

2024

ENVIRONMENTAL MANAGEMENT PLAN

Amendment of the Proposed Upgrade of the Existing Walvis Bay Waste Water Treatment Works (WWTW) to include the Construction of a New Sewer Pump Station, Gravity Line and Rising Main at Lagoon Area, Walvis Bay, Erongo Region



Environmental Management Plan

PROJECT DETAILS

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Table of Contents

1	INTRODUCTION	6
2	ROLES AND RESPONSIBILITIES	7
2.1	PROPONENT’S REPRESENTATIVE	8
2.2	ENVIRONMENTAL CONTROL OFFICER	8
2.2.1	Roles and responsibilities of the ECO	8
2.2.2	Site visits and reporting	9
2.3	CONTRACTOR	9
3	CONSTRUCTION PHASE	10
3.1	SCOPE	10
3.2	GENERAL	10
3.3	PLANNING AND DESIGN	11
3.4	ENVIRONMENTAL AWARENESS	11
3.4.1	Environmental, health and safety induction course	12
3.4.2	Toolbox talks	13
3.4.3	Safety of the public	13
3.4.4	Human resource and opportunities management	14
3.4.5	Working times	15
3.5	METHOD STATEMENTS	15
3.6	ENVIRONMENTAL CONSIDERATIONS PERTAINING TO SITE LAYOUT	18
3.6.1	Employee eating and recess areas	18
3.6.2	Ablution facilities	18
3.6.3	Access, traffic and haul roads	19
3.6.4	Solid waste management	20
3.6.5	Fuel and oil	21
3.6.6	Equipment maintenance and storage	21
3.6.7	Stockpiling and stockpile areas	22
3.6.8	Materials	22
(a)	Materials handling, use and storage	22
(b)	Hazardous substances	23
3.6.9	Cement and concrete batching	23
3.6.10	Noise	24
3.6.11	Trenching (only where applicable)	24
3.6.12	Fire control	24
3.6.13	Emergency procedures	25
3.6.14	Erosion, water quality, and storm water control	25
3.7	MEASUREMENT AND PAYMENT	26
3.7.1	Basic principles	26
3.7.2	Scheduled items	26
3.7	SUMMARY OF CONSTRUCTION PHASE MANAGEMENT ACTIONS	27
4	OPERATIONAL PHASE	31

4.1 INTRODUCTION 31

4.2 MAINTENANCE PROCEDURES..... 33

4.3 FACILITY MANAGEMENT AND OPERATIONS 33

4.4 ROUTINE MAINTENANCE AND REPAIRS..... 34

4.5 ENVIRONMENTAL AWARENESS..... 34

4.5 WASTE AND POLLUTION MANAGEMENT..... 34

4.5.1 Hazardous materials 34

4.5.2 Noise management..... 34

5 DECOMMISSIONING PHASE 35

6 CONCLUSION..... 35

Appendix A – Water Quality Guidelines 36

List of Tables

Table 1: PR’s responsibilities..... 8

Table 3: Construction phase management actions 27

List of Appendices

ABBREVIATIONS

AIDS	Acquired Immuno-Deficiency Syndrome
EA	Environmental Assessment
ECC	Environmental Clearance Certificate
ECO	Environmental Control Officer
EIA	Environmental Impact Assessment
EMA	Environmental Management Act
EMP	Environmental Management Plan
GG	Government Gazette
GIS	Geographic Information System
GN	Government Notice
GPS	Global Positioning System
HIV	Human Immuno-deficiency Virus
I&APs	Interested and Affected Parties
NHC	National Heritage Council
PR	Proponent's Representative
Reg.	Regulation
S	Section
TB	Tuberculosis

1 INTRODUCTION

Well-functioning Infrastructure supports the functioning of communities and their local economies. It unlocks an area's potential, enable residents to access services and potentially create work opportunities. The forecasted, accelerated growth of Walvis Bay place unprecedented stress on the infrastructure. The sewerage network that takes sewage away from properties in the Lagoon suburb is connected to the Jan Wilken Sewer pump station located at the Jan Wilken Sport stadium. From the recent revised Integrated, Urban Spatial Development Framework (IUDSF) for Walvis Bay town, it reveals a significant growth within the CBD that would require an upgrade of the infrastructure. Therefore, the development of the infrastructure is aligned with not only to the IUDSF, but it is mandated by the Local Authority Act, 1992 (Act 23 of 1992) as amended.

The exiting waste water treatment system needs to be augmented by supporting infrastructure to ensure that it can handle inflows into the plant to prevent future impacts (e.g. pollution, overflowing of the Waste Water Works by inadequate capacity and operational effectiveness). This additional infrastructure includes the Construction of a New Sewer Pump Station, Gravity Line and Rising Main at Lagoon Area. A new sewage pump station is required to provide service resilience for a number of reasons, which include but not limited to:

- **Consistent Flow:** This will support the Waste Water treatment Works (WWTW) by ensuring a consistent flow of wastewater to the treatment plant, thus facilitating effective treatment processes.
- **Capacity:** The existing sewer infrastructure might not have enough capacity to handle the wastewater generated by a neighbourhood. By investing in a new pump station and rising main, the municipality can improve the system's capacity and prevent issues like overflows or backups.
- **Population Growth:** As the population in the neighbourhood increases, the demand on the sewer system also grows. Investing in new infrastructure ensures that the system can adequately serve the needs of a growing community.
- **Compliance:** Municipalities are often required to meet certain environmental regulations and standards related to wastewater treatment and disposal. Upgrading infrastructure can help ensure compliance with these regulations.
- **Preventing Pollution:** A properly functioning sewer system is essential for protecting the environment and public health. By investing in new infrastructure, the municipality can reduce the risk of pollution from sewage leaks or overflows.

The Municipality of Walvis Bay (the Proponent) triggered by the above factors has commissioned the amendment of the Environmental Clearance Certificate (ECC) granted for

the upgrade of the Existing Walvis Bay WWTW to include the construction of a New Sewer Pump Station, Gravity Line and Rising Main at Lagoon Area, Walvis Bay. This is crucial for maintaining a functional and efficient wastewater management system in the area.

This will require an update to the Environmental Management Plan (EMP) that was developed for the upgrade of the WWTW and enable the application of an ECC as per the Environmental Management Act No. 7 of 2007 (EMA) and its regulations.

The proponent appointed Environam Consultants Trading cc (ECT) to undertake the process of updating the EMP and applying for the ECC from the Office of the Environmental Commissioner in the Ministry of Environment, Forestry and Tourism (MEFT).

An EMP is one of the most important outputs of the EIA process as it synthesises all of the proposed mitigation and monitoring actions, set to a timeline and with specific assigned responsibilities. This EMP details the mitigation and monitoring actions to be implemented during the following phases of this development:

- Planning and Design - the period, prior to construction, during which preliminary legislative and administrative arrangements, necessary for the preparation of the land, are made and engineering designs are carried out. The preparation of construction tender documents forms part of this phase;
- Construction - the period during which the proponent, having dealt with the necessary legislative and administrative arrangements, appoints a contractor for the construction of services infrastructure, buildings as well as any other construction process(s) within the development areas;
- Operation and Maintenance - the period during which the development will be fully functional, operational and maintained.
- Decommissioning - the period at which activities on site have reached the end of economic viability and closure is imminent.

2 ROLES AND RESPONSIBILITIES

The Municipality of Walvis Bay (the Proponent) is ultimately responsible for the implementation of the EMP, from the planning and design phase to the decommissioning phase of this development, if the development is in future decommissioned. The Proponent will delegate this responsibility as the project progresses through its life cycle. The delegated responsibility for the effective implementation of this EMP will rest on the following key individuals:

- Proponent's Representative;
- Environmental Control Officer; and
- Contractor (Construction, Operations and Maintenance, and Decommissioning).

2.1 PROPONENT'S REPRESENTATIVE

The Proponent should assign the responsibility of managing all aspects of this development for all development phases (including all contracts for work outsourced) to a designated member of staff, referred to in this EMP as the Proponent's Representative (PR). The Proponent may decide to assign this role to one person for the full duration of the development, or may assign a different PR to each of the development phases - i.e., one for the planning and design phase, one for the construction phase and one for the operation and maintenance phase. The PR's responsibilities are depicted in Table 1 as follows:

Table 1: PR's responsibilities

Responsibility	Project Phase
Making sure that the necessary approvals and permissions laid out in Table 2 are obtained/adhered to	Throughout the lifecycle of this development
Making sure that the relevant provisions detailed in Table 3 are addressed during planning and design phase.	Planning and design phase
Suspending/evicting individuals and/or equipment not complying with the EMP	<ul style="list-style-type: none"> • Construction • Operation and maintenance • Decommissioning
Issuing fines for contravening EMP provisions	<ul style="list-style-type: none"> • Construction • Operation and maintenance • Decommissioning

2.2 ENVIRONMENTAL CONTROL OFFICER

Prior to the commencement of construction, a suitably qualified and experienced Environmental Control Officer (ECO) shall be appointed by the Municipality of Walvis Bay to ensure that the mitigation rehabilitation measures are implemented and to ensure compliance with the provisions of the EMP.

2.2.1 Roles and responsibilities of the ECO

The role of the ECO is to oversee and monitor compliance with and implementation of the construction phase EMP (CEMP). Therefore, the ECO is responsible for the following:

- Liaison with the community, Municipality of Walvis Bay, Engineer and Environmental Authorities regarding environmental matters related to the project;
- Monitoring of all the Contractor's activities for compliance with the various environmental requirements contained in this CEMP;

- Reviewing of the Contractor's Environmental Method Statements as well as ensuring Municipality of Walvis Bay's approval thereof;
- Ensuring that the requisite remedial action is implemented in the event of noncompliance;
- Ensuring the contractor is demonstrating proactive, effective implementation and management of environmental protection measures;
- Ensuring that a register of public complaints is maintained by the Contractor and that any and all public comments or issues are appropriately reported and addressed;
- Routine recording and reporting of environmental activities on a monthly basis;
- Recording and reporting of environmental incidents;
- Notifying the Environmental Authorities immediately of any events or incidents that may cause significant environmental damage or breach the requirements of the CEMP; and
- Environmental Awareness Training courses to be conducted for the Contractor's workforce.

