	OCCUPATIONAL HEALTH & SAFETY (OHS) SPECIFICATION	
Johannesburg Water	PROJECT NUMBER:	JW 14302
	PROJECT LOCATION:	Carlswald
	PROJECT DESCR:	Construction of 20ML Carlswald Reservoir

VOLUME 3

Occupational Health & Safety Specification

JW 14302

CONSTRUCTION OF 20ML CARLSWALD RESERVOIR

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General Notification

This document forms an integral part of the Contract Specification and, in particular, shall constitute the Client's (Johannesburg Water SOC Ltd.) Occupational Health & Safety (OHS) Specification, as required by the Construction Regulations, 2014, as promulgated under the Occupational Health and Safety Act (Act no. 85 of 1993). The Specification shall furthermore be applied for the management of Mandatories performing activities for or on behalf of Johannesburg Water SOC Ltd, irrespective whether the contract work constitutes construction work or not.

The Contract Specification is contained in Volume 1 of the contract documents in Part 3: Scope of Work.

Acknowledgements

This Occupational Health & Safety (OHS) Specification was developed by the internal OHS Department for the sole use by Johannesburg Water SOC Ltd. The issue date of this OHS Specification is September 2016.

ABBREVIATIONS

Abbreviation	Description
CR	Construction Regulations
COID	Compensation for Occupational Injuries and Diseases
DoL	Department of Labour
GAR	General Administrative Regulations
GMR	General Machinery Regulations
GSR	General Safety Regulations
HCS	Hazardous Chemical Substances
HIRA	Hazard Identification and Risk Assessment
JW	Johannesburg Water (SOC) Ltd
MSDS	Material Safety Data Sheet
OHS	Occupational Health and Safety
PPE	Personal Protective Equipment
PER	Pressure Equipment Regulations
SANS	South African National Standards
SABS	South African Bureau Standard
SHE	Safety, Health & Environment
SOC	State Owned Company

DEFINITIONS

Word / Phrase	Definition
"WCL 1", "WCL 2" and "WCL 22"	Means the prescribed forms for reporting of incidents and occupational diseases referred to in the Compensation for Occupational Injuries and Diseases Act.
Competent Person	A person who has in respect of the work or task to be performed the required knowledge, training, experience and, where applicable, qualifications specific to that work or task: provided that where appropriate, qualifications and training are registered in terms of the provisions of the National Qualification Framework Act, 2000 (Act 67 of 2000).
Construction work	Any work in connection with: a) The construction, erection, alteration, renovation, repair, demolition or dismantling of or addition to a building or any similar structure b) the construction, maintenance, demolition or dismantling of any bridge, dam, canal, road, railway, runway, sewer or water reticulation system or any similar civil engineering structure; or the moving of earth, clearing of land, the making of an excavation, piling, or any similar type of work
Contractor (inclusive of Principal Contractor)	Any organization, person, entity performing activities for or on behalf of Johannesburg Water SOC Ltd.
Corrective Action	Action to eliminate the cause of a detected nonconformity or other undesirable situation.
Employee	Any person who is employed by or works for an employer and who receives or is entitled to receive any remuneration or who works under the direction or supervision of an employer or any other person
Employer	Any person who employs or provides work for any person and remunerates that person or expressly or tacitly undertakes to remunerate him, but excludes a labour broker as defined in section I (1) of the Labour Relations Act, 1956 (Act No. 28 of 1956)
Hazard	Means a source of or exposure to danger.
Hazard identification	The identification and documenting of existing or expected hazards to the health and safety of persons, which are normally associated with the type of construction work being executed or to be executed.
Incident	Means an incident as contemplated in section 24 (1) of the OHS Act 85 of 1993.
Machinery	means any article or combination of articles assembled, arranged or connected and which is used or intended to be used for converting any form of energy to performing work, or which is used or intended to be used, whether incidental thereto or not, for developing, receiving, storing, containing, confining, transforming, transmitting, transferring or controlling any form of energy
Mandatory	Includes an agent, a contractor or a subcontractor for work, but without derogating from his status in his own right as an employer or a user
Medical surveillance	Means a planned programme or periodic examination (which may include clinical examinations, biological monitoring or medical tests) of employees by an occupational health practitioner or, in prescribed cases, by an occupational medicine practitioner.
Method Statement	A document detailing the key activities to be performed in order to reduce as reasonably as practicable the hazards identified in any risk assessment.
Principal Contractor	Any employer who performs work and is appointed by the Client to be in overall control and management of the contract work (inclusive of Mandatories).
SHE File	A file or other record in permanent form, containing the information required as contemplated in the S.H.E Specification Document and legal requirements applicable to work activities.
SHE Plan	A documented plan which seeks to address all hazards identified means and ways to control and eliminate such to ensure compliance to the S.H.E Specification.
Workplace	Any physical location in which work related activities are performed under the control of the organization.

1. Introduction

In terms of Section 37 of the Occupational Health and Safety Act (Act no. 85 of 1993), Johannesburg Water SOC Ltd is required to control persons/organizations conducting activities for or on their behalf (Mandatories) and the Construction Regulations promulgated under the Occupational Health and Safety Act (Act no. 85 of 1993), is requiring Johannesburg Water SOC) Ltd. to compile an occupational health and safety specification for any intended project classified as construction work and to provide the specification to prospective tenderers / Mandatories.

The dual objective of this specification is to ensure that the Mandatories and Principal Contractors (herein after called Principal Contractor (including Mandatories)) entering into a contractual agreement/relationship with Johannesburg Water SOC Ltd. achieves and maintains an acceptable level of occupational health, safety and environmental performance whilst conducting activities to perform the contract work.

This document forms an integral part of the Contract Specification and, in particular, shall be the OCCUPATIONAL HEALTH & SAFETY (OHS) SPECIFICATION FOR CONSTRUCTION WORK. The Contract Specification is contained in Volume 1 of the contract documents. The principal and other contractors shall ensure that this specification is included with any contract/s that they may have with other contractors and/or suppliers that are engaged for the provision of labour, goods or services for this project. The Principal Contractor and its Contractors shall furthermore implement any reasonable practicable means to ensure compliance to this Occupational Health & Safety (OHS) Specification and any other applicable legislation on their organization and/or activities performed by or for them. This OHS Specification will be read in conjunction, where issued and applicable, with the Environmental Specification issued for listed activities requiring environmental authorization by a relevant authority.

Compliance with this OHS specification does not absolve the Principal Contractor from complying with any other applicable minimum legal requirement and the Principal Contractor remains responsible for the sustainable integrity of the environment and the health and safety of its employees, mandatories as well as any persons affected by activities conducted for or on behalf of Johannesburg Water SOC Ltd (SOC) Ltd..

1.1 Johannesburg Water SOC Ltd's commitment to Occupational Health, Safety & Environmental (SHE) Management

Johannesburg Water SOC Ltd is committed to responsible occupational health, safety and environmental management. This commitment is essential to protect the environment, employees, Mandatories, visitors and provide a work environment conducive to health and safety. Principal Contractors and their Contractors shall demonstrate their commitment and concern by:

- Ensuring that decisions and practices affecting occupational health, safety and environmental performance are consistent with the issued SHE specification;
- Ensuring adequate resources are made available for the effective implementation of occupational health, safety and environmental control and mitigation measures;
- Participating in hazard identification and risk assessments and design safety reviews;
- Communicating occupational health, safety and environmental management processes, strategies and control measures with all levels of employees, contractor and/or visitors;
- Ensuring visible leadership at all sites;
- Promoting and enforcing the use of correct types of Personal Protective Equipment (PPE);
- Reporting and investigation of incidents and accidents and ensuring actions are identified and implemented to prevent similar types of incidents reoccurring;
- Participating in Client audits and meetings and ensuring required actions are implemented within reasonable time frames on the site/project;
- Recognizing and commending safe work practices and coaching employees who require guidance;
- Applying and enforcing consequence management from deviations and transgressions of/from compliance to this SHE Specification noted and/or observed, where applicable;
- Carrying out safety observations, implement corrective and preventative actions and giving immediate feedback;

- Encouraging employee participation in the formulation of work instructions and safety rules.

1.2 Scope of Occupational Health, Safety and Environmental (SHE) Specification

The scope of this Occupational Health, Safety and Environmental (SHE) Specification is to address the reasonable and foreseeable aspects of occupational health, safety and environmental management, which will be affected by the contract work.

The specification will provide the requirements that the Principal Contractor and other Contractors shall comply with in order to reduce the risks associated with the contract work, and that may lead to incidents causing injury and/or ill health or degradation of the environment, to a level as low as reasonably practicable and possible.

In particular, Johannesburg Water SOC Ltd will ensure that it shall not appoint any Principal Contractor unless it is reasonably satisfied that the contractor which it intends to appoint has the necessary competencies and resources to carry out the work safely.

1.3 Omissions from SHE Specification

Where any omission from the SHE Specification is identified, applicable legal requirements will constitute the minimum standard for compliance to the relevant omission. The responsibility will be on the Principal Contractor to provide assurance to Johannesburg Water SOC Ltd on compliance to the applicable legal requirements related to the activity / task / process.

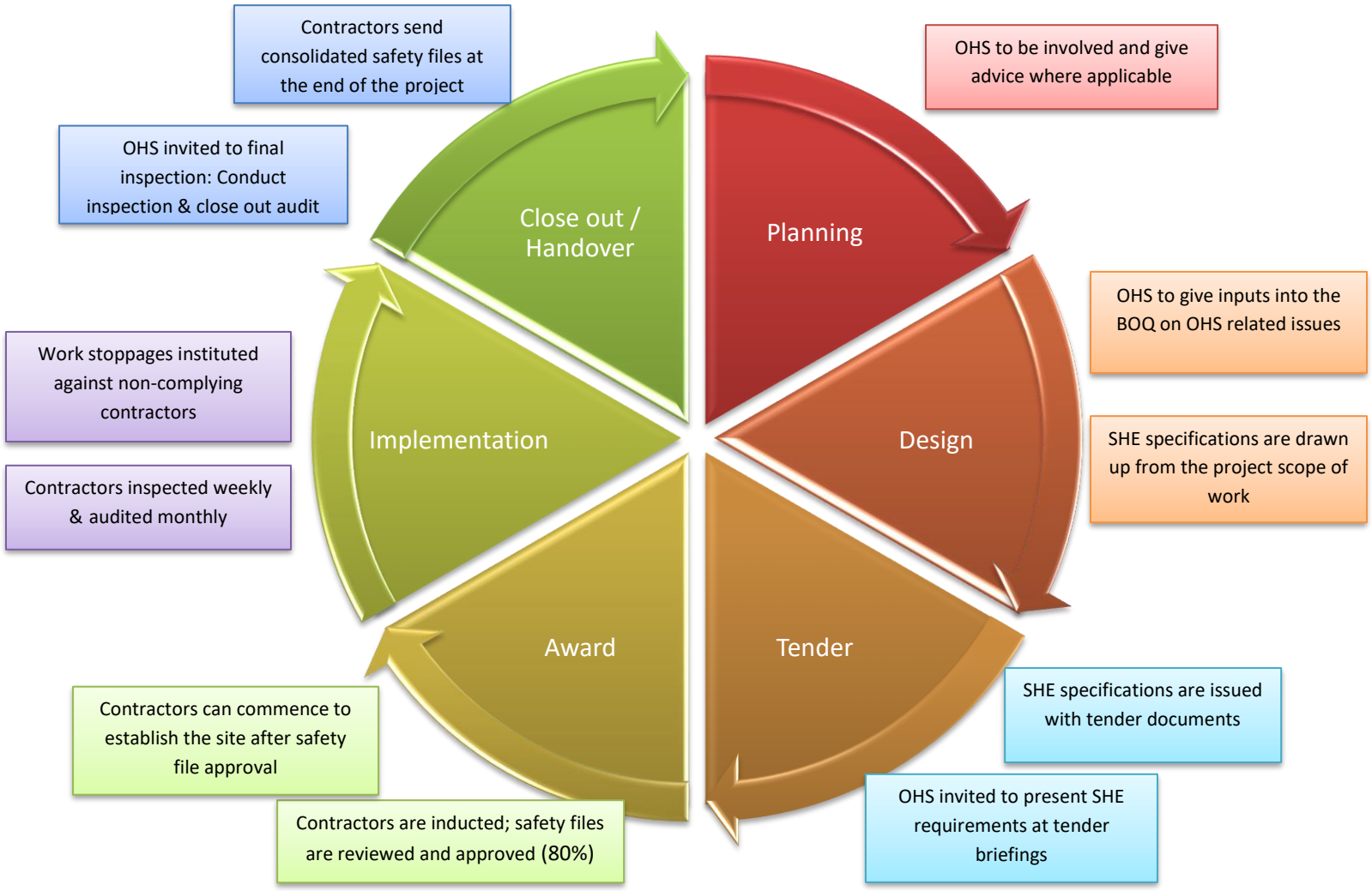
1.4 Change management

Whenever Johannesburg Water SOC Ltd identifies the need to change or review the SHE Specification, approved changes and revisions will be communicated to the Principal Contractor. A cost analysis on the implementation of the proposed changes / revisions will be calculated through a collaborative processes between Johannesburg Water SOC Ltd and the Principal Contractor – where the approved changes and/or revisions has no cost implication for the Principal Contractor the Principal Contractor will be required to accept the approved changes / revisions and ensure implementation within the SHE Plan / File framework.

2 Overview of contractor management process

The contractor management process consists of the following phases:

- Tender briefing and tender documentation;
- Competency evaluation of Principal Contractors (integrated into Supply Chain Management processes);
- Appointed contractor to attend SHE system induction;
- Preparation of SHE File by Principal Contractor;
- Evaluation of SHE File;
- Principal Contractor engagement phase;
- Project close-out and submission of consolidated Health & Safety File.


Contractors send consolidated safety files at the end of the project
OHS to be involved and give advice where applicable
OHS invited to final inspection: Conduct inspection & close out audit
Close out / Handover
Planning
OHS to give inputs into the BOQ on OHS related issues
Work stoppages instituted against non-complying contractors
Implementation
Design
SHE specifications are drawn up from the project scope of work
Contractors inspected weekly & audited monthly
Award
Tender
SHE specifications are issued with tender documents
Contractors can commence to establish the site after safety file approval
OHS invited to present SHE requirements at tender briefings
Contractors are inducted; safety files are reviewed and approved (80%)

2. SHE DOCUMENTATION

2.1 Safety file

The Principal Contractor will prepare a SHE File containing the processes / procedures and templates to be applied during the project period for the scope of work. The Principal Contractor will be evaluated during the contract period against the submitted SHE File.

