cu)	Not to exceed 0.02 mg/l
Cyanide (as Cn)	Not to exceed 0.5 mg/l
Dissolved oxygen	At least 75% saturation
Feacal coliforms Thermotolerant (faecal) coliform bacteria	No <i>E. coli</i> (0/100 ml) or No Thermotolerant (faecal) coliform bacteria (0/100 ml)
Fluoride (as F)	Not to exceed 1.0 mg/l
Free and saline ammonia (as N)	Not to exceed 1.0 mg/l
Lead (as Pb)	Not to exceed 0.1 mg/l
Manganese (as Mn)	Not to exceed 0.1 mg/l
Mercury (as Hg)	Not to exceed 0.02 mg/l
Nitrate (as NO ₃)	Not to exceed 1.5 mg/l
Nitrite	Not to exceed 1.0 mg/l
pH	Between 5,5 and 7,5
Phenolic compound (as phenol)	Not to exceed 0.01 mg/l
Phosphate (as PO ₄)	Not to exceed 1.0 mg/l
Residual Chlorine (as Cl)	Non residual chlorine
Selenium (as Se)	Not to exceed 0.05 mg/l
Soap, oil, grease	No soap, oil or grease
Sodium	Not to be increased by more than 50 mg/l above influent
Sulphides (as S)	Not to exceed 0.05 mg/l
Suspended solids	Not to exceed 10 mg/l
Temperature	In addition the effect of water discharged into Watercourses shall not raise the water within the Watercourse at a point 500 m downstream of the point of discharge by more than 2°C above the temperature of the water 500 m upstream of the Works
Total Chromium (as Cr)	Not to exceed 0.05 mg/l
Zinc (as Zn)	Not to exceed 0.03 mg/l

ANNEXURE 8/2

VARIABLE
The following measurements shall be taken in the flowing part of a stream:
i) pH (pH units);
ii) Temperature (°C);
iii) Colour and odour;
iv) Turbidity;
v) Electrical conductivity (EC) (mS/m); and
vi) Dissolved Oxygen (mg/l and % saturation).

The instruments should have a range and accuracy of 0 to 20 mg/l ±0.2 mg/l for dissolved oxygen, -5 to 40°C ±0.2°C for temperature, 0 to 14 units ±0.2 units for pH, and 0 – 2000 mS/m ±0.1 mS/m (0.001 mS/cm).

ANNEXURE 8/3

The Contractor must monitor four (6) sampling positions and the Contractor shall allow for an additional four (8) sampling positions where monitoring shall be done for the full duration of the Contract. All analysis, interpretation and recommendations must be undertaken by a suitably qualified Service Provider who is familiar with the planned activities, project area river systems and associated up and downstream land uses.

SAMPLING POINTS FOR WATER QUALITY AND BIOMONITORING

RIVER	POINT	LATITUDE	LONGITUDE
Crocodile River	CROC1	24°44'39.52"S	27°24'57.27"E
	CROC3	24°38'43.88"S	27°20'5.45"E
	CROC4	24°38'2.82"S	27°18'58.24"E
	CROC5	24°36'32.80"S	27°17'44.97"E
Matlabas	MAT1	24° 4'59.73"S	27°25'14.88"E
	MAT2	24° 3'10.42"S	27°21'35.77"E

The frequency for the physical and chemical analysis shall include the following parameters:

(a) Weekly

- PH;
- Temperature;
- Electrical Conductivity (EC);
- Total Dissolved Solids (TDS);
- Total Suspended Solids (TSS);
- Dissolved Oxygen (DO);
- Chemical Oxygen Demand (COD); and
- Turbidity.

The Contractor shall test for microbiological baseline parameters; E.coli and Faecal coliform counts weekly.

(b) Monthly

- Aluminium (Al);
- Ammonium nitrogen (NH₄-N);
- Cadmium (Cd);
- Calcium (Ca);
- Chloride (Cl);

PART C3.1 - SPECIFICATION

- f) Chromium (Cr);
- g) Copper (Cu);
- h) Cyanide (CN);
- i) Fluoride (F);
- j) Iron (Fe);
- k) Lead (II) (Pb);
- l) Manganese (Mn);
- m) Mercury (Hg);
- n) Nitrate & Nitrite nitrogen (NO₃+NO₂-N);
- o) Ortho-phosphate (PO₄-P);
- p) Sodium (Na);
- q) Sodium absorption rate (SAR);
- r) Soap, oil & grease (SOG); and
- s) Zinc (Zn).

The Contractor must conduct a full SANS 241 every six (6) months for the duration of the contract.

(c) Biomonitoring

The Contractor must include monthly biomonitoring for all monitoring points for the following aspects:

- a) SASS 5;
- b) Fish population assemblage; and
- c) Diatoms.

The contractor must ensure that there are photographic records from a fixed point for all monitoring.