2.2.2 Site visits and reporting

The ECO shall visit the site once a week for the first month of the construction phase. Based on the ECO's professional discretion, site visits can then be reduced to a minimum of once every month. Monthly compliance reports shall be submitted to the Engineer and Municipality of Walvis Bay and distributed to any other official party as agreed, including authorities. The compliance report shall speak to the requirements of the CEMP and the project specifications. A final Environmental Audit Report shall be compiled two months after construction has been completed and submitted to the Environmental Authorities and Municipality of Walvis Bay.

2.3 CONTRACTOR

In addition, the Contractor shall appoint, in writing, a suitably qualified senior member of his site staff as the Environmental Officer (EO).

The EO's duties shall entail:

- (a) Ensuring the requirements of the CEMP are implemented on a day-to-day basis;
- (b) Ensuring that all construction staff abide by the rules and regulations as stipulated by the information booklet and portrayed by the Environmental awareness posters;
- (c) Liaison with the ECO, Engineer and any other delegation on environmental matters;
- (d) Identifying environmental non-conformances and incidents and initiating measures to remedy such issues.

The Contractor shall construct and/or implement all the necessary environmental protection measures in each area before any construction work may proceed under the direction of the ECO. The Engineer / ECO may suspend the Works at any time should the Contractor, in the Engineer / ECO's opinion, fail to implement, operate or maintain any of the environmental protection measures adequately. The costs of such suspension shall be to the Contractor's account.

3 CONSTRUCTION PHASE

The CEMP section is to be included into all Tender and Contract documentation to ensure that the Contractor is aware of his obligations and is able to price the implementation of these requirements accordingly. Failure to comply with these requirements could result in penalties or otherwise hold the Contractor accountable for any damages arising from irresponsible behavior or non-compliance with the requirements. This ensures that identified environmental issues receive adequate attention during the planning and construction phase.

3.1 SCOPE

The general principles contained within this CEMP shall apply to all construction activities. All construction activities shall observe any relevant environmental legislation and in so doing shall be undertaken in such a manner as to minimise impacts on the natural and social environment. Best practice shall apply where this CEMP does not describe the management measures for a construction activity. The ECO must be consulted should there be no management measures in this CEMP for a specific construction activity or where there is uncertainty as to how the measures in this CEMP should be implemented. In such an instance the ECO must determine the Best Available Technique(s) to avoid and/ or minimise potential impacts that an activity might have as per available best practice guidelines.

3.2 GENERAL

Municipality of Walvis Bay, as the client, is responsible for:

- Appointing a qualified independent ECO;
- Ensuring that the objectives of the CEMP are given effect by including it in all contract documentation;
- Ensuring that all environmental impacts are managed in accordance with the CEMP;
- Ensuring that all monitoring and compliance auditing occurs in line with the CEMP;
- Ensuring that the environment is rehabilitated as far as practical to its natural state or existing land use practices; and

- Any environmental damage, pollution, pumping and treatment of extraneous water or ecological degradation as a result of activities both in and outside the site boundaries.

With regard to the above, the Contractor shall conduct his activities so as to cause the least possible disturbance to the existing amenities, whether natural or man-made, in accordance with all the current statutory requirements. Special care shall be taken by the Contractor to prevent irreversible damage to the environment. The Contractor shall take adequate steps to educate all members of his workforce as well as his supervisory staff on the relevant environmental laws and protection requirements. The Contractor shall supplement these steps with prominently displayed notices and signs in strategic locations to remind personnel of environmental obligations. A suitably qualified independent ECO shall be appointed by Municipality of Walvis Bay to undertake the following tasks:

- Liaison with Contractor, Interested and Affected Parties (I&APs); and Engineer regarding environmental matters;
- Monitoring of all of the Contractor's activities for compliance with the various environmental requirements at regular intervals;
- Routine environmental auditing and reporting of the Contractor's performance against the CEMP;
- Reporting of environmental incidents and routine reporting of environmental issues associated with construction activities to Municipality of Walvis Bay, the Contractor and any relevant environmental authority; and
- Identifying environmental non-conformances and initiating measures to remedy such issues, including the institution of fines against the Contractor.

The Contractor shall construct and/ or implement all the necessary environmental protection measures in each area before any construction work may proceed. The Engineer/ ECO may suspend the Works at any time should the Contractor, in the Engineer/ ECO's opinion, fail to implement, operate or maintain any of the environmental protection measures adequately. The costs of such suspension shall be to the Contractor's account.

3.3 PLANNING AND DESIGN

The Design Engineers must take cognisance of the outcomes and recommendations of the CEMP. Municipality of Walvis Bay and the Engineer must ensure that this CEMP is included in the briefing documentation to the Contractor (to be appointed). The Engineer must advise the Contractor to familiarise himself with the CEMP and ensure that adequate resources are made available to implement the requirements of the CEMP.

3.4 ENVIRONMENTAL AWARENESS

3.4.1 Environmental, health and safety induction course

The Contractor is responsible for informing employees and Sub-Contractors of their environmental obligations in terms of the CEMP and for ensuring that employees are adequately experienced and properly trained in order to execute the works in a manner that will minimise environmental impacts.

The Contractor shall ensure that all his employees, and those of his Sub-Contractors, attend an Environmental, Health and Safety Induction Course. This course shall be structured to ensure that attendees:

- Acquire a basic understanding of the key environmental features on the site and its immediate environs;
- Become familiar with the environmental controls contained in the CEMP;
- Are made aware of all protected areas and that the trapping, poisoning, and/ or shooting of animals is strictly forbidden. No domestic pets are allowed on site;
- Are informed that natural features (e.g. rock formations) are not defaced or marked for survey or other purposes unless agreed beforehand with the engineer. Furthermore, natural water sources (e.g. streams) are not allowed to be used for the purposes of swimming, personal washing, and the washing of machinery or clothes;
- Are made aware of the need to conserve water and minimise waste;
- Receive pertinent, written instructions regarding compliance with the relevant environmental management requirements (viz. typical environmental “do’s” and “don’ts”);
- Are made aware of any other environmental matters as deemed necessary by the Engineer/ ECO;
- Are made aware of the importance of preserving archaeological sites;
- Receive detailed training in site health and safety requirements, emergency responses and site evacuation procedures in terms of the Contractor’s health and safety plan;
- Are aware that a copy of the CEMP is readily available on site and that all site staff are aware of the location and have access to the document;
- Are aware of the requirements of any approved Method Statements that have bearing on their activities, and where necessary, any specialised training required to ensure compliance with the approved Method Statements has been provided; and
- Are informed that employee information posters, outlining the environmental “do’s” and “don’ts” (as per the environmental awareness training course) will be placed at prominent locations throughout the site.

The Environmental, Health, and Safety Induction Course should be conducted by the ECO and

Contractor's Health and Safety officer, who shall provide the site staff with an appreciation of the project's environmental requirements, and how they are to be implemented. All new staff coming onto site after the commencement of construction activities must also attend the Environmental, Health and Safety Induction Course, and refresher courses should be undertaken on a quarterly basis. A detailed record of all training sessions, including a list of attendees must be compiled by the Contractor and submitted to the Project Manager on a regular basis.

The initial Environmental, Health, and Safety Induction Course shall be held within 14 days from the site mobilisation date, and subsequent courses shall be arranged for all new employees arriving after the initial training course, also within 14 days of their arrival.

The Contractor shall provide a suitable venue with necessary facilities and ensure that all employees attend the environmental, health and safety induction course. The course shall be held in the morning during normal working hours. No more than 30 people shall attend each course and the Contractor shall allow for sufficient sessions to train all personnel. The Contractor shall provide proof of attendance by all of his employees in the form of a signed attendance register.

3.4.2 Toolbox talks

Environmental, health and safety issues specific to each area of the works, shall form part of the daily toolbox talks in each area. These can be short 10 - 15-minute discussions on the environmental sensitivities of the general area and/ or the specific sections that would be worked on, on that day. The foreman responsible will provide feedback to his staff on their day- to-day environmental performance and address issues requiring attention and specific actions required. A synopsis of the topics discussed at each area shall be recorded on a register and submitted to the ECO on regular (typically weekly) basis. Environmental matters shall be dealt with in toolbox talks on a regular basis (typically at least once a week).

3.4.3 Safety of the public

The Contractor shall take all reasonable measures to ensure the safety of people in the surrounding area. Where the public could be exposed to danger by any of the Works or site activities, the Contractor shall provide flagmen, barriers, and/ or warning signs in English, all to the approval of the Engineer/ ECO.

All unattended open excavations shall be adequately demarcated (fencing shall consist of orange mesh). Adequate protective measures must be implemented to prevent unauthorised access to the Working Area. No firearms shall be permitted on site.

The Contractor shall implement appropriate measures to limit any adverse social impacts associated with the accommodation of a construction workforce on the local communities. The following mitigation and management measures are prescribed in this regard:

- Measures to combat HIV/ AIDS and other social ills:
 - Municipality of Walvis Bay should ensure the health of its employees and their dependants by adopting rigorous health programmes, which should, at a minimum, include programmes to combat HIV/ AIDS and tuberculosis (TB);
 - The Contractor should make HIV/ AIDS and Sexually Transmitted Diseases (STD) Awareness and Prevention programmes a condition of contract for all suppliers and Sub-Contractors;
 - The Contractor should provide an adequate supply of free condoms to all workers;
 - A voluntary counselling and testing programme should be introduced during the construction phase and continued during operations; and
 - Access at the construction site and camp should be controlled to prevent sex workers from either visiting and/ or loitering at or near these locations.