Ata minimum the SHE File will contain the following documentation:

- Notification of construction work to the relevant Department of Labour (stamped on each page / no faxed copies);
- Scope of work to be performed;
- Personnel list (Principal Contractor employees);
- OH&S / SHE Policy and other Policies;
- Updated copy of the Occupational Health and Safety Act (Act no. 85 of 1993) and its Regulations; COID Act.
- Proof of valid registration and good standing with the Compensation Commissioner or another licensed Insurer;
- SHE Plan agreed with Johannesburg Water SOC Ltd.
- Approved risk assessments, review and monitoring plans and safe work procedures (method statements);
- A list of contractors (sub-contractors) including copies of the agreements between the parties and the type of work being done by each contractor;
- All written designations and appointments for project scope of work (CV and competency copies);
- Management structure (inclusive of OH&S responsibility & meeting structure);
- Induction training and site SHE rules;
- Occupational health and safety training matrix / plan;
- Arrangements with contractors and/or mandatories;
- Description of security measures;
- The following registers (as applicable to contract scope of work):
    - Accident and/or incident notifications, investigation & control register;
    - Occupational health and safety representatives inspection register;
    - Template for entry into confined space;
    - Toolbox talks pro-forma;
    - Fall protection inspections template;
    - First-aid box content template;
    - Record of first-aid treatment template;
    - Fire equipment inspection and maintenance template;
    - Ladder inspection template;
    - Machine safety inspections template (including machine guards, lock-outs etcetera);
    - Inspection templates for lifting machines and –tackle (including daily inspections by drivers/operators);
    - Inspection templates of scaffolding;
    - Inspections templates of structures;
    - Templates of issuing of Personal Protective Equipment;
    - Monthly reporting and recording of statistics templates;
    - Keeping of any other record in terms of applicable legislation falling within the scope of SHE Legislation applicable to the project and the Principal Contractor / Contractor's activities and organization.
- Emergency preparedness and response programmes;
- Medical examination tests

2.2 Principal contractor appointment

- The principal contractor will be appointed in terms of Construction Regulations 2014, Reg 5(1) k
- All responsibilities imposed on the contractor by the Regulations will be applicable
- The duties will include:

a) Prepare a site specific SHE file based on client SHE specification and project scope.
b) Have an updated Letter of Good standing.
c) Ensure the necessary legal appointment letters are compiled and signed by affected parties.
d) Ensure SHE file submitted before work commences to Johannesburg Water for evaluation and approval.
e) Must ensure an organizational medical programme for its employees is in place. This must address pre-employment, periodic examination, and exit examinations.
f) Ensure all employees undergo medical examination and are declared fit for the job they are employed for by a Medical Practitioner.
g) All employees undergo his control undergo company specific induction and Johannesburg water induction.
h) Ensure before work commences employees are trained on the health and safety risks associated with the work they are conducting.
i) Ensure employees are trained on company procedures, policies, method statements and informed of the Johannesburg Water SHE requirements as per the specification.
j) Ensure legislative requirements are complied with during the duration of the contract and ensure that their employees comply also.
k) Sign the 37 (2) Agreement between Johannesburg Water and themselves before any work commences and kept on their SHE file.
l) Ensure that 37(2) Agreement(s) are signed between themselves and their sub-contractors.
m) Ensure that sub-contractors have valid Compensation Commissioner Letter of Good Standing.
n) Have a disciplinary procedure to address those found to be transgressing requirements of SHE specification, SHE plan, site rules or any other OHS act and its Regulation requirement.
o) Prevent any employee or visitor who is under the influence of any alcohol or drugs (in state of intoxication) from being allowed to site.
p) Ensure the safety of employees who are taking legal medication.
q) Must hand over a consolidated SHE file at the end of the contract.
r) Stop his/her employees who are doing unsafe acts or who are creating an unsafe environment.
s) Investigate all incidents and report to Johannesburg water and ensure all reportable incidents as per the legislative requirement are complied with.
t) Ensure work is supervised by competent personnel and that work is done by competent employees.
u) Ensure pre-task risk assessment is done by a competent person and that employees are informed of the pre-task risks and the risk control measures.
v) Ensure tool box talks are conducted to communicate SHE issues in connection to the work being done and any other aspects.
w) Ensue that appointed personnel as per the SHE file are executing their duties as per the legal appointment.
x) Ensure first aid kit is made available in case of any emergency.
y) Ensure that housekeeping is maintained in good condition and that materials are store/stacked properly is designated areas.
z) Have sufficient waste receptacles and ensure the correct disposal of the different wastes.
aa) Proof of hazardous waste disposal to be requested from disposal site and to be kept inside SHE file.
bb) Take reasonable steps to ensure that each appointed sub-contractor health and safety plan is implemented and maintained on the site and SHE File documentation is up to date.
cc) Stop any work from being executed which is not in accordance with the client's health and safety specification and the principal contractor's health and safety plan for the site or which poses a threat to the health and safety of persons.
dd) Must maintain an up to date list of all the sub-contractors on site accountable to the principal contractor, the agreements between the parties and the type of work being done; and
ee) Ensure that all his or her employees have a valid medical certificate of fitness.

2.3 37.2 Agreement

- Johannesburg Water will enter into a 37(2) Agreement with all the appointed contractors
- A copy of the 37(2) Agreement must be kept in the SHE file of the contractor at all times.
- It is the responsibility of the contractor to ensure that there are 37(2) agreements between themselves and all their appointed sub-contractors.

2.4 SHE Plan

- The contractor shall prepare a SHE plan to address and manage all applicable sources of risk that are identified during the execution of the project. The SHE plan shall incorporate the requirements as listed in the SHE specification.
- A copy of the SHE plan shall be submitted together with SHE file for review and approval.
- It is the contractor responsibility to ensure they sub-contractor compiles a SHE plan that in line with the SHE specification requirement of Johannesburg Water.

2.5 Legislative framework

All contractors shall comply with legislation pertaining to this contract, including but not limited to:

- Constitution of the Republic of South Africa
- Occupational Health and Safety Act and its associated Regulations
- National Environmental Management Framework Legislation
- National Road Traffic Act
- Applicable South African National Standards (SANS)
- Compensation of Occupational Injuries and Diseases Act (COID)
- Local by-laws and provincial ordinances

2.6 SHE Policy

A SHE policy is a statement of intent and a commitment by the organization Chief Executive or Managing Director (OHS Act 16(1) appointee) in relation to requirements applicable to their Safety, Health and Environmental legal obligation, relevant SHE roles and responsibilities, and contractual obligations to the Client.
The contractor and their sub-contractor companies shall each have a documented SHE Policy authorized by their Chief Executive/Managing Director (OHS Act Section 16 (1) Appointee). The SHE Policy must meet the following minimum requirements;

- Organizational Mission and Goal.
- State the overall SHE objectives within the project.
- Show commitment to the prevention of injuries and ill-health.
- Show commitment to the protection of environment and the conservation of natural resources.
- Must be reviewed at predetermined intervals, or when there is change in work process, serious incident occurs.
- The SHE Policy must be in line with OHSAS 18001 and ISO 14001 requirements and guidance documentation.
- Must be authorized by contractor CEO.

2.7 Appointments and competencies

- The contractor and its appointed sub-contractor must make the relevant legislative and non-statutory appointments, which must be maintained valid for the entire contract duration.
- All appointees shall be suitably trained and certified competent for the responsibilities they are assigned for.
- Copies of all relevant appointments and the relevant competence certificates must be kept in the relevant SHE file.

2.8 Supervision of construction work

- The principal contractor shall ensure that the construction manager and construction health and safety officer are appointed for a ***single site*** on a full time basis.
- Where the total number of employees on site exceeds 75, the contractor shall appoint 2 Safety Officers and an Assistant Construction Manager.
- In the event that the appointed Safety Officer / Construction Manager cannot come to work for more than 5 days, the contractor must ensure that a substitute is appointed until they are back on site.
- JW should be informed in writing of the absence of the above-mentioned on site.

Appointment index

Appointment	Legislative Ref	Competency requirements (Min)
Alternate Construction Manager	CR 8.1	N.Dip Eng + 4yrs exp
Assistant Construction Manager	CR 8.2	N.Dip Eng + 4yrs exp
Assistant Construction Supervisor	CR 8.8	-
Bulk mixing plant	CR 20	Certificate
Confined Space Supervisor	GSR 5	Certificate + Proven experience
Construction Manager	CR 8.1	N.Dip Eng + 4yrs exp Full time on site
Construction Health , Safety & Environmental Officer	CR 8.5 & JW Requirement	N.Dip Safety + 2yrs exp; OR N.Dip Enviro + 3yrs exp; OR NEBOSH / SAMTRAC + 4yrs exp Full time on site Experience in enviro / certificate **Fully registered with SACPCMP as CHSO**
Construction supervisor	CR 8.7	3 yrs experience
Construction vehicle & mobile plant supervisor	CR 23.1	Certificate
Electrical installation and appliances inspector	CR 24	
Emergency, security and fire coordinator	CR 29	Certificate
Excavation supervisor (including piling)	CR 13	3yrs exp / N.Dip building
Fall protection supervisor	CR 10.1	Certificate
First-aiders	GSR 3	Certificate
Fire fighting equipment inspector	CR 29	Certificate
General Machinery Supervisor	GMR 2.1/7	GCC (GMR 2.1)/ 3yrs exp (GMR 2.7)
Temporary work supervisor (Formwork)	CR 12.2	N.Dip building + 4yrs exp
Hazardous chemical substances supervisor	HCS Regs	Certificate
Incident investigator	GAR 9.2	Certificate
Ladder inspector	GSR 13A	-
Lifting machines and equipment inspector	DMR 18.5	Certificate + 3yrs experience
Materials hoist inspector	CR 19.8	Certificate
Occupational health and safety committee	OHS Act 19	-
Occupational health and safety representatives	OHS Act 17	Certificate
Risk assessor	CR 9.1	Certificate
Stacking and storage supervisor	CR 28	Certificate
Structures supervisor	CR 11.2	N.Dip building + 4yrs exp

Suspended platform supervisor	CR 17.1	Certificate
Welding supervisor	GSR 9	Certificate

2.9 Insurances

- The principal contractor and all his appointed contractors shall be registered with an appropriate compensation commissioner and have available a valid letter of good standing at all times.
- The obligation lies with the contractor to ensure that the Letter of Good Standing remains valid throughout the entire duration of the project.
- A copy of the said letter must be filed in all SHE files and made available during inspections and audits.

2.10 Costing for SHE

The contractor is responsible for ensuring that SHE costing is taken into consideration for the entire project/contract as this will ensure they comply with the SHE legislative requirements.

2.11 Sub-contractors

- Whenever the Principal Contractor appoints contractors or sub-contractors, it is a requirement that an Occupational Health and Safety Act (Act no. 85 of 1993) Section 37(2) agreement (i.e. Agreement with Mandatory) is entered into between the Principal Contractor and Contractors.
- The Principal Contractor will ensure that all appointed contractors comply with the Johannesburg Water SOC Ltd SHE Specification requirements.
- The Principal Contractor will establish a procedure on sub-contractor management and assurance on compliance to the established procedure will be provided to Johannesburg Water SOC Ltd on a monthly basis.
- Principal Contractors are required to formally notify Johannesburg Water SOC Ltd before appointing subcontractors.
- Johannesburg Water SOC Ltd shall approve all specialist subcontractors to be appointed and/or engaged by the Principal Contractor.

The Principal Contractor shall:

- Ensure prior to work commencing on the site that every contractor is registered and in good standing with the compensation fund or with a licensed compensation insurer as contemplated in the Compensation for Occupational Injuries and Diseases Act, 1993;
- Appoint each contractor in writing for the part of the project on the construction site;
- Take reasonable steps to ensure that each contractor's health and safety plan is implemented and maintained on the construction site;
- Ensure that the periodic site audits and document verification are conducted at intervals mutually agreed upon between the principal contractor and any contractor, but at least once every 30 days;
- Stop any contractor from executing construction work which is not in accordance with the client's health and safety specifications and the principal contractor's health and safety plan for the site or which poses a threat to the health and safety of persons;
- Include and make available a comprehensive and updated list of all the contractors on site accountable to the principal contractor, the agreements between the parties and the type of work being done; and
- Ensure that all his or her employees have a valid medical certificate of fitness specific to the construction work to be performed and issued by an occupational health practitioner in the form of Annexure 3.

2.12 Notification of construction work

- The Principal Contractor shall, before carrying out any work, notify the relevant Department of Labour of the intention to carry out construction work and use the form (*Annexure 2 in the Construction Regulations 2014*) for this purpose.
- Only a certified copy stamped (each page) by the Department of Labour will be acceptable. No faxed or emailed notifications will be accepted.
- No work shall commence before the Principal Contractor has submitted notification of construction work to the relevant Department of Labour.

- Johannesburg Water SOC Ltd will not approve the SHE File if no original stamped / certified copy of the notification of construction work has been done.

2.13 Construction work permit

- There will be a requirement for a construction work permit for this based on the number of days on site as well as the project value.
- The permit can only be applied for after a contractor has been appointed, and the process will take approximately 30 days or more if requirements are not met.
- The Client will appoint a PrCHSA (Professional Construction Health and Safety Agent) registered with the SACPCMP to oversee the permit application process, and the contractor will be required to provide supporting documents for the application of the permit.

3. ORGANISATIONAL STRUCTURE

- The contractor shall develop and submit together with SHE file an organizational organogram related to the contractor, listing all the levels of responsibility from the Chief Executive down to the supervisor(s) responsible for the project.
- The organogram diagram must list all relevant positions, names of appointees and legal appointments.
- The contractor is responsible for updating the organogram timeously when there are changes to the appointments.
- All appointed sub-contractors are also required to compile their own organograms.

4. COMMITMENT TO SHE

- Visible commitment is essential to providing a safe working environment.
- Managers, supervisors and employees at all levels must demonstrate their commitment by being proactively involved in the day to day SHE operations.
- Legislation requires that each employee takes reasonable care of themselves and their fellow workers

5. HIRA

Annexure 1: List of possible hazards emanating from projects and activities conducted for or on behalf of Johannesburg Water SOC Ltd includes an assessment of site specific health and safety hazards and risks and environmental aspects and impacts that have been identified by Johannesburg Water SOC Ltd as possibly applicable to the contract work for this project. It is by no means exhaustive and is offered as assistance to the tenderers and contractors.

Development of risk assessments

Every Contractor performing construction work shall, before the commencement of any construction work or work associated with the construction work, and during construction work, ensure that a risk assessment is undertaken by a competent person, appointed in writing, and the risk assessment shall form part of the SHE plan to be applied on the site. Risk assessments shall identify occupational health and safety hazards and risks and environmental aspects and impacts emanating from the activity to be performed by the Principal Contractor / Contractor.

The risk assessment (inclusive of impact assessment) shall include (at a minimum):

- Identification of the relevant Johannesburg Water SOC Ltd Project with regard to JW Number, Project name and area;
- Date on which risk assessments were conducted / reviewed;
- The identification of the risks / hazards and aspects / impacts to which persons may be exposed to per activity;
- The analysis and evaluation of the risks / hazards and aspects / impacts identified;
- Existing control measures and proposed corrective measures;
- A plan to review the risk assessments as the work progresses and changes are introduced;
- Identification of significant risks (e.g. high; exceeding 75%);

- A documented plan of Safe Working Procedures (SWP)', and its relevance to the risk assessment, inclusive of method statements, to mitigate, reduce or control the risks and hazards that have been identified;
- A plan to monitor the application of the Safe Working Procedures (SWP);
- Signature of appointed competent person conducting risk assessment; and
- Signature of approval by Principal Contractor management and employees involved in risk assessment.

Based on the risk assessments, the Principal Contractor must develop a set of site-specific occupational SHE rules that will be applied to regulate the health, safety and environmental hazards/aspects of the construction work.

The risk assessments, together with the site-specific occupational health and safety rules, must be submitted to Johannesburg Water SOC Ltd before mobilisation on site commences. These will be included in the SHE plan. The Contractor shall ensure through his risk management process the hierarchy of controls stipulated as follows, are implemented:

- ***Eliminate*** - The complete elimination of the hazard.
- ***Substitute*** - Replacing the material or process with a less hazardous one.
- ***Redesign*** - Redesign the equipment or work process.
- ***Separate*** - Isolating the hazard by guarding or enclosing it.
- ***Administrate*** - Providing control such as training, procedures etc.
- ***Personal Protective Equipment (PPE)*** - Use of appropriate and properly fitted PPE where other controls are not practical. (PPE as the last resort)

The Principal Contractor will be required to carry out the following three forms of risk assessment:

- Baseline risk assessment;
- Issue based risk assessment;
- Continuous risk assessments.

Baseline risk assessments

The Principal Contractor is required to develop a baseline risk assessment taking the resources, competency levels, nature and scale of their organization into consideration for submission during SHE File evaluation phase. The hazards and risks to which persons, plant, vehicles and facilities may be exposed during the construction should be identified and evaluated. The aspects and impacts resulting in environmental pollution or degradation should also be identified and evaluated. Measures to reduce or control these risks or hazards should be defined during this assessment. The effectiveness of the measures defined and the baseline risk assessment prepared shall be monitored and reviewed from time to time to ensure that it remains relevant and accurate.