- Measures to prevent crime:
 - Construction workers shall be clearly identifiable by wearing proper construction uniforms displaying the logo of the construction company. Construction workers could also be issued with identification tags in order to gain access to the construction site;
 - All construction workers shall at all times wear the required Personal Protective Equipment (PPE) for identification; and
 - The Contractor should establish clear rules and regulations for access to the construction site and offices to control loitering. Consultation should occur with the local Namibian police branch to establish standard operating procedures for the control and/ or removal of loiterers.

- Measures to reduce traffic related incidents:
 - Ensure that road junctions have good sightlines;
 - Transport the materials in the least amount of trips as possible, whilst being careful of overloading vehicles;
 - Limit speed both on and off the site;
 - Adhere to the speed limit; and
 - Implement traffic control measures where necessary.

3.4.4 Human resource and opportunities management

Job creation, inward migration of workers and accommodation of a workforce within a small community have the potential to result in significant social impacts. Municipality of Walvis Bay and the Contractor must approach human resource management in a careful, cooperative and considered fashion so as to enhance the positive impacts, whilst minimising negative impacts associated with construction projects.

Given the proximity of the proposed project to Walvis Bay, the community should be given special consideration in terms of the benefits arising from the project. In order to enhance the benefits of employment creation for these communities, it is recommended that the following measures be implemented:

- The Contractor shall establish a formal and organised recruitment process;
- The Contractor shall be encouraged to employ local labour (i.e. from Walvis Bay) where possible;
- The Contractor shall be encouraged to recruit Namibian labourers;
- Recruiting by the Contractor must be conducted through a central office and no on-site hiring should be allowed;
- The Contractor shall inform job seekers that they are hired for a contract period only;
- The Contractor shall be encouraged to source construction materials locally as far as possible; and
- The Contractor shall be encouraged to make use of local sub-contractors.

3.4.5 Working times

The Contractor shall restrict construction activities to the hours of 06h30 - 18h00 during summer and 07h00 - 17h30 during winter on Mondays to Saturdays and no work will be permitted on Sundays or public holidays.

3.5 METHOD STATEMENTS

Any Method Statements required by the Engineer/ ECO or called for by the Project Specification shall be produced within such reasonable time as specified by the Engineer/ ECO or as stipulated in the Project Specification. The Contractor shall not commence the activity until the Method Statement has been approved, except in the case of emergency activities. The Contractor shall allow the Engineer/ ECO a one week period for the review and approval of the Method Statement. Such approval shall not be unreasonably withheld.

The Engineer/ ECO may require changes to a Method Statement if the proposal does not comply with the Specification or if, in the reasonable opinion of the Engineer/ ECO, the proposal may result in, or carries a greater risk of, damage to the environment in excess of

that which can be tolerated.

Approved Method Statements shall be readily available on the site and shall be communicated to all relevant personnel. The Contractor shall carry out the works in accordance with the approved Method Statement. Approval of the Method Statement shall not absolve the Contractor from any of his obligations or responsibilities in terms of the Contract or any other law except where this is specifically stated in the method statement.

Method Statements that shall be provided by the Contractor 14 days prior to the mobilisation on site include:

1. Mobilisation plan, covering:

- (a) The location and layout of all offices, storage containers, gates and fences, fuel storage areas and protection bunds, material lay-down areas, ablution facilities, carpentry areas, hazardous chemical storage facilities, wash bays, workshops and works service and maintenance areas, oil separators and grease traps, storm-water layout, first aid facilities, recess, training, eating and meeting areas, central waste storage areas, access/ haul roads and any other facilities associated with the Contractor's yard;
- (b) Security and access control to the site;
- (c) The design and location of all waste storage facilities, in particular the central waste storage area;
- (d) The central waste storage area shall include separate, weather proof, water-tight vessels/ skips for the disposal of hazardous waste and contaminated soil recovered during spills and for general waste respectively;
- (e) The system of collection and disposal of wastes, including the name and location of the point of final disposal, to an appropriate landfill site;
- (f) Initiatives for the control and recovery of litter on and around the Site and Contractor's yard;
- (g) Fuels and fuel spills: Methods of refuelling vehicles and details of methods for fuel spills and clean-up operations;
- (h) Sedimentation and Erosion Control: Sedimentation and erosion control of bulk earthworks and the management of sediment into rivers;
- (i) Stormwater management: Provisions to manage stormwater during the construction phase; and
- (j) Method of undertaking blasting.

2. Waste Management Plan, covering:

- (a) The design and location of all waste storage facilities, in particular the central waste storage area;

- (b) The central waste storage area shall include a separate, weather proof, water tight vessel for the disposal of hazardous waste and contaminated soil/water recovered during spills;
- (c) The system of collection and disposal of wastes, including the name and location of the point of final disposal to an appropriately registered landfill site;
- (d) Initiatives for the control and recovery of litter on and around the Site and Contractor's yard;
- (e) The recovery, handling and disposal of construction and organic (vegetation debris)
- (f) wastes; and
- (g) Initiatives implemented to minimise, reuse or recycle all wastes generated during construction.

3. Emergency Preparedness Plan, covering:

- (a) Contact details for relevant personnel, as well as their designations for:
 - (i) Emergency services and local authorities;
 - (ii) Private emergency services;
 - (iii) Contractor's personnel;
 - (iv) Engineer's personnel; and
 - (v) Employer's personnel.
- (b) Fire Protection Plan, covering:
 - (i) The type and location of all fire protection equipment including fire beaters, fire extinguishers, knapsack sprayers, rake-hoes, fire-fighting tankers, etc.
 - (ii) Details regarding procedures to be followed in responding to a fire.
 - (iii) Fire prevention initiatives, including designated smoking areas, preventing the lighting of fires on site, the proximity of fire extinguishers during hot work, the storage of explosive or flammable substances, etc.
- (c) Evacuation Plan, covering:
 - (i) How and to where personnel and site staff will be evacuated in the event of a fire, flood, bomb threat or other similar situation.
- (d) Spill Response Plan, covering:
 - (i) The protocols to be followed in the event of a large spill, including the recovery or neutralising of chemical spills on soil and in water environments;
 - (ii) Day-to-day measures and protocols to be followed to prevent the spillage of

potentially hazardous chemicals, with a focus on diesel and petrol fuel.

(e) Inclement Weather Preparedness Plan, covering:

- (i) Measures to be taken ahead of forecasted inclement weather that may result in high winds, heavy rains and flooding with the potential to cause damage to the works. Measures may include the removal of stationary equipment and stored chemicals from low-lying or excavated areas or the securing and / or removal of plant, waste, portable toilets ahead of such an event. Emergency preparedness earthworks initiatives used in the protection of the works areas where necessary should also be briefly described here.

3.6 ENVIRONMENTAL CONSIDERATIONS PERTAINING TO SITE LAYOUT

Some of the below considerations may not necessarily take place, due the WWTW being already existing and only affecting the existing footprint. Nether the less all potential impacts have been discussed and how they need to be addressed if it does occur during the proposed upgrade in the sections below.

3.6.1 Employee eating and recess areas

The Contractor shall identify a suitable area, which is shaded and away from construction noise and dust, where employees can eat and take work recesses in relative comfort. The eating areas shall be provided with scavenger proof rubbish bins which are to be emptied into the central waste storage vessel/ skip daily. Potable water and other sanitary conveniences shall also be located within reasonable range of the designated eating area. The Contractor shall prevent his employees from eating or recessing anywhere else but in the designated eating area Security Guards.

Security guards that would look after construction equipment, materials and plant at night time shall not be allowed to leave the construction yard. They must be provided with an office to shield them from the weather. They shall be bound by the conditions contained in this EMP. Security guards must therefore be made aware of the conditions of the CEMP, especially with relation to no-go areas, fires on site, health and safety and protection of fauna and flora.

3.6.2 Ablution facilities

Temporary/ portable toilets shall be supplied by the Contractor for the workers at a minimum ratio of 1 toilet per 15 workers and be within walking distance of the work area. The toilets shall be placed at appropriate locations to the approval of the Engineer/ ECO. Toilets shall

be kept in a good state of repair and shall be serviced at intervals sufficient to ensure that they are kept in clean and sanitary condition. The Contractor shall ensure that no spillage occurs when the toilets are cleaned or emptied and that the contents are removed from site.

Discharge of waste from toilets into the environment is prohibited. Each toilet shall be stocked with toilet paper at all times. All toilets shall be secured to the ground to ensure that they do not overturn during high winds or for any other reason. Washing, whether of the person or of personal effects, and acts of excretion and urination are strictly prohibited, other than at the facilities provided.

3.6.3 Access, traffic and haul roads

The Contractor shall be held responsible for the control of all project related traffic, including that of his suppliers, in ensuring that vehicles associated with the project remain on designated routes and within the designated working times. Construction traffic shall be controlled to ensure minimal disruption to normal road users. All existing access roads that may be affected during construction shall be kept open and in a good state of repair, where this is not possible, unobstructed and safe alternative access routes through the Works must be provided under the guidance of the ECO.

The following mitigation measures are further proposed to limit the impact of traffic in the area:

- Access roads shall be widened to the minimum width required and should not exceed 5m;
- New roads shall not be constructed if the quality of existing roads deteriorates. Existing roads shall be repaired and maintained for the duration of the construction phase and beyond;
- Road construction methods should ensure good road surfaces to preclude vehicles driving off road to find smoother surfaces with less corrugations or potholes;
- The area to be cleared for road construction shall be as small as possible;
- Road surface shall be regularly assessed and upgraded where appropriate;
- No operator will operate any equipment when he is under the influence of alcohol;
- Make sure all vehicles are roadworthy. Repair faulty brakes, exhausts etc. immediately (preferably offsite, if not offsite the ground surface must be protected by impermeable material and/ or drip trays);
- Ensure that road junctions have good sightlines;
- Transport the materials in the least amount of trips as possible;
- Limit speed both on and off the site;
- Adhere to the speed limit;

- Implement traffic control measures where necessary.
- Good driving and adherence to safety rules shall be adhered to at all times;
- Drivers must keep their headlights on when driving on gravel roads;
- Drivers must have the correct licence and training for the vehicles they are driving; and
- The following minimum standards for access roads should be followed:
 - Enter and exit roadways and construction areas should be demarcated at the entrances;
 - Erect signage to warn motorists about construction activities and heavy vehicle movement where appropriate;
 - Use 3-point turns and not U-turns and confine turning to the road; and
 - Prevent shortcuts between roads.

No new parking bay, haul or access road or passage of any sort shall be opened or be caused to be opened without the prior consent of the Engineer/ ECO. Establishing new borrow pits are strictly prohibited. Any contraventions of this clause shall result in penalisation.

3.6.4 Solid waste management

The Contractor shall provide sufficient number of scavenger proof rubbish bins with secured lids. Rubbish bins shall always be placed in pairs, to ensure that one is always present while the other is being emptied. As a minimum, rubbish bins shall be located at every point of entry/ exit to the site, any building, work area, ablutions facility or recess area. Areas where rubbish is likely to be generated in higher quantities shall be equipped with additional rubbish bins according to the activities occurring there and the volume of waste being generated. Areas requiring additional rubbish bin will include for example:

- Training and meeting facilities;
- Workshops;
- Stores;
- Canteens and eating areas;
- Materials laydown areas;
- Any work areas where outfitting (electrical, plumbing, mechanical) of structures is occurring (as required);
- Any mobile teams carrying out work away from the main site infrastructure, for example pipe or electrical installation teams, road building and maintenance teams, etc., shall carry a rubbish bin with them at all time and return all waste collected to the central storage area at the end of a day's work; and
- Any other area where an accumulation of litter and rubbish is noted or as instructed by the ECO.

No waste materials, including domestic, organic or construction wastes shall be burnt,

dumped or buried on the Site. Bins shall be emptied daily or as required. The waste may be stored temporarily on site in a central waste area that is weather and scavenger proof, as approved by the Engineer/ ECO. The Contractor shall, at his own cost, make available the time and resources required in recovering any litter or other wastes that have accumulated or have been dispersed as a result of his activities on the Site. The ECO shall monitor this strictly and institute strict penalties in the event of non-compliances.

The central waste storage vessel/ skip shall be emptied weekly or as necessary. All solid waste shall be disposed of at the closest registered waste disposal site. A copy of the waste disposal certificates shall be submitted to the Engineer/ ECO for record purposes.

3.6.5 Fuel and oil

The Contractor shall ensure that all liquid fuels are stored in tanks or mobile bowzers with lids that are kept firmly shut. The tanks or mobile bowzers must be in good working order (i.e. not leaking). The Contractor shall ensure that there is adequate fire-fighting equipment at the fuel storage areas. The tanks or bowzers shall be situated on a smooth impermeable surface (concrete slab or 250 micron plastic sheeting covered with at least 50mm of sand) with an earth bund. The impermeable lining shall extend to the crest of the bund. The volume of the bunded area shall be 130% the volume of the combined tank volumes stored therein. Provision shall be made for refuelling at the fuel storage area, by protecting the soil with an impermeable surface (similar to that used for the storage area itself). The tanks and/ or bowzers shall be inspected daily for any leaks. If they are leaking, either the leaks must be fixed immediately or the bowser/ tanks must be replaced.

The Contractor shall prevent unauthorised access to the fuel storage area. No smoking shall be permitted in the vicinity of the fuel storage area. The Contractor shall ensure that there are adequate fire-fighting provisions located at the fuel storage area.

Should a mobile fuel bowser be used, all refuelling shall occur with appropriate measures in place to prevent spillages; these may include the use of drip trays, funnels, non-drip dispensing nozzles, and any other similar device. Regardless of the preventative measures in place, all mobile fuel bowzers shall carry a spill-kit that is adequately sized to contain at least a 200 litre spill, at all times.

3.6.6 Equipment maintenance and storage

All vehicles and equipment shall be kept in good working order and shall be operated by designated and competent operators. Leaking or damaged equipment shall be repaired immediately or removed from the Site. Where emergency, in situ, maintenance operations are required the Contractor shall ensure that the soil or vegetation does not become contaminated. Drip trays shall be provided in construction areas for stationary and parked

plant as well as for the emergency servicing of vehicles. Drip trays shall be inspected and emptied daily, or as required. The contents of the drip trays shall be disposed of at an appropriately authorised facility and proof thereof shall be submitted to the Engineer/ ECO.

The washing of equipment shall be restricted to urgent or preventative maintenance requirements only during which the use of detergents for washing shall be restricted to low phosphate and nitrate containing, low foaming type detergents. Washing of equipment will only be allowed in a wash bay, at the site camp, approved by the Engineer/ ECO.

The Contractor shall ensure that oil and lubricant containers are stored in an area where the ground has been protected. The containers shall be inspected regularly to ensure that no leakage occurs. When oil/ lubricants are dispensed, the proper dispensing equipment shall be used, and the storage container shall not be tipped in order to dispense the oil/ lubricant. The dispensing mechanism of the oil/ lubricant storage container shall be stored in a waterproof container when not in use. The Contractor shall take all reasonable precautions to prevent accidental and incidental spillage during the use of oils.

In the event of oil/ lubricant or another hazardous spill, the source of the spillage shall be isolated, and the spillage contained. The Contractor shall clean up the spill by removing the contaminated soil to the hazardous waste vessel/ skip and the application of absorbent material to the affected area. Treatment and remediation of the spill area shall be undertaken to the reasonable satisfaction of the Engineer/ ECO.

3.6.7 Stockpiling and stockpile areas

Plant (i.e. machinery) and materials shall be stored within the demarcated construction camp or batching areas. Where this is not feasible, the Engineer/ ECO will identify additional sites for stockpiling within the Working Area. Where possible, stockpiled materials shall be stored off the ground on scaffolding and care shall be taken to minimise disturbance to the vegetation and topsoil.

Soil, sand, and gravel stockpiles shall be convex in shape and shall be located so as to cause minimal disturbance. Stockpiles shall be so placed as to occupy the minimum width compatible with the natural angle of repose of the material, and measures shall be taken to prevent the material from being spread over too wide a surface. The Contractor shall ensure that all stockpiles do not result in the damming of water or run off, or are themselves washed away. Stockpiles shall be placed to not obstruct or pollute any storm water or drainage paths.

3.6.8 Materials **(a) Materials handling, use and storage**

The Contractor shall ensure that any delivery drivers are informed of all procedures and

restrictions, including “no-go” areas and designated haul routes.

All material shall be stored within the designated Site boundaries and all material stockpiles shall be located no less than 20m from any water resource. The Contractor shall ensure that all material lay-down areas, workshops and stores, including temporary lay-down areas within the Works, are kept in a neat and orderly fashion on a daily interval, and to the satisfaction of the Engineer/ ECO. The Contractor shall set aside the time and resources required to remedy any contraventions of this clause at his own expense.

Materials shall be appropriately secured and covered to ensure safe passage between destinations. The Contractor shall be responsible for any clean-up resulting from the failure by his employees or suppliers to properly secure transported materials.

(b) Hazardous substances

Hazardous chemical substances used during construction shall be stored in secondary containers. The relevant Material Safety Data Sheets (MSDS) shall be available on site. Procedures detailed in the MSDSs shall be followed in the event of an emergency situation. Potentially hazardous substances shall be stored, handled and disposed of as prescribed by the Engineer/ ECO.

The Contractor shall provide a separate weather-proof, impervious vessel/ skip at the central waste storage area for the temporary storage of hazardous, potentially hazardous and contaminated materials. Waste from this vessel/ skip shall be disposed of at a landfill site that is registered to receive such waste. A copy of the Certificate of Disposal issued by the landfill shall be submitted to the Engineer/ ECO after every deposit.

3.6.9 Cement and concrete batching

The batching of concrete shall take place on a smooth, impermeable surface (plastic) and shall be enclosed with a bund and sloped toward a sump to contain any spillages. Concrete batching shall take place at least 20m away from any water resource, e.g. vegetated drainage lines, to avoid contaminated water and/ or sediment entering the resource. All waste water resulting from batching of concrete shall be contained and disposed of appropriately and shall not be discharged into the environment unless treated to acceptable standard, as determined by the Engineer/ ECO. Where concrete trucks are used, the Contractor shall ensure that dumping of the drum-wash does not occur directly onto the ground. If needed, facilities for the handling of the concrete contaminated wash-water shall be established to the satisfaction of the Engineer/ ECO. Any spillages of concrete or concrete-truck-drum-wash-water shall be cleaned-up immediately and disposed of through the solid waste disposal system.

The Contractor shall take all reasonable measures to prevent the spillage of cement/ concrete during batching and construction operations. During pouring, the soil surface shall be protected using plastic and all visible remains of concrete shall be physically removed on completion of the pour and disposed of as part of the solid waste disposal system. Empty cement bags shall be collected continuously and stored in temporary weatherproof containers, where they are protected from dispersion by wind and shall be disposed of regularly via the solid waste disposal system.

3.6.10 Noise

The Contractor shall limit noise levels by implementing the following:

- Install and maintain silencers on machinery;
- Appropriate directional and intensity settings are to be maintained on all hooters and sirens;
- No amplified sound shall be allowed on Site other than in Emergency situations; and
- Drivers and operators are to be instructed to not use their hooters unless absolutely required (i.e. operators of machinery should not use hooters for the purposes of general communication, which is typically seen on construction sites).

3.6.11 Trenching (only where applicable)

Trenches where envisaged shall be demarcated appropriately, using orange mesh, and securely and regularly monitored during operations to ensure that pedestrian (and vehicular) access to these areas is strictly prohibited. Where appropriate, sign boards, alerting pedestrians and road users to the potential dangers presented by the construction activities, shall be erected. The Contractor shall ensure that the time a trench is left exposed is kept to a minimum, and that open trenches are inspected on a daily basis for animals which may have fallen or become trapped. Animals found trapped shall be rescued and released into the wild. If poisonous animals/ reptiles such as snakes are found, the Dorob National Park and/ or a snake handler must be contacted to rescue the snake/ animal. A local snake handler must be identified before works start and his contact details shall be readily available.