Issue based risk assessments

The Contractor will be required to carry out separate risk assessments during construction of the project when methods and procedures are varied, for example when:

- Designs are amended;
- New machines are introduced;
- Plant is periodically cleaned and maintained;
- Plant is started-up or shut-down;
- Systems of work change or operations alter;
- Indents or near-misses occur; or
- Technological developments invalidate prior risk assessments.

Continuous risk assessments

The Occupational Health and Safety Act (Act no. 85 of 1993) specifically requires that employers shall provide and maintain working environments that are safe and without risk to health. The general awareness of hazards needs to be raised as work ethic to maintain a safe and risk free environment on an on-going basis. This is achieved by continuous risk assessments, a form of risk assessment that takes place as an integral part of day-to-day management. Examples of continuous risk assessments include:

- Maintaining general hazard awareness, and

- Pre-work risk assessments / Daily Safety Task Instructions.

Occupational health and safety risks or environmental impacts that are identified during the risk assessment process shall be communicated before the commencement of the said activity to every employee whose work is associated with the risk. Each employee shall sign to confirm understanding of the safety, health or environmental risks in the tasks.

Review of risk assessments

The Principal Contractor is required to review the hazards identified, the risk assessments and the Safe Work Procedures as the contract work develops and progresses and each time changes are made to the designs, plans and construction methods and/or processes. Revisions to the approved risk assessments and Safe Work Procedures will be presented at each production planning and progress meeting.

Risk assessments are to be reviewed whenever there is change on the scope of work, process, and accidents or when required by Johannesburg Water SOC Ltd

The Principal Contractor must provide Johannesburg Water SOC Ltd, other contractors and all other concerned or affected parties with copies of any changes, alterations or amendments to risk assessments and Safe Work Procedures within 14 days of such changes.

6. SAFE WORK PROCEDURES / METHOD STATEMENTS

Method statements or written safe work procedures shall be documented for all high risk activities:

- Design change or scope change/addition
- Change in job or task
- Introduction of new machinery, equipment or substance.

Method statements or written safe work procedures shall identify following:

- Tasks that are to be undertaken
- The hazards and associated risks of the task(s)
- The control measures for the task(s)
- The equipment and substances that are associated with task(s)
- Any training or qualification needed to do the task
- Personal protective equipment to be worn.

7. INCIDENT MANAGEMENT

7.1 Reporting of accidents and incidents

The Principal Contractor must report all incidents where an employee is injured on duty to the extent that he:

- Dies
- Becomes unconscious
- Loses a limb or part of a limb
- Is injured or becomes ill to such a degree that he is likely either to die or to suffer a permanent physical defect or likely to be unable for a period of at least 14 days either to work or continue with the activity for which he was usually employed

Or where -

- A major incident occurred
- The health or safety of any person was endangered
- Where a dangerous substance was spilled
- The uncontrolled release of any substance under pressure took place
- Machinery or any part of machinery fractured or failed resulting in flying, falling or uncontrolled moving objects
- Machinery ran out of control

to Johannesburg Water SOC Ltd within two days and to the Provincial Director of the Department of Labour within seven days from date of incident (Section 24 of the Occupational Health and Safety Act (Act no. 85 of 1993) and General Administrative Regulations), except that, where a person has died, has become unconscious for any reason

or has lost a limb or part of a limb or may die or suffer a permanent physical defect, the incident must be reported to both Johannesburg Water SOC Ltd and the Provincial Director of the Department of Labour forthwith by telephone, telefax or e-mail.

- All other reports required by this specification must also be completed. Reporting of accidents / incidents to Johannesburg Water SOC Ltd will be on the prescribed format.
- The Principal Contractor is required to provide Johannesburg Water SOC Ltd with copies of all statutory reports required in terms of the Occupational Health and Safety Act (Act no. 85 of 1993) within 7 days of the incident occurring.
- The Principal Contractor is required to provide Johannesburg Water SOC Ltd with copies of all internal and external accident/incident investigation reports, within 7 days of the incident occurring.

7.2 Accident and incident investigation

- The Principal Contractor is responsible for the investigation of all accidents and/or incidents where employees and non-employees were injured to the extent that they had to receive medical treatment other than first aid.
- The results of the investigation are to be entered into the accident and/or incident register. The Principal Contractor is responsible for the investigation of all incidents, including those described in Section 24 (1) (b) and (c) of the Occupational Health and Safety Act (Act no. 85 of 1993) and for keeping a record of the results of the investigations including the steps taken to prevent similar accidents in future.
- The Principal Contractor is responsible for the investigation of all road traffic accidents, related to the construction activities, and for keeping a record of the results of the investigations including the steps taken to prevent similar accidents in future.
- Johannesburg Water SOC Ltd reserves the right to hold its own investigation into an incident or call for an independent external investigation.

7.3 Close out

- All incident investigation reports will be closed out once all the recommendations to prevent further incidents have been implemented.
- A copy of the investigation report must be handed to JW Safety Officer conducting the investigation.

8. MEDICAL SCREENING REQUIREMENTS

- The Principal Contractor shall ensure that a medical surveillance programme is implemented for all employees.
- An initial health evaluation shall be carried out by an occupational health practitioner immediately, before after a person commences employment, where any exposure exists or may exist, which comprises:
  - an evaluation of the employees medical and occupational history;
  - a physical examination; and
  - any other essential examination which in the opinion of the occupational health practitioner is desirable in order to enable the practitioner to do a proper evaluation.
- Medical surveillance and immunisation shall be done accredited at / by institutions or occupational health personnel, including, but not limited to:
  - Audiograms.
  - A cardio-respiratory examination / Lung function test;
  - Chest X-rays
  - Eye/ sight tests.
  - A general physical examination;
  - A review of previous medical history.
  - Glucose levels
  - Blood pressure

- An entry medical certificate shall be obtained for all workers prior to commencing with site activities from approved medical institution. Copies of all medical certificates shall be retained in the SHE File prior to site establishment and before an employee is allowed to come onto site.
- Specific attention shall be given to the physical and psychological fitness of people who will be required to work in elevated positions and operators of mobile machinery.
- An exit medical certificate shall be obtained for all workers at the end of the contract and for all workers who leave the employment of the Contractor before the end of the Project. Copies of all exit medical certificates shall be submitted to the Johannesburg Water SOC Ltd Project Specialist or Appointed OHS Agent.

9 EMERGENCY MANAGEMENT

The Principal Contractor must appoint a competent person to act as emergency controller and/or coordinator.

The Principal Contractor must conduct an emergency identification exercise and establish what emergencies could possibly develop. He must then develop detailed contingency plans and emergency procedures, taking into account any emergency plan that Johannesburg Water SOC Ltd may have in place.

In the event where a contractor incorporates the services of a 3rd party service provider for the provision of Emergency Response Services, the following criteria must be met:

- Identification of 3rd party emergency response services (organization & contact details);
- Notification of contractor to 3rd party emergency response service of incorporation of services into contractor's emergency response plan (written agreement / signed letter).

The Principal Contractor and the other contractors must hold regular practice drills of contingency plans and emergency procedures to test them and familiarise employees with them.

First-aid

The Principal Contractor must provide first-aid equipment (including a stretcher) and have qualified first-aider(s) on site as required by General Safety Regulations promulgated in terms of the Occupational Health and Safety Act (Act no. 85 of 1993).

The contingency plan of the Principal Contractor must include arrangements for the speedy and timeous transporting of injured and/or ill person(s) to a medical facility or of getting emergency medical aid to person(s) who may require it.

The Principal Contractor must have written arrangements in place with his other contractors regarding the responsibility of the other contractors towards their own injured and/or ill employees.

10 SHE TRAINING

All employees in jobs requiring training in terms of the Occupational Health and Safety Act (Act no 85 of 1993) and any other applicable legislative requirements are to be in possession of valid proof of training. Other occupational health, safety and environmental training requirements of the Occupational Health and Safety Act (Act no 85 of 1993) and Construction Regulations can include:

- General induction;
- Site and job specific induction, including visitors;
- Occupational health and safety representatives;
- Training of the legal and nominated appointees;
- Operators and drivers of construction vehicles and mobile plant;
- Basic fire prevention and protection;
- Basic first-aid;
- Storekeeping methods and safe stacking; and
- Emergency planning and coordination
- Incident investigation
- Risk Assessment

- Planned job observations (supervisors)

All operators, drivers and users of construction vehicles, mobile plant and other equipment are to be in possession of valid proof of training and, where applicable, valid licenses.

12.1 General Job training

The contractor is required to ensure that before an employee commences work their direct supervisor or line manager who is responsible for the employee has informed the employees of his scope of authority, hazards and risks associated with the work to be performed as well as the safety control measure(s). This will involve discussion in connection with ay work standard, job description or company policy or procedure.

12.2 Awareness and promotion

The Principal Contractor is required to have a promotion and awareness programme in place to create an occupational health and safety culture within employees. The following are some of the methods that may be used:

- Toolbox talks;
- Posters;
- Videos;
- Competitions;
- Suggestion schemes;
- Participative employee activities such as “occupational health and safety circles”.

The Principal Contractor is, at a minimum, required to provide awareness programmes to employees on the following:

- General Health and Safety Awareness
- Environmental Awareness;
- HIV / AIDS awareness.

12.3 General competence requirement

The Principal Contractor shall ensure that his personnel and other contractors’ personnel are trained and competent to carry out work safely and without risk to health has been completed before work commences. The Principal Contractor shall ensure that follow-up and refresher training is conducted as the work progresses and whenever the scope or nature of the work changes.

A “**competent person**” in relation to construction work, means any person having the knowledge, training and experience specific to the work or task being performed: Provided that where appropriate qualifications and training are registered in terms of the provisions of the South African Qualifications Authority Act, 1995 (Act No. 58 of 1995), these qualifications and training shall be deemed to be the required qualifications and training. It is the responsibility of the Contractor to determine whether any appropriate qualifications and training are registered in terms of the provisions of the South African Qualifications Authority Act.

Records of all training must be kept in the SHE File. The contents of the file will be audited from time to time.

At a minimum, the Principal Contractor will provide training on Safe Work Procedures / Safe Operating Standards to personnel responsible for performing the related task. Records of training on Safe Work Procedures / Safe Operating Standards will be retained. Competence and skill levels by the employees responsible for performing the task on the implementation of the Safe Work Procedures / Safe Operating Standards will be measured through Planned Job Observations.

12.4 Site-specific induction training

The Principal Contractor will be required to develop a project specific induction-training course based on the baseline risk assessment for the contract work. He will ensure that all his employees and other contractors and their employees have received training on the submitted induction-training programme.

All employees of the principal and other contractors are to be in possession of proof (on person) that they have attended a site-specific occupational health and safety induction-training course.

No contractor shall allow or permit any employee, visitor or any other person to enter the site, unless such employee or person has undergone health, safety and environmental induction training pertaining to the hazards prevalent on the site at the time of entry.

Where the Principal Contractor is required to operate within Johannesburg Water SOC Ltd Depot's the Principal Contractor will ensure that all employees undergo the Johannesburg Water SOC Ltd induction.

11 PPE REQUIREMENTS

- The Principal Contractor is required to continuously identify the hazards in the workplace and deal with them. He must either remove them or, where impracticable take steps to protect workers and make it possible for them to work safely and without risk to health under the hazardous conditions.
- The Principal Contractor will establish a Personal Protective Equipment Policy and a Personal Protective Equipment study will be conducted to determine the types of Personal Protective Equipment (PPE) to be supplied related to the hazards and risks emanating from the tasks.
- Cognisance shall be given to the gender of individuals required to where PPE; size required by the employee and size issued.
- Personal protective equipment should, however, be the last resort and there should always first be an attempt to apply engineering and other solutions to mitigating hazardous situations before the issuing of personal protective equipment is considered.
- Where it is not possible to create an absolutely safe and healthy workplace the Principal Contractor is required to inform employees regarding this and issue, free of charge, suitable equipment to protect them from any hazards being present and that allows them to work safely and without risk to health in the hazardous environment.
- It is a further requirement that the Principal Contractor maintains the equipment, instructs and trains the employees in the use of the equipment and ensures that the employees use the prescribed equipment.
- Employees do not have the right to refuse to use and/or wear the equipment prescribed by the employer and, if it is impossible for an employee to use or wear the prescribed protective equipment through health or any other reason, the employee cannot be allowed to continue working under the hazardous condition(s) for which the equipment was prescribed. An alternative solution has to be found that may include relocating the employee.
- The Principal Contractor may not charge any fee for protective equipment prescribed by him but may charge for equipment under the following conditions:
    - Where the employee requests additional issue in excess of what is prescribed;
    - Where the employee has patently abused or neglected the equipment leading to early failure; and
    - Where the employee has lost the equipment.

All employees shall, as a minimum, be required to wear the following personal protective equipment on any of Johannesburg Water SOC Ltd's projects:

- Protective overalls;
- Protective footwear;

- Protective headwear; and
- Eye, face and ear protection.
- NO SHORTS OR DRESSES WILL BE ALLOWED ON SITE!!!

All Personal Protective Equipment will clearly display the branding components of the Principal Contractor's organization (e.g. Name of Organization, logo).

12 DISCIPLINARY PROCESSES

- The contractor is required to implement disciplinary process in order to enforce compliance with requirements.
- All sub-contractors are required to have the same.

13 SITE RULES

- The Principal Contractor must develop a set of site-specific OH&S rules that will be applied to regulate the Health and Safety Plan and associated aspects of the construction.
- When required for a site by law, visitors and non-employees upon entering the site shall be issued with the proper Personal Protective Equipment (PPE) as and when necessary**.**

14 PUBLIC HEALTH AND SAFETY

The Principal Contractor is responsible for ensuring that non-employees affected by the construction work are made aware of the dangers likely to arise from the construction work as well as the precautionary measures to be observed to avoid or minimise those dangers. This includes:

- Non- employees entering the site for whatever reason;
- The surrounding community; and
- Passers-by the site.

- The Principal Contractor shall organize the site in such a manner that pedestrians and vehicles can move safely and without risks to health, including sufficient and suitable traffic routes and safe walkways with relevant signage.
- Appropriate signage must be posted to this effect and all employees on site must be instructed to ensure that non-employees are protected at all times.
- All non-employees entering the site must receive induction into the hazards and risks of the site and the control measures to be observed.
- The Principal Contractor shall recognize that the Community Liaison Officer (CLO) is the link between Johannesburg Water SOC Ltd and the community and provide all reasonable support to the Community Liaison Officer to ensure relevant responsibilities are fulfilled and positive relationships with the community are maintained.
- Where activities are performed close to public routes, the Principal Contractor will establish a traffic management plan incorporating the requirements of relevant by-laws. At a minimum, barricading, warning signage and flagmen will be provided to ensure the protection of workers from vehicles in transit. Where required, the Principal Contractor will interact with the local traffic department to establish minimum requirements to be implemented on public routes.

15 REFUSAL TO WORK

- Section 14 of the OHS Act states that employees shall carry out any lawful orders given to them, suggesting that they have the right to refuse to obey any unlawful order or work instruction.
- In terms of legal and JW requirements, if an employee has reasonable belief that the work to be carried out is likely to endanger themselves or other persons in any way, he/she has the right to refuse to work.
- An employee may also refuse to work in term of Section 29 of NEMA, if the work would result in imminent and serious threat to the environment.
- All contractors shall ensure that their employees are conversant with hazards associated with their work and work environment, and be aware of the precautionary measures to take.
- The contractor must ensure that all refusals to work are investigated promptly and resolved timeously.

16 SECURITY

The Principal Contractor must establish site access rules and implement and maintain these throughout the construction period. Access control must, amongst other, include the rule that non-employees will not be allowed on site unaccompanied.

The Principal Contractor must develop a set of security rules and procedures and maintain these throughout the construction period.