3.6.12 Fire control

Fires are only permitted in designated areas and shall not be left unattended. These areas must first be discussed and approved by the Park officials. If such areas are approved by the Park officials, cooking places shall be located at a safe distance from fuel/ hazardous materials storage area and vehicle parking areas. All grass and bushes shall be removed around fireplaces. Fire extinguishers shall be readily available in the construction camp. Any fires that occur outside of designated areas shall be reported to the Engineer/ ECO immediately. Employees shall be made aware that the collection and removal of firewood is prohibited, except where indicated by the contractor as clearing takes place. The Contractor

shall either provide firewood or to limit the use thereof; provide gas or fuel efficient stoves. Smoking shall not be permitted in those areas where there is a fire hazard. Burning of waste for disposal purposes is not permitted.

The Contractor shall be responsible for ensuring that immediate and appropriate actions are taken in the event of a fire and shall ensure that employees are aware of the procedures to be followed. The Contractor shall ensure that there is at least one fire extinguisher at the entrance to the site and at the recess area. A fire extinguisher shall be present whenever undertaking any form of hot work, i.e. welding, gas cutting, angle grinding, etc. All transport, earth moving equipment, and materials handling equipment on the Site shall be fitted with fire extinguishers. All fire extinguishers shall be serviced at the specified intervals and all other fire-fighting equipment shall be maintained in a good state of repair.

3.6.13 Emergency procedures

The Contractor shall ensure that his employees are aware of the procedure to be followed for dealing with leaks and spills, which shall include notifying the Engineer/ ECO. The Contractor shall ensure that the necessary materials and equipment for dealing with leaks and spills are available on Site at all times. Treatment and remediation of spills shall be done to the satisfaction of the Engineer/ ECO.

In the event of a hydrocarbon spill, the source of the spillage shall be isolated, and the spillage contained. The affected areas shall be cordoned off and secured. The Contractor shall ensure

that there is always sufficient supply of absorbent material on Site to absorb/ breakdown or encapsulate at least a 200ℓ liquid hydrocarbon spill. Any soil contaminated by such a spill must be removed and disposed of at an appropriately registered waste site.

Emergency equipment including spill kits and fire extinguishers shall be positioned at accessible locations near to areas or facilities where such emergencies may arise.

3.6.14 Erosion, water quality, and storm water control

The Contractor shall take all reasonable steps to prevent or remediate damage to the environment resulting from the Works in the form of erosion and sedimentation. The Contractor shall immediately remedy any situation that is or has the potential to result in soil erosion, water pollution and sedimentation from the works as a result of storm water flows. A preventative approach must be adopted whereby the extent of clearance and disturbance is limited to those areas required to complete the Works (i.e. a working corridor of 15 m). If required, the Contractor shall establish necessary storm water control mechanisms in agreement with the engineer, to effectively control the movement of water

onto, through and off the construction site.

The Contractor shall establish, in agreement with the Engineer/ ECO, a suitable mechanism, where necessary, for containment and treatment of contaminated water emanating from the Works or associated activities, i.e. settlement or sedimentation ponds/ oil separators. A plan must be submitted and approved by the ECO/ Engineer.

3.7 MEASUREMENT AND PAYMENT

3.7.1 Basic principles

Except as specified below or in the Project specifications or as Scheduled, no separate measurement and payment will be made to cover the cost of complying with the provisions of this CEMP and such costs shall be deemed to be covered by the rates tendered for the items in the Schedule of Quantities completed by the Contractor when submitting his tender.

3.7.2 Scheduled items

All requirements of the environmental management specification

All work not measured elsewhere, associated with complying with any requirement of the environmental management Specification shall be as a measured sum. The tendered rate shall cover any cost associated with complying with the environmental management specification and shall include for all materials, labour and plant required to execute and complete the work as specified, described in the Schedule of Quantities or shown on the drawing(s).

Method statements: Additional work

No separate measurement or payment will be made for the provision of Method Statements but, where the Engineer/ ECO requires a change on the basis of his opinion that the proposal may result in, or carries a greater than warranted risk of damage to the work required, provided it could not reasonably have been foreseen by an experienced Contractor.

Work “required by the project specification”

Where a clause in this Specification includes a requirement as “required by the Project Specification”, measurement and payment for compliance with that requirement shall be in accordance with the relevant measurement and payment clause of the Project Specification.

3.7 SUMMARY OF CONSTRUCTION PHASE MANAGEMENT ACTIONS

Table 2: Construction phase management actions

Aspect	Management Objective	Management actions	Responsibility
Responsible management	To ensure that construction activities are carried out so as to cause the least possible disturbance to the existing amenities, whether natural or man-made.	<ul style="list-style-type: none"> The Contractor shall take adequate steps to educate all members of his workforce as well as his supervisory staff on the relevant environmental laws and protection requirements. A suitably qualified independent ECO shall be appointed by the Client. The Contractor shall construct and/or implement all the necessary environmental protection measures in each area before any construction work may proceed. 	Contractor
Environmental awareness	To ensure that all employees and Sub-Contractors are informed of their environmental obligations.	The Environmental, Health, and Safety Induction Course should be conducted by the ECO and Contractor's Health and Safety officer.	ECO
		The foreman responsible will provide feedback to his staff on their day-to-day environmental performance and address issues requiring attention and specific actions required.	Contractor
Safety to the public	To reduce the risks posed by the project to the public.	<ul style="list-style-type: none"> Where the public could be exposed to danger by any of the Works or site activities, the Contractor shall provide flagmen, barriers, and/or warning signs in English. No firearms shall be permitted on site without the prior approval of the Project Manager. 	Contractor
Human resource and opportunities management	To ensure that job creation, inward migration of workers and accommodation of a workforce within a small community does not result in significant social impacts.	<p>The Contractor shall implement appropriate measures to limit any adverse social impacts associated with the establishment of a construction camp and/or the accommodation of a construction workforce on the local communities.</p> <p>In order to enhance the benefits of employment creation for these communities, it is recommended that the Contractor shall establish a formal and organised recruitment process in line with this EMP.</p>	Contractor
	Construction activities shall be restricted to specified hours in order to limit disturbance to the public.	The Contractor shall restrict construction activities to the hours of 6h30 - 17h00 during summer and 07h00 - 17h00 during winter on Mondays to Saturdays and no work will be permitted on Sundays or public holidays.	Contractor
Dust	To limit dust levels.	Appropriate dust control measures must be implemented.	Contractor
Noise	To limit noise levels.	Appropriate measures shall be implemented to limit noise levels.	Contractor
Method statements	To ensure effective and formal communication between the Project Management Team and the Contractor on construction issues throughout all	System regarding method statement compilation, submission, review and approval to be rigorously implemented.	Contractor/ ECO
		Method Statements that shall be provided by the Contractor 14 days prior to the mobilisation on site include:	Contractor/

EMP Upgrade of the Existing Walvis Bay Waste Water Treatment Works

Aspect	Management Objective	Management actions	Responsibility
	stages of the project	<ul style="list-style-type: none"> Mobilisation plan; and Operational and rehabilitation plan. 	ECO
Environmental considerations pertaining to site layout	Suitable area identified where employees can eat and take work recess.	<ul style="list-style-type: none"> The Contractor shall identify a suitable area, which is shaded and away from construction noise and dust, where employees can eat and take work recesses in relative comfort. The eating areas shall be provided with scavenger proof rubbish bins, potable water and other sanitary conveniences. 	Contractor
Ablution facilities	Temporary toilets shall be provided by the contractor.	<ul style="list-style-type: none"> Temporary / portable toilets shall be supplied by the Contractor for the workers at a maximum ratio of 1 toilet per 15 workers and be within walking distance of the work area. The toilets shall be placed at appropriate locations to the approval of the Engineer / ECO. Toilets shall be kept in a good state of repair and shall be serviced at intervals sufficient to ensure that they are kept in clean and sanitary condition. 	Contractor
Access, traffic and haul roads	Construction traffic shall be controlled to ensure minimal disruption to normal road users.	The Contractor shall be held responsible for the control of all project related traffic, including that of his suppliers, in ensuring that vehicles associated with the project remain on designated routes and within the designated working times.	Contractor
Solid waste management	To ensure that there is no illegal disposal of waste.	<ul style="list-style-type: none"> The Contractor shall provide sufficient number of rubbish bins with secured lids. No waste materials, including domestic, organic or construction wastes shall be burnt, dumped or buried on the Site. 	Contractor
Fuel and oil	To ensure that all liquid fuels are stored appropriately and adequate fire-fighting equipment is stored on site.	<ul style="list-style-type: none"> The Contractor shall ensure that all liquid fuels are stored in tanks or mobile bowsers with lids that are kept firmly shut. All tanks and/or mobile bowsers shall be situated in a bunded area. The Contractor shall ensure that there is adequate fire-fighting equipment at the fuel storage areas. 	Contractor