The Principal Contractor shall:

- Provide a guardhouse for security personnel. The guardhouse should be in good condition and at-least meet minimum requirements as per Environmental Regulations for Workplaces as promulgated under the Occupational Health and Safety Act (Act no. 85 of 1993).
- Supply an access card containing the name, surname, employee number and photograph for all appointed employees (full or part time) for the site.
- Ensure that no person enters the construction site without wearing the necessary Personal Protective Equipment (PPE).
- Ensure that no children are allowed on the construction site.
- Ensure that no family members are sleeping over on the construction site.
- Ensure that no pets are allowed on the construction site.

17 ACCOMMODATION ON SITE

No employees shall be accommodated on site.

18 WELFARE FACILITIES

The provision of toilets for each sex is required in terms of the National Building Regulations and Construction Regulation 28. Chemical toilets are allowed instead of the water borne sewerage type. Toilets have to be provided at a ratio of 1 toilet per 30 workers. The Principal Contractor shall provide flushing toilets on the construction premises.

- At least cold-water showers for each sex have to be provided at a ratio of 1 shower per 15 workers.
- Some form of screened off changing facility must be provided separately for each sex.
- Some form of eating facility sheltered from the sun, wind and rain must be provided.

The employer needs to provide his employees with the following:

- Potable water for drinking;
- Water and soap for hand washing
- Toilet paper

19 COMPLIANCE MONITORING

20.1 Inspections

- Contractors will be inspected at least once per week by the JW Project Inspectors.
- Feedback of the inspections will be issued immediately on work instructions, and a formal report sent within 7 days of conducting the inspection to all relevant stakeholders.
- Johannesburg Water SOC Ltd. reserves the right to conduct other ad-hoc assessments and inspections as deemed necessary.
- This may include, amongst other measures, site safety walks. Corrective actions will be identified by Johannesburg Water SOC Ltd. and the Principal Contractor's representative and implemented

by the Principal Contractor (at no cost to Johannesburg Water SOC Ltd.) to ensure SHE Performance improvement.

20.2 Monthly audits

- Monthly audits will be conducted within periods not exceeding 30 days.
- The Principal Contractor is to conduct his own monthly internal audits and inspections to verify compliance with his own occupational health and safety plan and management system as well as compliance with the requirements of the Johannesburg Water SOC Ltd. SHE Specification.
- The Principal Contractor will also assess and inspect the compliance of other contractors under its control. Management members of the Principal Contractor will be involved in the internal assessments and inspections.

20.2.1 Monthly compliance rating

A monthly compliance rating will be calculated for each Principal Contractor as per a formula determined by Johannesburg Water SOC Ltd focussing on or incorporating outcomes of assurance (e.g. monthly audit), operational (e.g. behavioural based safety inspection) assessments and other requirements, as necessary. Johannesburg Water SOC Ltd reserves the right to adjust the monthly compliance calculation formula as and when required – each revision of the monthly compliance calculation formula will be communicated to the Principal Contractor before implementation.

Each Principal Contractor is required to maintain a minimum compliance rating of 93% (Ninety Three Percent).

Scoring	Classification	Classification description
93% -100%	Good	Substantial compliance
80% -92%	Average	Compliance status needs to be improved
60% - 79%	Poor	Methods to ensure compliance require substantial improvement - operations with substantial non-compliance risks
<60%	Very poor	Methods to ensure compliance failed completely - troubled operation with severe non-compliance risks

20.3 Work stoppages

Work stoppages will be identified for 2 (two) types of work stoppages to be implemented:

- Overall work stoppage – the Principal Contractor and its Contractors are not allowed to continue with any type of construction / site work up until the work stoppage has been closed-out;
- Activity work stoppage – The Principal Contractor and its Contractors are not allowed to continue with the specific activity / task / job up until the work stoppage has been closed-out.

Overall work stoppages will be issued where non-conformances are identified against the criteria in the following table.

NR	DESCRIPTION OF AUDIT NON-CONFORMANCE / NON-COMPLIANCE
1	**NOTIFICATION OF CONSTRUCTION WORK**
1.1	Local Department of Labour not notified of construction work before commencement of construction activities
1.2	Notification of construction work not stamped by local Department of Labour (no faxed copies)

NR	DESCRIPTION OF AUDIT NON-CONFORMANCE / NON-COMPLIANCE
1.3	Copy of notification of construction work not available on site
2	**PROOF OF REGISTRATION WITH COMPENSATION COMMISSIONER**
2.1	Proof of registration with Compensation Commissioner or other insurer not available
2.2	Registration with Compensation Commissioner or other insurer not valid and up-to-date
3	**POLICY COMMITMENT & SHE SPECIFICATION**
3.1	SHE Plan not compiled, approved by contractor management and available on site
4	**SECTION 37(2) AGREEMENT**
4.1	Signed section 37(2) Agreement not signed and available on site
5	**RISK ASSESSMENTS**
5.1	Risk assessments not developed/ not applicable to scope of work issued by Client
6	**CONSTRUCTION MANAGER**
6.1	No construction manager appointed / available on site
6.2	Appointed construction manager does not meet requirements
6.3	Proof of competency not available on-site
7	**SITE SAFETY OFFICER**
7.1	No safety officer appointed/ available on site
7.2	Safety officer does not meet requirements
8	**SHE FILE**
8.1	No file on site

Activity work stoppages will be issued where non-conformance are identified per activity where the health and safety of employees or the public is compromised.

20.4 Non-compliance management process

The following actions will be instituted where non-conformances are identified in terms of compliance to relevant legislative requirements and the Johannesburg Water SOC Ltd SHE Specification.

CRITERIA	ACTION TO BE INSTITUTED	RESPONSIBLE PARTY
Compliance rating: 93-100%	Non-conformance closure	Principal Contractor / Contractor
Compliance rating: 80-92%	Letter of compliance improvement to Principal Contractor	Johannesburg Water SOC Ltd

CRITERIA	ACTION TO BE INSTITUTED	RESPONSIBLE PARTY
	Non-conformance closure	Principal Contractor / Contractor
Compliance rating: 60-79%	Non-compliance hearing	Johannesburg Water SOC Ltd
	Letter of commitment for performance improvement	Principal Contractor / Contractor
	Non-conformance closure	Principal Contractor / Contractor
Compliance rating: <60%	Non-compliance hearing	Johannesburg Water SOC Ltd
	Letter of commitment for performance improvement	Principal Contractor / Contractor
	Non-conformance closure	Principal Contractor / Contractor
	Supply Chain Management to be informed of non-compliance standing	Johannesburg Water SOC Ltd
3 x Work stoppages	Non-compliance hearing	Johannesburg Water SOC Ltd
	Letter of commitment for performance improvement	Principal Contractor / Contractor
	Non-conformance closure	Principal Contractor / Contractor
	Supply Chain Management to be informed of non-compliance standing	Johannesburg Water SOC Ltd
3 x Non-conformance to <93% monthly compliance rating	Non-compliance hearing	Johannesburg Water SOC Ltd
	Letter of commitment for performance improvement	Principal Contractor / Contractor
	Non-conformance closure	Principal Contractor / Contractor
	Supply Chain Management to be informed of non-compliance standing	Johannesburg Water SOC Ltd
3 x consecutive repeat findings	Non-compliance hearing	Johannesburg Water SOC Ltd
	Letter of commitment for performance improvement	Principal Contractor / Contractor
	Non-conformance closure	Principal Contractor / Contractor
	Escalation to SCMU & CAPEX	Johannesburg Water SOC Ltd

21 OPERATIONAL REQUIREMENTS

21.1 EXCAVATIONS

- Where excavations will exceed 1.5 m in depth the contractor will be required to submit a method statement to Johannesburg Water SOC Ltd for approval before commencing with the excavation and Johannesburg Water SOC Ltd will issue a permit to proceed once the risk assessment and method statement is approved.
- Excavations must be limited to 100m per day, or equated to the amount of work to be done for the day.
- All open excavations shall be closed within 3 days of excavation. No excavation will remain open beyond 3 days or during holidays.

- Excavation work must be carried out under the supervision of a competent person, who has been appointed in writing, with at least two years' experience in excavation work. Before excavation work begins the stability of the ground must be evaluated.
- Whilst excavation work is being performed, the contractor must take suitable and sufficient steps to prevent any person from being buried or trapped by a fall or dislodgement of material.
- No person may be required or permitted to work in an excavation that has not been adequately shored or braced.
- Where the excavation is in stable material and where the sides of the excavation are sloped back to at least the angle of repose of the excavated material, shoring or bracing may be left out but only after written permission has been obtained from the appointed competent person.
- Shoring and bracing must be designed and constructed to safely support the sides of the excavation.
- Where uncertainty exists regarding the stability of the soil the opinion of a competent professional engineer or professional technologist must be obtained whose opinion will be decisive. The opinion must be in writing and signed by the engineer or technologist as well as the appointed competent person.
- No load or material may be placed near the edge of an excavation unless suitable shoring has been installed to be able to carry the additional load.
- Neighbouring/adjoining buildings, structures or roads that may be affected or endangered by the excavation must be suitably protected.
- Every excavation must be provided with means of access that must be within 6 metres of any worker within the excavation.
- The location and nature of any existing services such as water, electricity, gas etc. must be established before any excavation is commenced with and any service that may be affected by the excavation must be protected and made safe for workers in the excavation.
- The appointed competent person must inspect every excavation, including the shoring and bracing or any other method to prevent collapse, as follows:
    - Daily before work commences
    - After every blasting operation
    - After an unexpected collapse of the excavation
    - After substantial damage to any supports
    - After rain
- The results of any inspections must be recorded in a register kept on site and in the safety file.
- Every excavation accessible to the public or that is adjacent to a public road or thoroughfare or that threatens the safety of persons, must be adequately barricaded or fenced to at least one meter high and as close to the excavation as practicable, regardless of the depth of the excavation.
- Every excavation must be provided with warning lights or visible boundary indicators after dark or when visibility is poor.
- Upon entering an excavation the requirements of General Safety Regulation 5, work in confined spaces, must be observed:
- Any confined space may only be entered after the air quality has been tested to ensure that it is safe to breathe and does not contain any flammable or noxious air mixture.
- The confined space must be purged and ventilated of any hazardous or flammable gas, vapour, dust or fumes.
- The safe atmosphere must be maintained and, where necessary.
- Employees are to be provided with breathing apparatus and must wear a safety harness with a rope with the free end of the rope being continuously attended to by a person outside the confined space.
- Furthermore, an additional person, trained in resuscitation, to be in full-time attendance immediately outside the confined space.

- Additional serviceable breathing and rescue apparatus is kept immediately outside the confined space for rescue purposes.
- All pipes, ducts etc. that may leak into the confined space to be blanked off sufficiently to prevent any leakage or seepage.
- The employer must ensure that all employees have left the confined space after the completion of work.
- Where flammable gas is present in a confined space no work may be performed in close proximity to the flammable atmosphere.
- Excavations and other openings must be provided with sufficient barriers to prevent construction vehicles and mobile plant from falling into them.
- Excavations left open for extended periods of time (exceeding 48 hours) must be approved the relevant Engineer / Construction Supervisor.

21.2 CONFINED SPACE ENTRY

- Enclosed space work necessitates a Confined Space Permit. This may only be obtained from the authorized person nominated in writing.
- The responsibility for safe procedure, both at the time of entry and during the entire operation of entering and working in confined spaces, rests with the Contractor.
- The Contractor shall be sure that adequate steps have been taken to eliminate or control hazards.
- Before working in an area that contains dust, the area is to be ventilated and hosed down to settle and dampen the dust.
- The Contractor shall provide all necessary equipment to manage confined spaces, including all necessary monitoring and rescue equipment (such as tripods, breathing equipment and the like).
- The Contractor shall ensure all persons working in a confined space or managing entry to a confined space are appropriately trained.
- Compulsory - Continuous monitoring, trained rescue teams, radio communication & adequate ventilation.

Pump sumps & valve chambers

Ventilation

- All available manholes or ventilation covers must be removed and the compartment ventilated for 10 (ten) to 15 (fifteen) minutes, using compressed air or a portable blower.
- Such ventilation must be continued while personnel are in the compartment.
- Ensure that exhaust fumes from blower do not enter the confined space.
- Before entering any sump or compartment, the atmosphere must be tested by the Principal Contractor's competent person (trained by the supplier of the gas monitoring equipment) by lowering the gas monitoring equipment to the bottom of the sump or compartment by means of a rope.
- A register must be kept indicating that the atmosphere has been tested and that the sump or compartment is fit to work in.
- The Principal Contractor's construction supervisor must check and co-sign this register each time he visits a site to ensure that the atmosphere is continuously being monitored.

Entering sump

- When entering a sump the person entering the sump must wear the safety harness, gas detector as well as a self-rescuer.
- A lifeline must be attached to the safety harness and a person on the surface must be in continuous contact with the person in the sump.
- At least one person on the surface must be trained in basic first aid and CPR and a first aid kit with resuscitation equipment must be available outside the entrance of the confined space for emergencies.
- Should the alarm sound when a person is in the confined space, the area must be evacuated immediately and the atmosphere re-tested and certified safe before re-entry into the confined space.
- In no circumstance shall any person remain within a sump for a period of more than one hour at a time.
- A five-minute rest on the surface must be taken after this period before re-entering.

- No naked lights, smoking or unprotected electrical apparatus which may cause sparks, shall be permitted in any sump or in their vicinity.

Confined spaces & water chambers

General

- All employees working in confined spaces or sewer manholes must be issued with gas monitoring equipment and safety harnesses and self- rescuers where applicable.
- All these employees must be trained in their use.
- Where over pumping between manholes is involved, only leakage free pumping machines and conveyance tubes will be allowed.
- Under no circumstances may any confined space be entered unless it has been certified safe to work in.
- Safety harnesses and attachments must be checked for damage to webbing, metal fittings and ropes on a monthly basis and the findings recorded in a register.
- Should a harness be damaged, it must be reported to the construction supervisor immediately.

The following records shall be taken and maintained by the Principal Contractor:

- Confined space entry permits
- Confined space entry registers
- Safety harness registers

Ventilation

- All available manholes or ventilation covers must be removed and the chamber ventilated for 10 (ten) to 15 (fifteen) minutes, using compressed air or a portable blower.
- Such ventilation must be continued while personnel are in the chamber.
- Ensure that exhaust fumes from blower do not enter the confined space.
- Before entering any chamber, the atmosphere must be tested by the Principal Contractor's competent person (trained by the supplier of the gas monitoring equipment) by lowering the gas monitoring equipment to the bottom of the chamber by means of a rope.
- A register must be kept indicating that the atmosphere has been tested and that the area is fit to work in.
- The Principal Contractor's construction supervisor must check and co-sign this register every time he visits the site to ensure that the atmosphere is continuously being monitored.
- Fumes must be extracted from the chamber while welding.

Entering chamber

- When entering a chamber the person entering the chamber must wear a safety harness as well as the gas detector.
- A lifeline must be attached to the safety harness and a person on the surface must be in continuous contact with the person in the manhole.
- At least one person on the surface must be trained in basic first aid and CPR and a first aid kit with resuscitation equipment must be available outside the entrance of the confined space for emergencies.
- In no circumstances shall any person remain within a chamber for a period of more than one hour at a time. A five-minute rest on the surface must be taken after this period before re-entering.
- Should the alarm sound when a person is in the confined space, the area must be evacuated immediately and the atmosphere re-tested and certified safe before re-entry into the confined space.
- When the activity to undertake inside the pipeline includes the use of any hazardous chemical substances or substances, which might cause hazardous fumes or gasses the contractor, must comply with 5.24 Hazardous Chemical Substances.

Safety equipment

- All teams must be issued with gas monitoring equipment and safety harnesses and self-rescuers where applicable.
- All employees must be trained in the use thereof.