EMP Upgrade of the Existing Walvis Bay Waste Water Treatment Works

Aspect	Management Objective	Management actions	Responsibility
Equipment maintenance and storage	All vehicles and equipment are kept in good working order.	<ul style="list-style-type: none"> Leaking or damaged equipment shall be repaired immediately or removed from the Site. Drip trays shall be provided in construction areas for stationary and parked plant as well as for the emergency servicing of vehicles. 	Contractor
Stockpiling and stockpile areas	All plant and materials shall be stored in designed areas to minimise the disturbance to vegetation and topsoil.	Plant and materials shall be stored within the demarcated construction camp or batching areas.	Contractor
Materials handling, use and storage	All delivery drivers are informed of the on-site procedures and restrictions.	<ul style="list-style-type: none"> The Contractor shall ensure that any delivery drivers are informed of all procedures and restrictions, including “no-go” areas and designated haul routes. All material shall be stored within the designated Site boundaries. 	Contractor
Hazardous	Any hazardous substances are stored appropriately	<ul style="list-style-type: none"> Hazardous chemical substances used during construction shall be stored in secondary containers. The relevant Material Safety Data Sheets (MSDS) shall be available on site. 	Contractor
Aspect	Management Objective	Management actions	Responsibility
Cement concrete and batching	Cement and concrete batching take place in designated areas.	<ul style="list-style-type: none"> The batching of concrete shall take place on a smooth, impermeable surface (plastic) and shall be enclosed with a bund and sloped toward a sump to contain any spillages. The Contractor shall take all reasonable measures to prevent the spillage of cement / concrete during batching and construction operations. 	Contractor
Trenching	Trenches are appropriately demarcated and secured.	Trenches shall be demarcated appropriately and securely and regularly monitored to ensure that pedestrian (and vehicular) access to these areas is strictly prohibited.	Contractor
Fire control	To reduce the risk of fires	<ul style="list-style-type: none"> Fires are only permitted in designated area and shall not be left unattended. Fire extinguishers shall be readily available. 	Contractor
Emergency procedures	All employees are aware of emergency procedures.	<ul style="list-style-type: none"> The Contractor shall ensure that his employees are aware of the procedure to be followed for dealing with leaks and spills. The Contractor shall ensure that the necessary materials and equipment for dealing with leaks and spills are available on Site at all times. 	Contractor
Erosion, water quality, and stormwater management	To prevent or remediate damage to the environment resulting from the Works in the form of erosion and sedimentation shall be taken.	<ul style="list-style-type: none"> The Contractor shall take all reasonable steps to prevent or remediate damage to the environment resulting from the Works in the form of erosion and sedimentation. The Contractor shall immediately remedy any situation that is or has the potential to result in soil erosion, water pollution and sedimentation from the works as a result of storm water flows. 	Contractor

EMP Upgrade of the Existing Walvis Bay Waste Water Treatment Works

Aspect	Management Objective	Management actions	Responsibility
Penalties	To ensure that environmental requirements are strictly adhered to.	Penalties will be issues for certain specified transgressions.	Contractor

4 OPERATIONAL PHASE

4.1 INTRODUCTION

The Operational Phase Section of the Environmental Management Plan relates to the management and mitigation measures required to ensure that the proposed WWTW and additional infrastructure upgrade is operated in a manner that demonstrates responsible, precautionary environmental management.

The Operational EMP (OEMP) will address specific areas of concern in terms of the long-term environmental management of the affected environment and is intended to serve as a guide to the on-going management of the WWTW and new infrastructure as well as the affected environment. The OEMP will therefore aim to provide the Municipality of Walvis Bay with the necessary tools to ensure that the potential impacts on the natural environment of the WWTW and additional infrastructure during operation are minimised. Moreover, it will aim to ensure that the infrastructure is operated and maintained in an environmentally sensitive and sustainable manner, and that the operation of the infrastructure does not result in reasonably avoidable environmental impacts.

The information is summarised in tabular format illustrating the activity, aspect, impact, mitigation measure, performance indicators, resources, schedule and verification. These criteria are listed and explained below:

The following components are identified/ described:

- **Activity:** component/ activity of the project for which the impact has been identified;
- **Aspect:** the aspect of the above activity which will be impacted;
- **Impact:** the environmental impact identified and to be mitigated;
- **Mitigation measure:** measures identified for implementation in terms of environmental management to reduce, rectify or contain the identified environmental impact - mitigation is divided into the following:
 - **Objective:** desired outcome of mitigation measure,
 - **Mechanism:** method of achieving the objective;
- **Performance indicators:** outcomes that will indicate achievement of objective/s;
- **Responsibility:** party or parties identified for implementation of mitigation measure/s;
- **Resources:** available resources to aid implementation of mitigation;
- **Schedule:** timeframe in which identified impact and mitigation measure is anticipated to occur; and
- **Verification:** party or parties identified as responsible for review and assessment of final outcome.

EMP Upgrade of the Existing Walvis Bay Waste Water Treatment Works

Issue	Objective	Strategy	Actions	Time frame
Maintenance and emergency procedures	To ensure correct procedures are in place to avoid environmental impacts associated with maintenance activities as well as proactive intervention to avoid, and if required, to respond to emergencies	<ul style="list-style-type: none"> Establish environmentally sensitive and technically sound maintenance procedures as well as reporting structures. Compile a staff competency assessment and training programme. Establish emergency procedures to ensure appropriate response and minimise potential risk to the biophysical and social environment. 	<ol style="list-style-type: none"> Develop an Operation and Maintenance (O&M) manual of procedures with technical guidelines Establish regular reporting procedures on maintenance Undertake regular inspection and maintenance of all infrastructure to ensure they are in working order and to assess damaged/ deficient equipment, as per the O&M Manual. Review, and if necessary, revise maintenance manual. Establish emergency procedures guidelines for pipe and pump station blockage/ failure, flooding, contaminant removal and disinfection, power failure and fire. Implement the response procedures when emergency incident occurs. Complete the incident report checklist in the case of emergency and keep with monitoring records for submission. Undertake annual education course for all operational staff. Review, and if necessary, revise emergency manual. 	<p>Within the first year of operation.</p> <p>Within the first year of operation.</p> <p>Once a month for lifespan of infrastructure as per the O&M manual.</p> <p>Bi-annually for lifespan of works.</p> <p>When emergency incident occurs.</p> <p>Emergency incident</p> <p>Annually for lifespan of operation.</p> <p>Annually for lifespan of operation</p> <p>Annually for lifespan of operation</p>

A more detailed Operational and Maintenance Manual (O&M) will need to be compiled by the Municipality of Walvis Bay when operation takes place in order to be more site specific. Below is more detail of what it should entail.

4.2 MAINTENANCE PROCEDURES

The optimal operation and effective maintenance of the WWTW and additional infrastructure are important in protecting the environment and ensuring that resources are not wasted and environmental incidents arising out of equipment or infrastructure failures, are avoided. A detailed O&M Manual will be compiled for the Works by a qualified person. The manual will provide detailed guidance on the operation of all machinery and associated systems as well as related maintenance procedures, including maintenance schedules. Implementation of this manual by the Municipality of Walvis Bay will facilitate the proactive management of potential risks and thus result in impacts on the receiving environment being averted. Accordingly, the O&M Manual shall be regarded as an integral component of the OEMP.

The O&M Manual will include, but not be limited to, the following sections:

- Works Safety including personnel safety and equipment safety;
- Equipment summary;
- Works description;
- Disposal of waste (e.g. sections of replaced pipe);
- Works operation, including:
 1. Commissioning start up (Pre-start-up checks), and
 2. Normal operation (Operation and daily operation checks).
- Maintenance schedules, including
 1. General care and maintenance,
 2. Maintenance log,
 3. Daily operating checks,
 4. Monthly Maintenance Procedures, and
 5. Annual Maintenance Procedures.

The maintenance procedures set out in the O&M Manual, will provide specific guidance in terms of the monitoring and maintenance of the key mechanical and electrical equipment. These procedures will specify the equipment item and specific component of each piece of equipment requiring checking, the scope and nature of the check that is to be carried out including detailed instructions related to the specific check, and the programme for conducting each check. Completed schedules will be kept on site to provide a complete compliance record.

4.3 FACILITY MANAGEMENT AND OPERATIONS

The Municipality of Walvis Bay shall ensure that sufficient budget allocations and provisions are made available to ensure that the infrastructure can be adequately

operated and maintained. The Municipality of Walvis Bay must also attend to any damages of the Water Works and the additional infrastructure resulting in pollution and leakages of the sewage, as a matter of high priority.

4.4 ROUTINE MAINTENANCE AND REPAIRS

The condition of the infrastructure shall be inspected routinely and a maintenance list compiled. Identified, preventative maintenance issues shall be undertaken as soon as possible. Any wastes or pollution arising from the repair and maintenance work must be rectified as soon as possible.

4.5 ENVIRONMENTAL AWARENESS

Instilling a sense of environmental awareness and consideration in all employees, but especially those involved with the project is vital to the overall success of any environmental management plan. It is therefore recommended that a general environmental awareness course for all new operational staff and employees of maintenance Contractors, who may be required to carry out duties on the project, be undertaken on their appointment. It is recommended that the municipality create a “green rules” pamphlet for dissemination to all workers and Contractors working on all municipality projects and sites.

4.5 WASTE AND POLLUTION MANAGEMENT

4.5.1 Hazardous materials

Where hazardous materials are required for repair and maintenance work (including fuels and oils), care shall be taken to ensure that a competent individual is appointed to enforce the responsible use of such materials. The operational staff or maintenance teams shall carry a copy of the relevant MSDS whenever using such materials. Municipality of Walvis Bay shall ensure that persons working with hazardous materials have been trained in the handling of such substances, as well as in emergency procedures to be followed in the event of an accidental spillage or medical emergency. Maintenance teams shall also carry a spill kit containing the appropriate neutralizing chemicals, absorbent materials and other relevant equipment required to undertake a clean-up of any spill that may occur.

4.5.2 Noise management

During maintenance operations, all silencing mechanisms on all equipment must be in a good state of repair. Except for in emergency situations, no amplified sound

may be broadcast. All routine maintenance shall be restricted to daylight hours.

5 DECOMMISSIONING PHASE

Given the nature and purpose of the infrastructure, it is unlikely that this infrastructure will be decommissioned in the foreseeable future. In the unlikely event that use of the infrastructure is discontinued by the Municipality of Walvis Bay, a decommissioning plan should be developed. Removal of the infrastructure is likely to cause more environmental harm than its abandonment.

6 CONCLUSION

In conclusion it should be noted that this EMP must be regarded as a living document and changes should be made to the EMP as required by project evolution while retaining the underlying principles and objectives on which the document is based.

The Environmental Assessment Practitioner (EAP) is thus of the opinion that this EMP would be sufficient for the proposed Amendment of the Upgrade of the Existing Walvis Bay Waste Water Treatment Works (WWTW) to include the Construction of a New Sewer Pump Station, Gravity Line and Rising Main at Lagoon Area, Walvis Bay, Erongo Region. It is our opinion that an Environmental Clearance Certificate be issued from the Ministry of Environment, Forestry and Tourism: Department of Environmental Affairs, on behalf of the Municipality of Walvis Bay on the provision of this EMP.

Appendix A - Water Quality Guidelines

ANNEXURE

Water Quality Standards for Effluent

Effluent to be discharged or disposed of in areas with potential for drinking water source contamination; international rivers and dams and in water management and other areas				
			Special Standard	General Standard
DETERMINANTS	UNIT	FORMAT	95 percentile requirements	
PHYSICAL REQUIREMENTS				
Temperature	° C		Not more than 10°C higher than the recipient water body	
Turbidity	NTU		< 5	< 12
pH			6,5-9,5	6,5-9,5
Colour	mg/litre Pt		< 10	< 15
Smell			No offensive smell	
Electric conductivity 25 °C	mS/m		< 75 mS/m above the intake potable water quality	
Total Dissolved Solids	mg/litre		< 500 mg/litre above the intake potable water quality	
Total Suspended Solids	mg/litre		< 25	< 100
Dissolved oxygen	% saturation		>75	>75
Radioactivity	units		below ambient water quality of the recipient water body	
ORGANIC REQUIREMENTS				
Biological Oxygen Demand	mg/litre	BOD	< 10	< 30
Chemical Oxygen Demand	mg/litre	COD	< 45	< 100
Detergents (soap)	mg/litre		< 0.2	< 3
Fat, oil & grease, individual	mg/litre	FOG	nil	< 2.5
Phenolic compounds	µg/litre	as phenol	< 0.01	< 0.10
Aldehyde	µg/litre		< 50	< 100
Adsorbable Organic Halogen	µg/litre	AOX	< 50	< 100
INORGANIC MACRO DETERMINANTS				
Ammonia (NH ₄ – N)	mg/litre	N	< 1	< 10
Nitrate (NO ₃ - N)	mg/litre	N	< 15	< 20
Nitrite (NO ₂ - N)	mg/litre	N	< 2	< 3
Total Kjeldahl Nitrogen (TKN)	mg/litre	N	< 18	< 33
Chloride	mg/litre	Cl	< 40 mg/litre above the intake potable water quality	< 70 mg/litre above the intake potable water quality
Sodium	mg/litre	N	< 50 mg/litre above the intake potable water quality	<90 mg/litre above the intake potable water quality
Sulphate	mg/litre	SO ₄	< 20 mg/litre above the intake potable water quality	< 40 mg/litre above the intake potable water quality
Sulphide	µg/litre	S	< 0.05	< 0.5
Fluoride	mg/litre	F	1,0	2,0
Cyanide (Free)	µg/litre	CN	< 30	< 100
Cyanide (recoverable)	µg/litre	CN	< 70	< 200
Soluble Ortho phosphate	mg/litre	P	< 0.2	3,0
Zinc*	mg/litre	Zn	1	5

Effluent to be discharged or disposed of in areas with potential for drinking water source contamination; international rivers and dams and in water management and other areas				
			Special Standard	General Standard
DETERMINANTS	UNIT	FORMAT	95 percentile requirements	
INORGANIC MICRO DETERMINANTS				
Aluminium	µg/litre	Al	< 25	< 200
Antimony	µg/litre	Sb	< 5	< 50
Arsenic	µg/litre	As	< 50	< 150
Barium	µg/litre	Ba	< 50	< 200
Boron	µg/litre	B	< 500	< 1000
Cadmium*	µg/litre	Cd	< 5	< 50
Chromium, (hexavalent)	µg/litre	Cr	< 10	< 50
Chromium, Total*	µg/litre	Cr	< 50	< 1000
Copper*	µg/litre	Cu	< 500	< 2000
Iron	µg/litre	Fe	< 200	< 1000
Lead*	µg/litre	Pb	< 10	< 100
Manganese	µg/litre	Mn	< 100	< 400
Mercury*	µg/litre	Hg	< 1	< 2
Nickel	µg/litre	Ni	< 100	< 300
Selenium	µg/litre	Se	< 10	< 50
Strontium*	µg/litre	Sr	< 100	< 100
Thallium	µg/litre	Tl	< 5	< 10
Tin*	µg/litre	Sn	< 100	< 400
Titanium	µg/litre	Ti	< 100	< 300
Uranium*	µg/litre	U	< 15	< 500
*Total for Heavy Metals (Sum of Cd,Cr,Cu,Hg,Pb)	µg/litre	Cd,Cr,Cu, Hg & Pb	< 200	< 500
UNSPECIFIED COMPOUNDS FROM ANTHROPOGENIC ACTIVITIES				
Agricultural chemical compounds	µg/litre		Any in-/organic compound recognized as an agro-chemical is to be avoided or reduced as far as possible. Maximum acceptable contaminant levels will be site specific, dependent on chemical usage and based the water quality of the recipient water body	
Industrial and mining chemical compounds, including unlisted metals and persistent organic pollutants	µg/litre		Any in-/ organic compound recognized as an industrial chemical including unlisted metals is to be avoided or reduced as far as possible. Maximum acceptable contaminant levels will be site specific dependent on chemical usage and based the water quality of the recipient water body	
Endocrine Disruptive Compounds (EDC)	µg/litre		Any chemical compound that is suspected of having endocrine disruptive effects is to be avoided as far as is possible. Maximum acceptable contaminant levels will be site specific dependent on chemical usage and based the water quality of the recipient water body.	
Hydrocarbons (Benzene, Ethyl Benzene, Toluene and Xylene)	µg/litre		Below detection level	Below detection level
Organo-metallic compounds: methyl mercury, tributyl tin (TBT), etc.	µg/litre		Below detection level	Below detection level
DISINFECTION				
Residual chlorine	mg/litre		< 0.1 Dependent on recipient water body	< 0.3 Dependent on recipient water body

Effluent to be discharged or disposed of in areas with potential for drinking water source contamination; international rivers and dams and in water management and other areas				
			Special Standard	General Standard
DETERMINANTS	UNIT	FORMAT		
BIOLOGICAL REQUIREMENTS (Algae and parasites)				
Further treatment of the effluent dependent on: <ol style="list-style-type: none"> 1. the water quality of the recipient water body if any 2. the distance from any point of potable water abstraction 3. an acceptable maximum contaminant level downstream of the point of discharge 4. the exposure to human and animal consumption downstream of the point of discharge 5. any reuse option that may be implemented. 				
MICROBIOLOGY				
Further treatment of the effluent are dependent on: <ol style="list-style-type: none"> 1. the water quality of the recipient water body if any 2. the distance from any point of potable water abstraction 3. an acceptable maximum contaminant level downstream of the point of discharge 4. the exposure to human and animal consumption downstream of the point of discharge 5. any water reuse option that may be implemented. 				

ANNEXURE

Table 1. Water Quality Guidelines and Standards for Potable Water

Specifications for water quality intended for human consumption from the source and piped water supply					
Status				Ranges and upper limits	
Interpretation				(Ideal guideline)	(Acceptable Standard)
DETERMINANTS	Unit	Format	Concern	95 Percentile Requirement	
PHYSICAL AND ORGANOLEPTIC REQUIREMENTS					
Temperature	° C		E	Ambient temperature	
Colour	PTU	or mg/litre	E	10	<15
Taste			O,E	No objectionable taste	
Odour			O,E	No objectionable odour	
Turbidity (treated surface water)	NTU	or TU	H,I	< 0,3	< 0,5
Turbidity (groundwater)	NTU	or TU	H,I	< 0,5	<2
pH @ 20 °C	pH		I	6.0 to 8,5	6 to 9
Electric Conductivity @ 25 °C	mS/m***	E.C.	H,I	< 80	< 300
Total Dissolved Solids	mg/litre		H,I	< 500	< 2 000
INORGANIC MACRO DETERMINANTS					
Ammonia	mg/litre	N	H	< 0.2	< 0.5
Calcium	mg/litre	Ca	I	< 80	< 150
Chloride	mg/litre	Cl	H,I	< 100	< 300
Fluoride	mg/litre	F	H	< 0.7	< 2,0
Magnesium	mg/litre	Mg	H	< 30	< 70
Nitrate	mg/litre	N	H	< 6	< 11
Nitrite	mg/litre	NO ₂	H	< 0.2	< 0.5
Potassium	mg/litre	K	H	< 25	< 100
Sodium	mg/litre	Na	H,I	< 100	< 300
Sulphate	mg/litre	SO ₄	H,O	100	< 300
Asbestos (fibres longer than 10 µm)	Fibres/litre		H	<500 000	< 1000 000
INORGANIC MICRO DETERMINANTS					
Aluminium	µg/litre	Al	H	< 25	< 100
Antimony	µg/litre	Sb	H	< 5	< 50
Arsenic	µg/litre	As	H	<10	< 50
Barium	µg/litre	Ba	H	0,5	< 2
Beryllium	µg/litre	Be	H	< 2	< 5
Bismuth	µg/litre	Bi	H	< 250	< 500
Boron	µg/litre	B	H	< 300	< 500
Bromide	µg/litre	Br	H	< 500	< 1 000
Cadmium	µg/litre	Cd	H	< 5	< 10
Cerium	µg/litre	Ce	H	<1 000	<2 000
Cesium	µg/litre	Cs	H	< 1 000	< 2 000
Chromium Total	µg/litre	Cr	H	< 50	< 100
Cobalt	µg/litre	Co	H	< 250	< 500
Copper	µg/litre	Cu	H	< 500	< 2 000