21.3 BARRICADING

- Barricading plans are to be presented by the Principal Contractor for any major operations involving site works for approval by Johannesburg Water SOC Ltd. Where areas are unsafe, they should be enclosed with barricading. Examples are people working overhead, welding splatter etc.
- Where there is a risk of injury, the area should be barricaded off with secure solid barricades.
- Barricading for the prevention of access into areas with a potential risk of injury shall as a minimum be constructed of a handrail, knee-rail and appropriately supported as to prevent any person from falling into the restricted/risk area.
- Appropriate signage shall be affixed to the barricade indicating the risk associated (i.e. deep excavation, lifting operations etc.) and the responsible Supervisor and contact details shall be displayed. All barricading shall have a "No Entry" signs on all sides and at each change of direction. Signage shall be placed at 20 m intervals where lengths exceed. All signage shall be a minimum size of 290 mm x 290 mm.
- Danger tape shall not be utilised to prevent personnel from entering into areas.
- Where no risk exists of injury to personnel such as stacking and storage areas, the use of wire for hand and knee rails netting shall be acceptable to demarcate the area.
- All barricades will have a dedicated entrance where it is required that personnel enter the areas.
- Appropriate signage shall be placed at the entrance indicating which Contractor has right of entry.
- It is the Contractor's responsibility to remove all redundant barricades directly after use. The Contractor's Safety Officers will maintain a marked-up site plan indicating where barricades are erected.
- It will be a requirement that the contractor protects employees against contact with exposed rebar and poles by the installation of rebar-caps on all exposed areas where there is a potential that an employee could be injured.

21.4 SYMBOLIC SIGNGAGE

Contractors shall use mandatory and prescribed symbolic safety signs at their lay down and site areas. The display of the following signs is mandatory:

- "Radio-Active Material" symbolic signs at radioactive storage areas.
- "Eye Protection" symbolic signs shall be displayed at all grinding machines and at any area where it is mandatory to wear eye protection or where there is danger of an eye injury being sustained.
- "Ear Protection" symbolic signs shall be displayed at all areas where there is a danger of noise induced hearing loss being sustained.
- Every separate room of a workplace shall be consecutively numbered.
- All toilets or urinals shall be marked in a conspicuous place with painted or stencilled letters to indicate the sex for which they are intended.
- The location of every first aid box is to be clearly indicated by means of a sign.
- In any room, cabinet or enclosure where flammable substances are used or stored shall be fixed a suitable and conspicuous sign prohibiting smoking or the use of naked flames in the area.
- At the entrance to premises where machinery is used
- Restricted access on "Authorised Person Only" signs on entry. "No person shall enter the workplace or premises without the permission of the employer or user of the machinery".
- At every place where machinery is used a notice (English & Pictograms) shall be posted.
- Explosive Power Tool shall have a sign warning people when it is in use.
- Electrical Control Gear. A notice shall be posted so as to warn against the re-closing of a switch of control gear whilst a person is working on such equipment.
- Emergency contact telephone numbers.
- Adequate scaffolding signs. (When applicable).
- Adequate fire fighting equipment signs.
- Speed limit signs.
- Warning notices at openings through which people may fall.

- Risk based signage depending on the task being performed e.g.:
    - "Men working above", "Men working below', "Road closed – detour", "Excavation in progress", "No walkway" etc.;
- No-entry signs to incomplete platforms

The Principal Contractor shall install a notification board indicating the following information at the site entrance:

- Johannesburg Water SOC Ltd project number;
- Principal Contractor identification details (name, telephone number)
- Name and contact details of Construction Supervisor;
- Name and contact details of site safety officer;
- Monthly compliance rating;
- Lost Time Injury Rate;

The Principal Contractor will ensure that information on the notification board is kept up-to-date.

21.5 USE AND STORAGE OF FLAMMABLES

The Principal Contractor to ensure that:

- No person is required or permitted to work in a place where there is the danger of fire or an explosion due to flammable vapours being present unless adequate precautions are taken;
- No flammable material is used or applied e.g. in spray painting, unless in a room or cabinet or other enclosure specially designed and constructed for the purpose unless there is no danger of fire or explosion due to the application of adequate ventilation;
- The workplace is effectively ventilated. Where this cannot be achieved:
    - Employees must wear suitable respiratory equipment
    - No smoking or other source of ignition is allowed in the area
    - The area is conspicuously demarcated as "flammable"
- Flammables stored on a construction site are stored in a well-ventilated, reasonably fire-resistant container, cage or room that is kept locked with access control measures in place. Sufficient fire fighting equipment is installed and fire prevention methods practiced. Proper housekeeping may achieve this;
- Flammables stored in a permanent flammable store are stored so that no fire or explosion is caused.
- Stored in a locked and well-ventilated reasonably fire resistant container, cage or room conspicuously demarcated as "Flammable Store – No Smoking or Naked Lights"
- The flammables store to be constructed of two-hour fire retardant walls and roof and separated from adjoining rooms or workplaces by means of a two-hour fire retardant fire wall
- Adequate and suitable fire fighting equipment installed around the flammables store and marked with the prescribed signs
- All electrical switches and fittings to be of a flameproof design
- Any work done with tools in a flammable store or work areas to be of a non-sparking nature
- No Class A combustibles such as paper, cardboard, wood, plastic, straw and the like to be stored together with flammables
- The flammable store to be designed and constructed such that in the event of spillage of liquids the store is able to contain the full quantity + 10% of the liquids stored
- A sign indicating the capacity of the store to be displayed on the door
- Only one day's quantity of flammable is to be kept in the workplace;
- Containers (including empty containers) to be kept closed to prevent fumes/vapours from escaping and accumulating in low lying areas;
- Metal containers to be bonded to earth whilst decanting to prevent build-up of static forces; and
- Welding and other flammable gases to be stored segregated according to the type of gas and empty and full cylinders.

21.6 HAZARDOUS CHEMICAL SUBSTANCES

The Principal Contractor must ensure that:

- Employees receive the necessary information and training to be able to use and store hazardous chemical substances safely;
- Employees obey lawful instructions regarding:
  - The wearing and use of protective equipment
  - The use and storage of hazardous chemical substances
  - The prevention of the release of hazardous chemical substances
  - The wearing of exposure monitoring and measuring equipment
  - The cleaning up and disposal of materials containing hazardous chemical substances
  - Housekeeping, personal hygiene and the protection of the environment
- The risk assessments required in terms of Construction Regulation include employee exposure to hazardous chemical substances and that the necessary measures be taken to protect persons from being detrimentally affected by hazardous chemical substances present or used in the workplace;
- Suppliers provide the necessary information in the form of a material safety data sheet regarding a hazardous chemical substances required to ensure the safe use and storage of that substances;
- An up-to-date list is kept on site of hazardous chemical substances stored and used together with the material safety data sheet of the hazardous chemical substances;
- Hazardous chemical substances containers be clearly marked with the contents and main hazardous category e.g. “Flammable” or “Corrosive” and the reference number of the hazardous chemical substances on the list indicated above;
- Hazardous chemical substances, for example asbestos dust, are not cleared by using compressed air but should be vacuumed;
- No person eats or drinks in a hazardous chemical substances workplace; and
- Hazardous chemical substances waste is disposed of safely in terms of hazardous waste disposal requirements.
- MSDS’s to be in 16 point format- available on site

21.7 FIRE PREVENTION AND PROTECTION

The Principal Contractor must ensure that:

- The risk of fire is avoided;
- Sufficient and suitable storage for flammables is provided;
- Sources of ignition are removed wherever flammable or highly combustible material is present in the workplace, for example:
  - Notices prohibiting smoking are displayed and enforced
  - Welding and flame cutting is only allowed under controlled conditions that includes written hot work permits
  - Only spark-free hand and power tools are used
  - No grinding, cutting and shaping of ferrous metals is allowed using electrically driven power tools that produce sparks
  - Flameproof switches and fittings are to be used in the flammable atmosphere
  - Good housekeeping is maintained to prevent the accumulation of unnecessary combustibles
  - Adequate ventilation is maintained
  - Adequate and suitable fixed and portable fire fighting equipment is provided and maintained in good working order.
- Maintenance must include:
  - Regular inspection of fire equipment by a competent person appointed in writing and keeping a register
  - Annual inspection and service by an accredited service provider
- All employees are instructed in the use of the fire fighting equipment and know how to attempt to extinguish a fire;
- A sufficient number of employees are appointed and trained to act as an emergency team to deal with fires and other emergencies;
- Employees are informed regarding emergency evacuation procedures and escape routes;

- Emergency escape routes are kept clear at all times and clearly marked;
- Evacuation assembly points are demarcated;
- Evacuation is practiced to ensure that all persons are evacuated timeously;
- Roll call is held after evacuation to account for all personnel and ensure that no-one has been left behind; and
- A siren or alarm is fitted which is clearly audible to all persons on site.

21.8STACKING AND STORAGE

The Principal Contractor must ensure that:

- A competent person is appointed in writing to supervise all stacking and storage on a construction site;
- Adequate storage areas are provided and demarcated;
- The storage areas are kept neat and under control;
- The base of any stack is level and capable of sustaining the weight exerted on it by the stack;
- The items in the lower layers can support the weight exerted by the top layers;
- Cartons and other containers that may become unstable due to wet conditions are kept dry;
- Pallets and containers are in good condition and no material is allowed to spill out;
- The height of any stack does not exceed 3 times the base unless stepped back at least half the depth of a single container at least every fifth tier or the approval of an inspector has been obtained to build the stacks higher with the aid of a machine. The operator of the machine must be protected against items falling from overhead off the stack and no items may overhang;
- The articles that make up a single tier are consistently of the same size, shape and mass;
- Structures for supporting stacks are structurally sound and able to support the mass of the stack;
- No articles are removed from the bottom of the stack first but from the top tier first;
- Anybody climbing onto a stack must do it in a safe manner, taking reasonable safety precautions, and ensuring that the stack is stable and capable of supporting him or her
- Stacks that are in danger of collapsing are broken down and restacked;
- Stability of stacks are not threatened by vehicles or other moving plant and machinery;
- Stacks are built in a header and stretcher fashion and that corners are securely bonded;
- Stacks are stepped back at least half the depth of a single container at least every fifth tier; and
- Persons climbing onto stacks do not approach unguarded moving machinery or electrical installations.
- Laydown area is allocated for Contractor-supplied items.
- At all times, the Contractor shall be responsible for the safe and adequate storage of all materials and equipment on site which he is to install, whether they are supplied by himself or others.
- The safe handling, unloading and loading of material receipts and dispatches at site or storage areas shall be the Contractors' responsibility.

The Contractor shall provide a suitable and adequate lock-up store for the storage of items of equipment and material, which would be damaged or pilfered if stored in the open. The Principal Contractor shall provide all facilities required for weather-proofing, dust proofing or vermin proofing.

The Contractor is responsible for the proper storage and maintenance of all equipment until issue of the Certificate of Practical Completion.

All equipment and materials will be stored on suitable wood poles or pallets which will not protrude more than a meter from any of the stored material. Safe access ways shall be maintained between all stored items preventing employees from having to climb over or under equipment to retrieve the necessary.

21.9 HOUSEKEEPING

The Principal Contractor to ensure that:

- Housekeeping is continuously implemented and maintained;
- Materials and equipment are properly stored;
- Scrap, waste and debris is removed regularly;

- Materials placed for use are placed safely and not allowed to accumulate or cause obstruction to the free-flow of pedestrians and vehicular traffic;
- Waste and debris not to be removed from heights by throwing but rather by chute or crane;
- Where practicable, construction sites are fenced off to prevent entry of unauthorised persons;
- Catch platforms or nets are erected over entry and exit ways or over places where persons are working to prevent them being struck by falling objects;
- An unimpeded work space is maintained for every employee;
- Every workplace is kept clean, orderly and free of tools, materials and the like that are not required for the work being done;
- As far as is practicable, every floor, walkway, stair, passage and gangway is kept in good state of repair, skid-free and free of obstruction, waste and materials;
- The walls and roof of every indoors workplace sound and leak-free; and
- Openings in floors, hatchways, stairways and open sides of floors or buildings are barricaded, fenced, boarded over or provided with protection to prevent persons from falling.

21.10 PUBLIC HEALTH AND SAFETY

The Principal Contractor is responsible for ensuring that non-employees affected by the construction work are made aware of the dangers likely to arise from the construction work as well as the precautionary measures to be observed to avoid or minimise those dangers. This includes:

- Non- employees entering the site for whatever reason;
- The surrounding community; and
- Passers-by the site.

- The Principal Contractor shall organize the site in such a manner that pedestrians and vehicles can move safely and without risks to health, including sufficient and suitable traffic routes and safe walkways with relevant signage.
- Appropriate signage must be posted to this effect and all employees on site must be instructed to ensure that non-employees are protected at all times. All non-employees entering the site must receive induction into the hazards and risks of the site and the control measures to be observed.
- The Principal Contractor shall recognize that the Community Liaison Officer (CLO) is the link between Johannesburg Water SOC Ltd and the community and provide all reasonable support to the Community Liaison Officer to ensure relevant responsibilities are fulfilled and positive relationships with the community are maintained.

21.11 TRAFFIC MANAGEMENT

- Where activities are performed close to public routes, the Principal Contractor will establish a traffic management plan incorporating the requirements of relevant by-laws.
- At a minimum, barricading, warning signage and flagmen will be provided to ensure the protection of workers from vehicles in transit.
- Where required, the Principal Contractor will interact with the local traffic department to establish minimum requirements to be implemented on public routes.

21.12 HAND TOOLS

The Principal Contractor must inspect all hand tools before it is brought onto the site.

- As far as possible all hand tools must be numbered and placed on register to be inspected monthly by a person designated to do so.
- Any tools found to be in an unsafe condition must immediately be removed from service and either discarded or rectified.
- No chisels with “mushroomed” heads must be used.
- No hammer shall be used with a cracked or damaged handle.
- All files must be fitted with handles.

- All trolleys, pushcarts, etc. used on site must be identifiable, placed on register and inspected at least once every month.
- Non-sparking tools must be used in areas where the risk of fire or explosion is present.
- No homemade hand tools are allowed on the project.
- All tools shall be attached to a suitable lanyard when utilised in elevated positions

21.13 PORTABLE ELECTRICAL EQUIPMENT

Portable electrical tools and equipment includes every unit that takes electrical power from a 15 ampere plug point and is moved around for use in the workplace for example; drills, saws, grindstones, portable lights, etcetera. Other electrical appliances such as fridges, hotplates, heaters, and etcetera must be inspected and maintained to the same standards as portable electrical tools and appliances.

The use, inspection and maintenance of portable electrical tools and equipment shall be as follows:

- Periodical inspections must be carried out by a competent person appointed in writing;
- Inspection results must be recorded in a register;
- Only competent authorised persons are allowed to use portable electrical tools and equipment; and
- The correct protective equipment must be worn or used whilst operating portable electrical tools and equipment.

This equipment:

- Must be maintained in good condition at all times to prevent an electrical shock to the user;
- The main power source should incorporate an earth leakage protection device or receive power through a double wound transformer or be double insulated and clearly marked as such; and
- All equipment must be fitted with a switch to allow for safe and easy starting and stopping.

The following requirements apply to portable lights:

- Must be fitted with a robust non-hygroscopic non-conducting handle;
- Live metal parts or parts which may become live must be protected against contact;
- The lamp must be protected by a strong guard;
- The cable lead-in must withstand rough handling;
- Inspections must be undertaken that concentrate on plug, cord, switch and any obvious faults;
- A register be kept for each piece of equipment with findings of regular inspections undertaken to evaluate the condition of these lights; and
- When used in wet/damp/metal container conditions, the lamp must be protected.

21.14 LIFTING EQUIPMENT & MACHINERY

Lifting equipment must be designed and constructed in accordance with the manufactures/designers specifications as well as generally accepted technical standards and operated, used, inspected and maintained in accordance with the manufactures requirements as well as that of the of Driven Machinery Regulations promulgated in terms of the Occupational Health and Safety Act (Act no 85 of 1993).

The Driven Machinery Regulations requires that:

- Lifting equipment is clearly and conspicuously marked with the maximum mass load (MML) that it is designed to carry safely. When the MML varies with the conditions of use a table showing the maximum mass load with respect to every variable condition shall be posted up by the user in a conspicuous, place easily visible to the operator and the table shall be used by the driver/operator;
- Each winch on a lifting machine must at all times have, at least, three full turns of rope on the drum when the winch has been run to its lowest limit;
- Lifting equipment shall be fitted with a brake or other device capable of holding the MML. This brake or device shall automatically prevent the downward movement of the load when the lifting power is interrupted;
- Lifting equipment shall be fitted with a load limiting device that automatically arrest the lift when the load reaches its highest safe position or when the mass of the load is greater than the MML;

- Every chain or rope on a lifting machine that forms an integral part of the machine must have a factor of safety as prescribed by the manufacturer of the machine. Where no standard is available the factor of safety must be:
  - chains – 4 (four)
  - steel wire ropes 5 (five)
  - fibre ropes- 10 (ten)
- Every hook or load attaching device must be designed to prevent the load from slipping off or disconnecting;
- Every lifting machine must be inspected and load tested by a competent person every time it has been dismantled and re-erected and every 12 months after that. The load test must be in accordance with the manufacturer's requirements or to 110% of the MML. In addition, all ropes, chains, hooks or other attaching devices, sheaves, brakes and safety devices forming an integral part of a lifting machine must be inspected every 6 months by a competent person;
- All maintenance, repairs, alterations and inspection results must be recorded in a log book and each lifting machine must have its own log book; and
- No person may be lifted by a lifting machine not designed for lifting persons unless in a cradle approved by the inspector of the Department of Labour.

General requirements for cranes and lifting equipment

All documentation must be provided to the Johannesburg Water SOC Ltd Project Engineer prior to mobilisation. Failure to do so and the resulting cost of any delays and/or remedial activities will be for the Contractor's account.

All crane operators must be authorised by the relevant Engineer before they may operate a crane or lifting machine. The Load charts must be displayed at the crane.

Daily pre-use inspections of the cranes must be done and be kept on the file. The inspections must be logged in a logbook. The area in which a lift is performed must always be barricaded to prevent employees from entering.

A crane or lifting machine must not be left unattended and the keys may never be left in the ignition when the operator is not present. Properly constructed out rigger pads must be used when soil is uneven or unstable. (Only sleepers or appropriately designed steel plate pads may be used for this purpose).

Only a competent rigger may direct a lift of any kind unless the following requirements are met. Rigger assistants used for performing lifting operations shall be limited to lifts with all of the following requirements:

- Lifts lower than 5 tons
- Easy lifts that does not require the load to be lifted over structures, equipment or machinery
- Equipment that is not critical
- Rigging configuration that requires the attachment of several parts of lifting equipment such as chain blocks to adjust the angle of loads.
- All safety devices on a crane or lifting machine must be functional.

Certification will be required for record purpose, and shall cover the following:

- A Brake or other device capable of holding the maximum mass should the power fail, or which is such that it shall automatically prevent the uncontrolled downward movement of the load when the raising effort is interrupted; and
- A Limiting device which shall automatically arrest the driving effort when:
- The Hook or Load attachment point of the Power Driven lifting machine reaches its highest safe position; and
- In the case of a Winch Operated lifting machine with a lifting capacity of 5000kg or more, the load is greater than the rated mass load of such machine.

The user shall ensure that every lifting machine is operated by an Operator specifically trained for a particular type of lifting machine; the user shall not require or permit a person to operate such lifting machine unless the operator is in possession of a certificate of training, issued by an accredited person or organisation.

No Crane shall be used at arrival on site before copies of all documentation have been handed over to the Johannesburg Water SOC Ltd and the Crane have been checked by a person duly authorised and signed off as acceptable. Copies of all documentation shall be kept in the SHE File at all times.

No Crane shall be used without a pre-use check and findings entered on an approved checklist. Before any cranes are established on site the following must be inspected and approved:

- Operator's licences
- Training certificates
- Medical fitness certificate.
- The cranes load test certificate.
- Rope test certificates including Mill / Destructive test.
- The lifting gear load test certificates.
- The load limiting device calibration certificate.
- Proof that the hooks have been measured for spreading.
- The service inspection history.
- Monthly comprehensive inspection certificate
- Operation and maintenance Manuals and crane condition.

Cranes and Lifting Machines

A contractor shall ensure that where tower cranes are used:

- Account is taken of the effects of wind forces on the structure;
- Account is taken of the bearing capacity of the ground on which the tower crane is to stand;
- The bases for the tower cranes and tracks for rail-mounted tower cranes are firm and level;
- The tower cranes are erected at a safe distance from excavations;
- There is sufficient clear space available for erection, operation and dismantling;
- The tower crane operators are competent to carry out the work safely; and
- The tower crane operators are physically and psychologically fit to work in such an environment by being in possession of a medical certificate of fitness."

No user shall use or permit any person to use a Jib-Crane with a lifting capacity of 5000kg or more at a minimum Jib radius, unless it is provided with:

- A load indicator that shall indicate to the operator of the Jib-Crane the mass of the load being lifted, provided that such a device shall not require manual adjustment from the application of the load, to the Jib-Crane, until the release of the load.
- A Limiting Device, which shall automatically arrest the driving effort whenever the load is lifted, is greater than the rated mass load of the Jib-Crane.

Mobile Crane near Power Lines

No mobile cranes are to be used near overhead power lines until the Johannesburg Water SOC Ltd representative has been notified and provided safe access conditions and a valid permit to work is obtained. Mobile cranes shall be effectively earthed when working in the vicinity of electrical wires. Assume that all electrical equipment and wires are live and avoid them.

Lifting tackle

The following requirements will apply to lifting tackle:

- Manufactured of sound material, well-constructed and free from patent defects;
- Clearly and conspicuously marked with an identity number;
- MML factor of safety:
    - Natural fibre ropes - 10(ten)
    - Man-made fibre ropes and woven webbing - 06(six)
    - Steel wire ropes – single rope - 06(six)
    - Steel wire ropes – combination slings - 08(eight)

- Mild Steel chains - 05(five)
- High tensile/alloy steel chains - 04(four)

- Steel wire ropes must be examined by a competent person every three months and the results recorded in a designated logbook. The ropes must be discarded (not used any further for lifting purposes) when wear and corrosion is evident.

21.15 LADDERS

The following requirements for ladders will apply:

- All ladders used on the site shall be constructed and used in compliance with the OH&S Act and Regulations.
- Ladders, which provide access to a working platform, shall extend one metre above the platform where it provides access, and shall be secured to prevent slipping.
- Timber ladders shall not be painted other than with clear preserving oils, clear varnishes or clear plastics.
- Ladders, which are in a damaged condition, shall not be used and shall be labelled accordingly and removed from the Premises.
- All Ladders shall be numbered, logged in a register, and inspected monthly.
- A ladder in use shall be held by an assistant and/or properly tied down in position.
- Only ladders that do not conduct electricity shall be used in live electrical sub-stations and switching rooms.
- Ladders shall be removed after use and stored in an appropriate facility as to not expose them unnecessarily to the elements or potential damage by surrounding activities.

21.16 CONSTRUCTION VEHICLES AND MOBILE PLANT

Johannesburg Water SOC Ltd will inspect construction vehicles and mobile plant prior to being allowed on a project site. Suppliers of hired vehicles, plant and equipment will be required to comply with this specification as well as the Occupational Health and Safety Act (Act no. 85 of 1993) and Regulations.

Construction vehicles and mobile plant to be:

- Of acceptable design and construction;
- Maintained in good working order;
- Used in accordance with their design and intention for which they were designed;
- Operated and/or driven by trained, competent and authorised operators/drivers. No unauthorised persons are to be allowed to drive construction vehicles and mobile plant;
- Provided with safe and suitable means of access;
- Fitted with adequate signalling devices to make movement safe including reversing;
- Provided with roll-over protection (where applicable);
- Inspected daily before start-up by the driver, operator and/or user and the findings recorded in a register/log book;
- Fitted with two head and two tail lights that are in good working condition and must be used whilst operating under poor visibility conditions;
- When used for transporting persons must have seats firmly secured and sufficient for the number of persons being transported.

Operators and drivers of construction vehicles and mobile plant must be in possession of a valid medical certificate declaring the operator and/or driver physically and psychologically fit to operate or drive construction vehicles and mobile plant.

No loose tools, materials etc. are allowed in the driver and/or operators compartment/cabin or in the compartment in which any other persons are transported.

No person shall ride on any construction vehicle or mobile plant otherwise than in a safe place provided thereon for that purpose. Employees shall only be transported if provision for seating and safety belts has been provided with an adequate canopy or rollover protection.

All construction vehicles and mobile plant left unattended at night, adjacent to a freeway in normal use or adjacent to construction areas where work is in progress, must have appropriate lights or reflectors, or barricades equipped with appropriate lights or reflectors, in order to identify the location of the vehicles or plant.

Bulldozers, scrapers, loaders, and other similar mobile plant must, when being repaired or when not in use, be fully lowered or blocked with controls in a neutral position, motors stopped and brakes set.

Self-Propelled Mobile Machinery

All Self-Propelled Mobile Machinery must be inspected daily and the findings recorded in a register. Pre-use inspection checklist shall identify critical items that would stop the operator from operating machinery should a defect be detected.

All operators shall be tested on their ability to operate machinery and equipment inspected prior to be used on any of the premises by the Johannesburg Water SOC Ltd Project Inspectors and Responsible Engineer. Relief drivers shall be made available for mobile machinery where there is a need for on-going operations and the contractor shall establish a rotation schedule.

All Drivers/Operators shall be appointed under the applicable legislation prior to operating any type of mobile equipment or machinery:

- If Driver/Operator does not adhere to the rules and regulations his appointment as operator shall be cancelled and he shall not be able to carry on with his duty.
- No Driver/Operator shall be appointed without proof of training, driver's licence or letter of competency.
- No training of Drivers/Operators on Site.
- No passengers on dump truck, Loaders or Excavators.
- No eating or drinking allowed while operating equipment.
- No vehicle shall be left unattended with engine running or key in ignition.
- Drivers may use no cellular phones during operations.

Equipment Approval

Authorization for the use of equipment shall be given in writing only after the following minimum requirements and documentation have been verified and shall as a minimum include the following:

- Minimum two lights in front and rear of vehicle
- Communications system (where required);
- Reflective Taping;
- First-aid kit, fire-fighting equipment and emergency roadside triangles;
- Tyres in good condition;
- Windscreen clear of cracks;
- Safety belts fitted for all occupants;
- Signage for clear identification;
- Windscreen wipers;
- Warning hooter and reverse alarm;
- Rotating warning lights (where applicable);
- Maximum number of persons indicated;
- Equipment free of oil and other leaks;
- Maintenance/Service & Equipment manuals available;

Operator Approval

Authorization for operators for the use of equipment shall be given in writing only after the following minimum requirements and documentation have been verified and shall as a minimum include the following:

- Operator's Certificate (accredited training organisation);
- Operators Licence appropriate to the nature of the Mobile equipment;
- Operator's knowledge tested and familiar with the controls for the vehicle;
- Public driver's permit where required;
- Medical fitness certificate.

21.18 Fall protection (Working in elevated positions)

A pre-emptive risk assessment will be required for any work to be carried out above **two metres** from the ground or any floor level. This work will be classified as "work in elevated positions".

As far as is practicable, any person working in an elevated position will work from a platform, ladder or other device that is at least as safe as if he is working at ground level. Whilst working in this position he shall be wearing a single belt with lanyard to prevent the person falling from the platform, ladder or other device. This safety belt will be, as far as is possible, secured to a point away from the edge over which the person might fall and the lanyard must be of such a length and strength that the person will not be able to move over the edge.

Alternatively, any platform, slab, deck or surface forming an edge over which a person may fall may be fitted with suitable guard rails at two different heights as prescribed in the relevant South African National Standard for the design, erection, use and inspection of access scaffolding.

Where the requirement in the paragraph above is not practicable, the person will be provided with a full body harness that will be worn at all times and shall be attached above the wearer's head at all times. The lanyard must be fitted with a shock-absorbing device or the person must be attached to a fall arrest system (anchorage connector; body wear; and connecting device) approved by Johannesburg Water SOC Ltd.

Where the requirements in the paragraph above are not practicable, a suitable catch net must be erected.

Employees working in elevated positions must be trained to work without risk to their health and safety or to the health and safety of others and be declared medically and psychologically fit to perform work at elevated positions.
Where work on roofs is carried out, the risk assessment must take into account the possibility of persons falling through fragile material, i.e. skylights and openings in the roof.

Access scaffolding

Access scaffolding must be erected, used and maintained safely in accordance with Construction Regulations and relevant SA Bureau of Standards Code of Practice.

Detailed consideration must be given to all scaffolding to ensure that it is properly planned to meet the working requirements, designed to carry the necessary loadings and maintained in a sound condition. Sufficient material must be available to erect the scaffolding properly.

Scaffolding must only be erected, altered or dismantled by persons who have adequate training and experience and are competent in this type of work and under the continuous supervision of such a person.

21.19 Structures

The Principal Contractor must ensure that:

- Only skilled employees are allowed to erect structures and that the skills of these employees are verified at regular intervals.
- Steps are taken to ensure that no structure becomes unstable or collapses due to construction work being performed on it or in the vicinity of it.
- No structure is overloaded to the extent that it becomes unsafe.
- He has received from the designer the following information:
    - Information on known or anticipated hazards relating to the construction work and the relevant information required for the safe execution of the construction work.
    - A geo-scientific report (where applicable).
    - The loading the structure is designed to bear.
    - The methods and sequence of the construction process.

All drawings relating to the design are on site and available for inspection.

21.20 Explosive powered tools

Every explosive powered tool must be:

- Provided with a guard around the muzzle to confine flying fragments or particles; and
- Must be fitted with a firing mechanism that will prevent the explosive powered tool from firing unless it is pushed against the surface and at the right angle. Where the explosive powered tool is fitted with an intermediate piston between the charge and the nail this requirement is waived.

The Principal Contractor or user must ensure that:

- Only the correct type of cartridge is used;
- The explosive powered tool is cleaned and inspected daily before use by an appointed competent person. The competent person will keep a register with the findings of his inspection and the details of cleaning, service and repairs;
- The safety devices are in good working order before the explosive powered tool is used;
- When the explosive powered tool is not being used it is stored in an unloaded condition together with the cartridges in a safe and secure place inaccessible to unauthorised persons;
- A warning notice is displayed at the point where the explosive powered tool is in use;
- The issue and return of cartridges must be by issue/returns register signed by both issuer and user and empty cartridge cases must be returned with unspent cartridges;
- Users and operators of the explosive powered tool have received the necessary training and has been authorised as competent to use/operate the explosive powered tool; and
- Users and operators must wear the prescribed personal protective equipment whilst using and/or operating the tool.

21.21 Bulk mixing plants (Batch plants)

- All contractors shall ensure that all bulk mixing plants are operated and supervised by a competent person who has been appointed in writing.
- All contractors shall ensure that the placement and erection of a bulk mixing plant complies with the requirements set out by the manufacturer and that such plant is erected as designed.
- All contractors shall ensure that all devices to start and stop a bulk mixing plant are provided and that these devices are:
- Placed in an easily accessible position; and
- Constructed in such a manner as to prevent accidental starting.
- The contractor shall ensure that the machinery and plant selected is suitable for the task and that all dangerous moving parts of a mixer are placed beyond the reach of persons by means of doors, covers or other similar means.
- No person shall be permitted to remove or modify any guard or safety equipment relating to a bulk mixing plant, unless authorized to do so by the appointed person.
- The contractor shall ensure that all persons authorized to operate the bulk mixing plant are fully aware of all the dangers involved in the operation thereof and conversant with the precautionary measures to be taken in the interest of health and safety.
- No person supervising or operating a bulk mixing plant shall authorize any other person to operate the plant, unless such person is competent to operate machinery.
- The contractor shall ensure that all precautionary measures as stipulated for confined spaces in “good safe practices” are adhered to when entering any silo.
- The contractor shall ensure that a record is kept of any repairs or maintenance to a bulk mixing plant and that it is made available, on site, to an inspector, client, client’s agent or employee upon request.
- The contractor shall ensure that all lifting machines and lifting tackle used in the operation of a bulk mixing plant complies with the requirements of the Regulations promulgated.