Specifications for water quality intended for human consumption from the source and piped water supply					
Status				Ranges and upper limits	
Interpretation				(Ideal guideline)	(Acceptable Standard)
DETERMINANTS	Unit	Format	Concern	95 Percentile Requirement	
INORGANIC MICRO DETERMINANTS					
Cyanide (free)	µg/litre	CN ⁻	H	< 20	< 50
Cyanide (recoverable)	µg/litre	CN ⁻	H	< 70	< 200
Iron	µg/litre	Fe	H,E	< 200	< 300
Lead	µg/litre	Pb	H	<10	< 50
Manganese	µg/litre	Mn	H	< 50	< 100
Mercury	µg/litre	Hg	H	< 1	<2
Nickel	µg/litre	Ni	H	< 50	< 150
Selenium	µg/litre	Se	H	< 10	< 50
Thallium	µg/litre	Tl	H	< 5	< 10
Tin	µg/litre	Sn	H	<100	<200
Titanium	µg/litre	Ti	H	< 100	< 300
Uranium	µg/litre	U	H	< 3	< 15
Vanadium	µg/litre	V	H	< 100	< 500
Zinc	µg/litre	Zn	H	< 1 000	< 5 000
Organo-metallic compounds	µg/litre	-	H	below detection limit	below detection limit
ORGANIC DETERMINANTS					
Dissolved Organic Carbon	mg/litre	DOC-C	H	< 5	<10
Phenol compounds	µg/litre	phenol	H	< 5	< 10
DISINFECTION AND DISINFECTION BY-PRODUCTS					
Bromodichloromethane (Part of THM)	µg/litre		H	< 20	< 50
Bromoform (Part of THM)	µg/litre		H	< 40	< 40
Chloroform (Part of THM)	µg/litre		H	< 20	< 100
Dibromomonochloro-methane (Part of THM)	µg/litre		H	< 20	< 100
Trihalomethanes (Total)	µg/litre	THM	H	< 100	< 150
Bromate	µg/litre		H	< 5	< 10
Chloramines	mg/litre	Cl ₂	H	< 2	< 4
Chlorine dioxide	µg/litre		H	< 400	< 800
Chlorite	µg/litre		H	< 400	< 4000
Chlorate	µg/litre		H	< 200	< 700
Haloacetic acids	µg/litre		H	not detected	< 60
Chlorine, free, after 30 min; GENERAL	mg/litre	Cl ₂	H,I	0,1 – 0,5	0,1 - 3,0
Chlorine, free, after 30 min; SPECIFIC	mg/litre	Cl ₂	Turbidity: < 0,3 NTU	0,1	0,1 - 3,0
Chlorine, free, after 30 min; SPECIFIC	mg/litre	Cl ₂	Turbidity: > 0,3 NTU	0,5	0,1 - 3,0
Chlorine, free, after 60 min; SPECIFIC	mg/litre	Cl ₂	Turbidity: >1,0 NTU	1,0	0,1 - 3,0

Specifications for water quality intended for human consumption from the source and piped water supply					
Status				Ranges and upper limits	
Interpretation				(Ideal guideline)	(Acceptable Standard)
DETERMINANTS	Unit	Format	Concern	95 Percentile Requirement	
BIOLOGICAL REQUIREMENTS					
Algae					
Chlorophyll α	$\mu\text{g/litre}$		E,O	< 1	< 2
Blue-green algae	cells	/ml	H,O	< 200	<2 000
Mycrocystin	$\mu\text{g/litre}$		H	< 0.1	< 1
Geosmin	$\eta\text{g/litre}$		E, H	< 15	< 30
2-Methyl Iso Borneal (2 MIB)	$\eta\text{g/litre}$		E, H	< 15	< 30
OTHER DETERMINANTS					
Agricultural chemical compounds			H	Any organic compound recognized as an agro-chemical should be in accordance with the WHO and EPA requirements.	
Industrial chemical compounds			H	Any organic compound recognized as an industrial chemical should be in accordance with the WHO and EPA requirements.	
Endocrine disruptive chemicals			H	Any chemical compound that is suspected of having endocrine disruptive effects shall be in accordance with the WHO and EPA requirements.	
RADIOACTIVITY				95 Percentile Requirement	
Gross alpha activity	Bq/litre		H	< 0.2	< 0.5
Gross beta activity	Bq/litre		H	< 0.4	< 1.0
If Gross alpha and beta is above specification calculate Dose based on individual radionuclide concentrations	mSv/a		H	≤ 0.04	≤ 0.1
ANALYSIS QUALITY CHECK***					
Ion balance: Total anions			-	< 3 -Tolerance = 0.2 m equivalent 3-10 – Tolerance 2% on +- balance 10-800 – Tolerance 5% on +- balance	
TDS Balance: determined / calculated	ratio		-	~ 1	~ 1
Ratio TDS / EC (EC as $\mu\text{S/cm}$)	ratio		-	~ 0,66	0,55 – 0,7

"Concern" refers to impact if the limit is transgressed: H = health concern; O = organoleptic effect; I = effect on infrastructure, structural; E = aesthetic effect

* Based on a viral cell culture-dependent method and not on cell culture-independent methods (e.g. PCR)

** Indicative of faecal pollution having occurred, even when the residual disinfectant levels are safe.

*** Comply with SANAS Guidelines

Table 2: Microbiological and Biological Requirements

MICROBIOLOGICAL REQUIREMENTS APPLICABLE TO ALL POTABLE WATER					
Microbiology	cfu			95 percentile	1 of samples maximum
Heterotrophic bacteria HPC or TCC	counts	/ml		100 at 37 ^o C	1 000 at 37 ^o C
Total Coliform	counts	/100 ml	H	0	5
E.Coli	counts	/100 ml	H	0	1
Enterococci	counts	/100 ml	H	0	1
Somatic Coliphage	counts	/100 ml	H	0	1
Clostridium perfringens inclusive spores	counts	/100 ml	H	0	1
Enteric viruses	viral count*	/10 L	H	0	1
Parasites (Protozoa) applicable to all potable water				95 percentile	99 percentile
Giardia lamblia	cysts	/100 litre	H	0	1
Cryptosporidium	oocysts	/100 litre	H	0	1
Giardia lamblia and Giardia lamblia (Grab sample)	cysts or oocysts	/10 L	H	0	0

Table 3: Special Requirements for the Protection of Infrastructure

Specifications for water quality intended for human consumption from the source and piped water supply for the protection of infrastructure against corrosion					
Status				Ranges and upper limits	
Interpretation				(Ideal guideline)	(Acceptable Standard)
DETERMINANTS	Unit	Format	Concern	95 Percentile requirement	
CORROSIVE AND SCALING PROPERTIES					
Calcium Carbonate Precipitation Potential	mg/litre	CCPP	I	4 - 5	3 - 6
Alkalinity/Sulphate/ Chloride Ratio	Equivalents	Corrosivity Ratio	I	With SO ₄ and Cl above 50 mg/litre Ratio=(Alk/50)/(SO ₄ /48+Cl/35.5) > 5.0 Water is Stable Ratio= (SO ₄ /48+Cl/35.5)/(Alk/50) > 0.2 Water is Corrosive	
Total Hardness (Ca & Mg)	mg/litre	CaCO ₃	I	<200	< 400

Table 4: Frequency of Microbiological Monitoring for Bulk Water Supply

Size of population served	Turbidity 95%**	Frequency of sampling
> 250 000	< 0,5 NTU	Thrice weekly ***
100 001 – 250 000	< 1,0 NTU	Twice weekly
50 001 – 100 000	< 1,0 NTU	Once weekly
10 001 – 50 000	< 1,0 NTU	Three times every month
< 10 000 reticulated	< 1,0 NTU	Once every 1 month*
< 10 000 non-reticulated	1 – 2 NTU	Once every 1 month*

* Upon complaints by the consumers or of medical practitioners and after incidents such as pipe breaks, the frequency should be increased until the situation has returned to original counts and been declared safe;

** Average or 95 percentile turbidity of the water supplied

*** The frequency should be stepped up by one extra sampling per week for every 100 000 residents (including the estimated number of visitors residing within the area at any time) in the area served, over and above 250 000.

General Information

1. The area being monitored shall be defined by the Minister in consultation with the Minister responsible for health and, where applicable, relevant officials from the Regional and Local Authorities;
2. At the time of sampling the operator shall also take a "free chlorine" reading of the same water under examination but prior to sampling for microbiological sampling, whilst using a portable device designed for that purpose and accepted by the Minister; this 'reading' is to be recorded and reported together with the results from the microbiological analyses;
3. As for field 'screening' of water supplies for microbiological contamination there exist portable devices designed for that purpose and accepted by the Minister; these 'readings' are to be recorded and reported together with the results from the microbiological analyses;
4. The results of the microbiological monitoring together with the free chlorine readings is to be reported as per mutual agreement to the ultimate supplier (bulk water supplier, Local Authority, or any other supplier) for remedial action where required, and to the Minister for record and monitoring purposes and follow up actions;
5. The costs of routine monitoring shall be borne by the authority commissioning the monitoring;

Methodology for Sampling and Analyses

The methodologies followed for sampling and during transit and storage of samples prior to analysis shall be as prescribed.

1. Preferably samples are to be taken in borosilicate glass bottles with a glass or polypropylene screw-cap lid;
2. Where this is not feasible or practical polyethylene bottles with internal seal and with screw-lid can be used;
3. Samples shall, as far as practical, be analysed within 24 hours of sampling;
4. Where there are special requirements for the period between sampling and analysis to be less than 24 hours, such requirement should be attended to as far as is practical;
5. Samples are to be kept and stored, even during transit, at as low a temperature as is practically manageable, whilst preventing the risk of the sample freezing;
6. The sample shall be kept away from light and shielded from sunlight, to reduce chances of micro-/biological growth to a minimum;
7. The use of preservation chemicals should be considered, planned and executed with extreme care;
8. Where sample preservation is appropriate or required an extra smaller volume sample should be taken so as to not upset any other analyses that are affected by the preservation chemical(s);
9. Certain determinants may be monitored 'in the field' at the time of sampling; such field-data are to be measured in a receptacle or container different from the sample container; data so obtained shall be recorded as "field measurement" and cannot replace laboratory analysis for the parameters concerned;
10. The methodologies followed for physical, chemical and microbiological analysis shall be in agreement with the specifications listed in the latest edition of the SANS 241, Drinking Water Standards, published by the SABS.
11. The cost of routine, regulatory inspections and monitoring, for the purpose of fulfilling the provisions of this regulation shall borne by the service provider.