- The contractor shall ensure that all precautionary measures are adhered to regarding the usage of electrical equipment in explosive atmospheres, when entering a silo, as contemplated in the Regulations.

21.22 Electrical installations

The installation of temporary electricity for construction shall be in accordance with Construction Regulations and the Electrical Installation Regulations. The Principal Contractor must ensure that:

- Existing services are located and marked before construction commences and the markings maintained during construction;
- Electrical installations and -machinery are sufficiently robust to withstand normal working conditions on site;
- Temporary electrical installations must be inspected at least once a week by a competent person and a record of the inspections kept in the SHE File;
- Electrical machinery used on a construction site must be inspected daily before start-up by the competent driver/operator or any other competent person and a record of the inspections kept in the SHE File; and
- A competent person appointed in writing must control and be responsible for all temporary electrical installations.
- An employer or user shall provide free of charge and maintain in good condition such protective equipment as may be necessary to prevent incidents, for use by persons engaged in working on or in close proximity to live electrical machinery or dead electrical machinery which may become live.

21.22.1 Electrical control gear

- The contractor shall ensure that all electrical machinery are provided with controlling apparatus and protective devices which shall, as far as is reasonably practicable, be capable of automatically isolating the power supply in the event of a fault developing on such machinery.
- The contractor shall place a switch, circuit breaker or fuse in the neutral conductor of a polyphase alternating current or three-wire direct current distribution system unless such switch, circuit breaker or fuse is so arranged as to isolate all phase conductors and the neutral conductor simultaneously: Provided that this shall not include an isolating link on the neutral conductor installed for test purposes or to prevent circulating currents.
- The contractor shall, whenever reasonably practicable, provide switchgear with an interlocking device so arranged that the door or cover of the switch cannot be opened unless the switch is in the 'off position and cannot be switched on unless the door or cover is locked.
- The contractor shall mark or label all controlling apparatus permanently so as to identify the system or part of the system or the electrical machinery which it controls, and where such control apparatus is accessible from the front and the back these markings shall be on both the front and the back.
- The contractor shall post a notice at switchgear or control gear which has been switched off or locked out to enable persons to work on electrical machinery or other machinery operated by electricity and controlled by. Such switchgear or control gear, warning against reclosing such switchgear or control gear.

21.22.2 Work on disconnected electrical machinery

- Without derogating from any specific duty imposed on employers or users of machinery by the Act, an employer or user shall, whenever work is to be carried out on any electrical machinery which has been disconnected from all sources of electrical energy, but which is liable to acquire or to retain an electrical charge, as far as is practicable, cause precautions to be taken by earthing or other means to discharge the electrical energy to earth from such electrical machinery or any adjacent electrical machinery if there is danger there from before it is handled and to prevent any electrical machinery from being charged or made live while persons are working thereon

21.22.3 Portable electric tools

No person shall use or permit the use of a portable electric tool with an operating voltage that exceeds 50 V to earth unless-

- It is connected to a source of electrical energy incorporating an earth leakage protection device, the construction of which meets the requirements of the relevant health and safety standard incorporated into these Regulations under section 44 of the Act; or
- It is connected to a source of electrical energy through the interposition between each tool and the source of an individually double-wound isolating transformer, the secondary winding of which is not earthed at any point and the construction of which meets the requirements of the relevant health and safety standard incorporated into these Regulations under section 44 of the Act; or
- It is connected to a source of high frequency electrical energy derived from a generator which is used solely for supplying energy to such portable electric tool and which arrangement is approved by the chief inspector; or it is clearly marked that it is constructed with double or reinforced insulation.

No person shall sell a portable electric tool constructed with double or reinforced insulation unless-

- It is clearly marked that it is constructed with such insulation; and Its insulation is constructed in accordance with the relevant health and safety standard incorporated into these Regulations under section 44 of the Act.
- No employer or user shall use or permit the use of a portable electric tool which is not fitted with a switch to allow for easy and safe starting and stopping of the tool.
- The employer or user shall maintain every portable electric tool, together with its flexible cord and plug, in good working order.

21.22.4 Switchboards

The contractor shall ensure that an unobstructed space for operating and maintenance staff is provided at the back and front of all switchboards, and the space at the back shall be kept closed and locked except for the purpose of inspection, alteration or repair: Provided that the requirements of this regulation with respect to the unobstructed space at the back of the switchboard shall not apply in the case of-

- switchboards which have no uninsulated conductors accessible from the back;
- switchboards, the switchgear of which is of a totally enclosed construction;
- switchboards, the backs of which are only accessible through an opening in the wall or partition against which they are placed, such openings being kept closed and locked; and
- switchboards which can be safely and effectively maintained from the front and which have all parts accessible from the front.

21.22.5 Electrical machinery in hazardous locations

- No person may use electrical machinery in locations where there is danger of fire or explosion owing to the presence, occurrence or development of explosive or flammable articles, or where explosive articles are manufactured, handled or stored, unless such electrical machinery, with regard to its construction relating to the classification of the hazardous locations in which it is to be used, meets the requirements of a safety standard incorporated for this purpose in these regulations under section 36 of the Act.
- Every user of electrical machinery shall be in possession of a certificate in a form acceptable to the chief inspector which has been issued by an approved inspection authority, in which it is certified that the electrical machinery has been manufactured and tested for the groups of dangerous articles in terms of the safety standard which has been incorporated in these regulations for this purpose under section 36 of the Act: Provided that in lieu of such certificate an inspector may approve permanent labeling on such machinery which contains all the relevant information.
- When diverse items of electrical machinery such as motors, cables and control apparatus are used together to form an electrical installation, the user shall ensure that the selection, arrangement, installation, protection, maintenance and working thereof results in no less a degree of safety than when the individual items of such machinery are used separately.
- The user shall use electrical machinery to which this regulation applies only under such conditions and in such surroundings as are prescribed in the safety standard incorporated in these regulations for this purpose under section 36

- No person shall effect repairs or adjustments to or otherwise work on electrical machinery under conditions (bullet 1) unless such machinery has been rendered dead and effective measures have been taken to ensure that such machinery remains dead.
- Wherever there is a possibility of the formation of static electricity under working conditions, the user shall earth all metallic structures, machine parts, pneumatic conveyor ducts and pipelines conveying flammable articles and the like, or take such other measures as may be necessary to effectively prevent the formation of electric sparks.
- The user shall cause all electrical machinery to which this regulation applies to be examined and tested at intervals not exceeding two years by a person who is competent to express an opinion on the safety thereof.
- The person carrying out the examination shall enter, sign and date the results of each such examination in a record book which shall be kept by the user for this purpose: Provided that where such machinery is subject to adverse climatic or physical conditions the frequency of such examinations shall be increased to intervals of no longer than one year or such shorter period as circumstances may necessitate.

21.22.6 Design and construction

- No person shall authorize, design, install or permit or require the installation of an electrical installation, other than in accordance with a health and safety standard incorporated into these regulations under section 44 of the Act: Provided that the components within an electrical installation shall comply with the standards referred to in the incorporated standard and proof of compliance shall be identifiable on the components or certification shall be available from the supplier or manufacturer of the components: Provided further that items of an electrical installation not covered by such incorporated safety standard, and the conductors between the point of supply and the point of control, shall be installed in accordance with the by-laws or regulations of the supplier concerned.
- A registered person shall exercise general control over all electrical installation work being carried out, and no person shall allow such work without such control: Provided that where the voltage exceeds 1kV, the installation shall be designed and supervised by a person deemed competent in terms of paragraphs (b), (c) or (d) of the definition of a competent person in regulation 1 of the General machinery Regulations, 1998.
- No supplier shall restrict the application of a health and safety standard referred to in sub-regulation (1) when an electrical installation is installed, except where the distribution system of the supplier may be adversely affected by the application thereof.

21.22.7 Electrical contractor

- Any person, including a juristic person, who intends to do installation work as an electrical contractor shall register annually with the chief inspector in the form prescribed in annexure 1 of the Electrical Installations Regulations.

21.22.8 Commencement and permission to connect installation work

- No person shall commence with installation work which would require a new supply or an increase in electricity supply capacity unless the supplier has been notified thereof in the form of Annexure 3: Provided that the supplier may waive this requirement in respect of such types of work as it may specify.
- No person shall connect or permit the connection of any completed or partially completed electrical installation to the electricity supply unless it has been inspected and tested by a registered person and a certificate of compliance for that electrical installation has been issued: Provided that the supplier may on request connect the supply to the installation for the purpose of testing and completion of the certificate of compliance by a registered person: Provided further that this sub-regulation shall not apply in the case where the electricity was disconnected for the non-payment of the electricity account or where there has been a change of tenant but not of ownership.

- Where the supply to an electrical installation is 25kVA or above, the user shall appoint an approved inspection authority or a competent person who shall ensure the compliance from the commencement to the commissioning of the installation.

21.22.9 Issuing of certificate of compliance

Only registered person may issue a certificate of compliance in the form of annexure 4 and which shall be accompanied by a test report in the format approved by the chief inspector, after having satisfied himself or herself by means of an inspection and testing that—

- a new electrical installation complies with the provisions of regulation 7 (1) of the Electrical Installation Regulations (EIR); or
- an electrical installation which existed prior to the publication of the current edition of the health and safety standard incorporated into these regulations in terms of regulation 7 (1) (EIR), complies with the general safety principles of such standard; or
- an electrical installation which existed prior the publication of the current edition of the health and safety standard incorporated into these regulations in terms of regulation 7 (1) and to which extensions or alterations have been affected, that–
    - ting part of the installation, complies with the general safety principles of such standard and is reasonable safe, and
    - extensions or alterations affected comply with the provisions of regulation 7 (1) of the Electrical Installation Regulations (EIR).

- If at any time prior to issuing a certificate of compliance any fault or defect is detected in any part of the installation, the registered person shall refuse to issue such certificate: Provided that if such fault or defect in the opinion of the registered person constitutes an immediate danger to persons in the case where electricity is already supplied, he or she shall forthwith take steps to disconnect the supply to the circuit in which the fault or defect was detected and notify the chief inspector.

- Any person who undertakes to do electrical installation work shall ensure that a valid certificate of compliance is issued for that work.
- No person shall amend a certificate of compliance issued by a registered person.

21.23 DEMOLITION

- A contractor must appoint a competent person in writing to supervise and control all demolition work on site.
- A contractor must ensure that before any demolition work is carried out, and in order to ascertain the method of demolition to be used, a detailed structural engineering survey of the structure to be demolished is carried out by a competent person and that a method statement on the procedure to be followed in demolishing the structure is developed by that person.
- During demolition, the competent person must check the structural integrity of the structure at intervals determined in the method statement, in order to avoid any premature collapses.
- A contractor who performs demolition work must-

(a) with regard to a structure being demolished, take steps to ensure that-
(i) no floor, roof or other part of the structure is overloaded with debris or material in a manner which would render it unsafe;
(ii) all reasonably practicable precautions are taken to avoid the danger of the structure collapsing when any part of the framing of a framed or partly framed building is removed, or when reinforced concrete is cut; and
(iii) precautions are taken in the form of adequate shoring or other means that may be necessary to prevent the accidental collapse of any part of the structure or adjoining structure;

(b) ensure that no person works under overhanging material or a structure which has not been adequately supported, shored or braced;

(c) ensure that any support, shoring or bracing contemplated in paragraph (b), is designed and constructed so that it is strong enough to support the overhanging material;
(d) where the stability of an adjoining building, structure or road is likely to be affected by demolition work on a structure, take steps to ensure the stability of such structure or road and the safety of persons;
(e) ascertain as far as is reasonably practicable the location and nature of electricity, water, gas or other similar services which may in any way be affected by the work to be performed, and must before the commencement of demolition work that may affect any such service, take the steps that are necessary to render circumstances safe for all persons involved;
(f) cause every stairwell used and every floor where work is being performed in a building being demolished, to be adequately illuminated by either natural or artificial means;
(g) cause convenient and safe means of access to be provided to every part of the demolition site in which persons are required to work; and
(h) erect a catch platform or net above an entrance or passageway or above a place where persons work or pass under, or fence off the danger area if work is being performed above such entrance, passageway, or place so as to ensure that all persons are kept safe where there is a danger or possibility of persons being struck by falling objects.

- A contractor must ensure that no material is dropped to any point, which falls outside the exterior walls of the structure, unless the area is effectively protected.
- No person may dispose of waste and debris from a high place by a chute unless the chute-

(a) is adequately constructed and rigidly fastened;
(b) if inclined at an angle of more than 45 degrees to the horizontal, is enclosed on its four sides;
(c) if of the open type, is inclined at an angle of less than 45 degrees to the horizontal;
(d) where necessary, is fitted with a gate at the bottom end to control the flow of material; and
(e) discharges into a container or an enclosed area surrounded by barriers.

- A contractor must ensure that every chute used to dispose of rubble is designed in such a manner that rubble does not free-fall and that the chute is strong enough to withstand the force of the debris travelling along the chute.
- A contractor must ensure that no equipment is used on floors or working surfaces, unless such floors or surfaces are of sufficient strength to support the imposed loads.
- Where a risk assessment indicates the presence of asbestos, a contractor must ensure that all asbestos related work is conducted in accordance with the Asbestos Regulations, 2001, promulgated by Government Notice No. R. 155 of 10 February 2002.
- Where a risk assessment indicates the presence of lead, a contractor must ensure that all lead related work is conducted in accordance with the Lead Regulations, 2001, promulgated by Government Notice No. R.236 of 28 February 2002.
- Where the demolition work involves the use of explosives, a method statement must be developed in accordance with the applicable explosives legislation, by an appointed person who is competent in the use of explosives for demolition work and all persons involved in the demolition works must adhere to demolition procedures issued by the appointed person.
- A contractor must ensure that all waste and debris are as soon as reasonably practicable removed and disposed of from the site in accordance with the applicable legislation.

22. Monthly reporting

- The Principal Contractor is required to provide Johannesburg Water SOC Ltd. with a monthly report in the format provided on the last working day of the month.
- The report will include the monthly man-hours, incidents, training, inductions, audits, etc

23. Project close out

- Upon completion of the project, the contractor is required to hand over a consolidated project file to the Client with all the working documents for retention.

Returnable Annexure A: Acknowledgement of SHE Specification & Annexures

CONTRACTOR:	

I, the undersigned, hereby acknowledge that I have obtained copies of the following listed documentation and confirm that I fully understand the contents thereof and the consequences of non-compliance. The Contractor furthermore reiterates its commitment to compliance of the requirements contained within the following provided documentation:

- Johannesburg Water SOC Ltd, Safety, Health & Environmental (SHE) Specification, Volume 2;
- Annexure 1: List of possible hazards emanating from projects and activities conducted for or on behalf of Johannesburg Water SOC Ltd;

Signed at …… on this …….. Day of …… 20……...

CONTRACT MANAGER			
NAME	DESIGNATION	DATE	SIGNATURE
CONTRACT SUPERVISOR			
NAME	DESIGNATION	DATE	SIGNATURE
WITNESS (1)			
NAME	DESIGNATION	DATE	SIGNATURE
WITNESS (2)			
NAME	DESIGNATION	DATE	SIGNATURE

ANNEXURE 1:

BASELINE RISK ASSESSMENT

	OCCUPATIONAL HEALTH & SAFETY (OHS) SPECIFICATION: BASELINE RISK ASSESSMENT	
Johannesburg Water	PROJECT NUMBER:	JW 14302
	PROJECT LOCATION:	Carlswald
	PROJECT DESCR:	Construction of 20ML Carlswald Reservoir

POSSIBLE RISKS FOR THIS PROJECT

Task	Hazard	Risk	Consequence	Rating	Controls
Transportation of material to site	✓ Unsafe road conditions ✓ Un-road worthy vehicles ✓ Equipment and material not safely secured ✓ Incompetent drivers ✓ Driving under the influence of alcohol ✓ Inclement weather ✓ Speeding ✓ Slippery road	✓ Overturning vehicles ✓ Vehicle collisions	✓ Injuries ✓ Property damages ✓ Third party liability	**M**	✓ Adherence to the speed limit ✓ Only competent/ authorised drivers should operate the vehicle ✓ Inspection of vehicles ✓ Equipment and material to be properly secured ✓ Alcohol testing to be done ✓ The road to be paved to prevent accidents ✓ Traffic control to be implemented to avoid collisions
Offloading of material	✓ Faulty lifting machinery & equipment ✓ Suspended load ✓ Poor housekeeping	✓ Malfunctioning ✓ Falling on employees ✓ Obstructed walkways by materials	✓ Injuries	**M**	✓ Inspect lifting equipment prior to use. ✓ Ensure the safe working load prior to use ✓ Train the employees in manual lifting ✓ Ensure proper housekeeping ✓ The correct PPE must be worn ✓ Designate the stacking areas and put signs

					✓ Stacking and storage inspector must be appointed and in charge
Site establishment	✓ Sharp objects/ wires ✓ Uneven surface ✓ Faulty connection ✓ Poor ergonomics ✓ Falling objects ✓ Inadequate security services ✓ Not enough welfare facilities e.g. toilets, change rooms and lockers	✓ Cuts ✓ Slips and trips ✓ Damage to services ✓ Using the environment as ablution facilities	✓ Injuries ✓ Back strains and injuries ✓ Crime, theft, fights ✓ Contracting of communicable diseases ✓ Soil, water pollution	**M**	✓ Supervisors to plan during site set up and induct employees ✓ A competent electrician must be appointed to connect electrical wires to the site offices and Distribution Board. ✓ Ensure there are welfare facilities on site for health and hygiene purposes ✓ Awareness on hygiene and use of ablution facilities ✓ Detailed Risk Assessment must be drawn before any work commences on site.
Installing containers	✓ Using lifting equipment ✓ Faulty equipment ✓ Faulty slings / chains	✓ Wind ✓ Incompetent personnel ✓ Heavy load ✓ Failing of lifting equipment ✓	✓ Serious injuries ✓ Property damage	**H**	✓ Check wind speed prior to using the crane. ✓ Inspect the crane, slings and chains before use. ✓ Load test the crane before use ✓ Only carry loads certified to be carried by the crane
Electrical installation	✓ Electricity ✓ Incompetent personnel ✓ Wrong tools ✓ Damaged cables	✓ Contact with live electricity ✓ Incompetent person connecting electricity ✓ Electric shocks	✓ Electrocution ✓ Serious injuries	**H**	✓ Follow lock out procedure ✓ Ensure that equipment are earthed to an approved earthing point ✓ Ensure a zero potential test is performed for electricity is isolated ✓ Inspect all tools ✓ Use correct tools for the job

					✓ Appoint a competent electrician/ technician ✓ Wear task specific PPE ✓ Ensure that there are no exposed wires on the cables
Entry and exit	✓ No access control	✓ Unauthorised entry into the construction site	✓ Injuries ✓ Theft of tools and material	**M**	✓ Appoint a full time, registered security guard on site
Stacking and storage	✓ Unsafe stacks of materials or pallets	✓ Falling of pallets and material on employees ✓	✓ Injuries ✓ Property damage	**H**	✓ Supervision of all stacking of materials on site ✓ Materials of same base and heights stacked together ✓ Barricade the stacking area ✓ Unsafe stacks to be removed immediately ✓ Never stack materials during knocking off time or late at night ✓ Use task specific PPE
Blasting	✓ Fly rock ✓	✓ Contact with employees, adjacent properties and vehicles	✓ Injuries ✓ Property damage	**M**	✓ Remove employees from the blast area ✓ Cover the blast area to minimize the fly rock
	✓ Method of blasting	✓ Vibrations ✓ Noise ✓	✓ Structural damages to adjacent properties	**H**	✓ Extend the blast area where possible ✓ Select the method of blasting with minimal adverse effects ✓ Neighbours must be notified of each blasting operation ✓ Marking and setting out of the holes is to be done by the blaster. ✓ Ensure that the holes are drilled correctly.

					✓ Only people authorised or part of the blasting team should be allowed on the blast area. ✓ Smoking and cell phones (contraband) must be prohibited near the vicinity of the charging process and already charged holes. ✓ Vibration measuring equipment is to be set-up on the road. ✓ Site must be cleared of all personnel prior to blast ✓ Hearing protection to be provided to the blaster / team
Excavation	✓ Deep excavations	✓ Collapse ✓ Falling ✓ Unsafe entry and exit ✓ Spoil material	✓ Injuries	**H**	✓ Geotechnical surveys to be conducted prior to construction ✓ Shoring of the excavation ✓ No unauthorised entry into the project site. ✓ Fencing off of the excavation and prompt supervision of the area. ✓ Full time security on site to monitor entry and exit. ✓ Safe method of entry and exit to be provided for employees ✓ Spoil material to be stored at least 2m away from the excavation ✓ Signage to be displayed indicating deep excavations

	✓ Excavator	✓ Incompetent operator ✓ Faulty excavator ✓ Contact with underground services	✓ Serious injuries ✓ Electrocution	**H**	✓ Only competent personnel may operate the excavator ✓ All excavators must be inspected prior to use ✓ All underground services to be identified prior to excavation.
Slab laying (concrete pouring)	✓ Operating ready mix truck	✓ No warning signs ✓ Employees not visible to the operator ✓ Slippery surfaces ✓ Malfunctioning ✓ Falling on employees ✓ Falling into excavations	✓ Injuries ✓ Property damage ✓ Dermatitis ✓ Skin burns ✓ Serious injuries	**M**	✓ Inspect truck daily prior to use ✓ Competent operator must operate the truck ✓ Supervision of the activity ✓ Ensure that warning sounds are working ✓ Employees to steer clear of the truck and wear reflective PPE ✓ Follow safe work procedures ✓ Ensure that the roads are not slippery
Concrete works	✓ Moving bucket	✓ Hitting employees	✓ Injuries	**M**	✓ Workers to stand clear of the path of the bucket ✓ Banksman to direct the loading and offloading activities
	✓ Working at heights	✓ Falls from heights	✓ Injuries	**H**	✓ Only work on platforms that are fully boarded and handrails installed
	✓ Concrete splashing	✓ Skin contact	✓ Dermatitis ✓ Skin burns	**M**	✓ Use of skin protection ✓ Provide gloves and safety boots ✓ Have MSDS
	✓ Concrete splashing	✓ Eye contact	✓ Eye injuries	**M**	✓ Provide safety goggles

Operating concrete truck	✓ Incompetent operator	✓ Hitting employees; ✓ Bumping vehicles and properties	✓ Injuries ✓ Property damages	**M**	✓ Only trained, competent and appointed operators may operate a concrete truck ✓ Flagman to be posted to direct the operator
	✓ Speeding	✓ Hitting employees; ✓ Bumping vehicles and properties	✓ Injuries ✓ Property damages	**M**	✓ Site speed limits to be adhered to at all times
	✓ Manual handling of chutes	✓ Incorrect handling	✓ Injuries	**M**	✓ Training in correct handling methods ✓ Provide employees with gloves ✓ Provide leather gloves for concrete chute
Pouring concrete with a bucket by means of a mobile crane	✓ Incompetent operator	✓ Hitting employees; ✓ Bumping vehicles and properties	✓ Injuries ✓ Property damages	**M**	✓ Only trained, competent and appointed operators may operate a concrete truck ✓ Flagman to be posted to direct the operator
	✓ Unauthorised / unsuitable crane	✓ Hitting employees; ✓ Collapse of material ✓	✓ Injuries ✓ Property damages	**M**	✓ Crane to be inspected by a competent person prior to use. ✓ Unsuitable crane to be tagged and locked out
	✓ Crane parking	✓ Crane overturning	✓ Injuries ✓ Property damages	**M**	✓ Crane to be established on solid ground with outriggers fully extended and pads in place
False work	✓ Poor Assembly ✓ Poor quality false work ✓ Reinforcement	✓ Unstable structure ✓ Collapse of stacks	✓ Serious injuries ✓ Fatalities ✓ Serious injuries	**H**	✓ False work to be done under supervision of a competent person.

	✓ Poor quality concrete ✓ Improper stacking				✓ Form work to be inspected prior to assembly ✓ Necessary PPE to be provided for employees ✓ Inspections of all materials prior to working
Brick laying	✓ Dust from cutting Bricks ✓ Unsecured bricks	✓ Inhalation of dust ✓ Falling on employees	✓ Respiratory problems ✓ Injuries	**M**	✓ Employees should wear dust masks ✓ Wear hand protection ✓ Employees to exercise caution when handling bricks.
Scaffold work	✓ Improper erection	✓ Collapse ✓ Falling of employees and equipment	✓ Property damages ✓ Fatalities	**H**	✓ Only a competent scaffold erector may erect a scaffold. ✓ Scaffold to be erected on firm, stable base ✓ Check the stability of the scaffold prior to allowing employees to climb on them. ✓ Mobile scaffolds must have their wheels locked before any person is allowed to climb on them. ✓ All parts of the work platform and scaffold must have safe means of access ✓ Unattended or incomplete scaffold should be prevented against unauthorized access. ✓ Suitable access ladder must be provided ✓ A fall arrest harness must be worn. ✓ Never use worn out fall arrest equipment.

					✓ Suitable equipment for rescue must be available ✓ Proper bracing of the scaffold ✓ Scaffold to be securely tied to a structure
	✓ Overloading	✓ Collapse ✓ Falling of employees and equipment	✓ Property damage ✓ Fatalities	**H**	✓ Display the safe working load of the scaffold ✓ Never exceed the SWL of the scaffold
	✓ Overhead lines	✓ Contact with overhead lines ✓ Contact with employees	✓ Property damages ✓ Electrocution	**H**	✓ Erect the scaffold away from power lines ✓ Keep tools away from overhead lines ✓ Fall arrest equipment to be attached
	✓ Unstable ground conditions	✓ Collapsing of scaffold	✓ Injuries ✓ Property damage	**H**	✓ Ensure that the foundation / footing of the scaffold is stable and levelled ✓ Only trained and competent persons may erect a scaffold
	✓ Non-compliant scaffolding	✓ Collapsing of scaffold	✓ Injuries ✓ Property damage	**H**	✓ All platforms to be fully boarded and boards used to comply with SANS 085 ✓ All components of the scaffold must comply with SANS 085
Work platform	✓ Inadequate space	✓ Falling persons and objects	✓ Fatalities ✓ Property damages	**H**	✓ Work platform should be at least 1m wide and capable of carrying the load that the type of work carried out may require ✓ To prevent persons from falling from the outside

					edges of work platforms, guardrails and mid-rails must be fitted. ✓ If loose objects or other materials may be present on the platform, edge protection/ toe boards must be provided on work platforms.
Edge protection	✓ Working close to edges	✓ Falling	✓ Fatalities		✓ To prevent persons from falling, edge protection must be erected around the perimeter of the work. This must comprise the guardrail and mid-rail designed to withstand any reasonable force, which is expected to fall against it. ✓ Only a competent person may erect an edge protection system ✓ Edge protection can be in the form of hook on boards used as toe boards ✓
Lifting using a crane	✓ Overhead lines	✓ Contact with crane	✓ Electrocution ✓ Property damages	**H**	✓ All lifting activities to be planned at least 2m away from overhead lines
	✓ Wind / Unfavourable weather	✓ Deflection ✓ Loss of control	✓ Injuries ✓ Property damages	**H**	✓ Do not use during unfavourable weather conditions
	✓ Incompetent operator	✓ Loss of control ✓ Hitting structures and people	✓ Injuries ✓ Property damages	**H**	✓ Only trained and competent operators many operate the crane

	✓ Overloading	✓ Collapse of material	✓ Injuries ✓ Property damages	**H**	✓ Display safe working load on the crane
	✓ Faulty crane	✓ Malfunctioning	✓ Injuries ✓ Property damages	**H**	✓ Cranes to be inspected by competent persons prior to being used ✓ All faulty cranes to be tagged and locked out
Working at heights	✓ Heights ✓ Unfit employees ✓ Using hand tools ✓ Unsecured tools and equipment	✓ Falls ✓ Unfit for the job ✓ Damaged hand tools ✓ Falling onto employees	✓ Injuries	**M**	✓ Employees to use proper PPE including safety harnesses when working at heights. ✓ Inspect all tools prior to use. ✓ Provide training for using safety harnesses correctly. ✓ Employees working at heights must be certified fit to work. ✓ Hand tools must be attached to lanyards when working at heights. ✓ Use tool bags ✓ Use netting system below each level. ✓ No work should be done on the ground when work at heights is in progress. ✓ Proper signage to be displayed.
Traffic management	✓ Moving vehicles and pedestrians ✓ Improperly placed signage ✓ Incorrect signage displayed	✓ Road accidents ✓ Knocking off by cars ✓ Property damage	✓ Fatalities ✓ Serious injuries	**H**	✓ Adhere to traffic management procedures ✓ Ensure good communication between flagmen ✓ Display correct road signage ✓ Employees should wear reflective PPE

	✓ Poor communication between flagmen				✓ Keep area clean & clear of obstacles.
Storage of HCS	✓ Burning or fires on site ✓ Improper labelling of chemical containers	✓ Property damage ✓ Accidental consumption of flammable liquids	✓ Serious injuries ✓ Illnesses	**M**	✓ A well ventilated cage may be used for storage of all the HCS and flammables ✓ HCS supervisor must record all quantities on a register. ✓ Label containers correctly ✓ Display HCS signage
Mechanical Works – Lifting practices	✓ Crane operation	✓ No SWL displayed ✓ Incompetent operator ✓ Employees standing around ✓ Unfavourable weather conditions	✓ Serious injuries ✓ Property damages	**M**	✓ Load testing of lifting equipment ✓ Inspection of lifting tackle and equipment prior to use ✓ Display SWL ✓ Only competent people to operate the lifting equipment ✓ Access control to the lifting area ✓ Do not use during unfavourable weather conditions
Installation of equipment	✓ Manual handling	✓ Poor ergonomics ✓ Hands stuck between equipment	✓ Back sprains ✓ Pinch point injuries	**L**	✓ Two employees to carry heavy equipment ✓ Use the correct lifting techniques ✓ Train employees on the correct lifting techniques ✓ Use hand gloves
	✓ Use of hand tools	✓ Usage of the wrong tool for the task ✓ Using damaged tools ✓ Lack of skill	✓ Injuries ✓ Loss of services ✓ Damage to property	**L**	✓ Damaged tools ✓ All tools are visually inspected before use. ✓ Specific equipment/tools are only used by competent users
Cutting and drilling	✓ Drilling ✓ Drill pit	✓ Vibration ✓ Cutting edges	✓ Damaged hearing	**M**	✓ Use hearing protection when exposed to excessive noise

	✓ Drill sharp metal fibres ✓ High Noise Levels ✓ Cutting Grinder/Disc	✓ Eye penetration ✓ Finger cuts ✓ Expose to high noise level area ✓ Uncontrolled disc ✓ Electrical equipment failure ✓ Sharp window edges	✓ Carpal tunnel syndrome ✓ Cuts/ injuries ✓ Eye irritation / blindness ✓ Injuries ✓ Eye injuries		levels (greater than 85 dB over an 8-hour work period) ✓ Assess noise level with sound level meter if possibility exists that level may exceed 85dB ✓ Rotate drilling tasks to minimize worker exposure to equipment vibration ✓ Use right size of a drill to drill different layers of the ground ✓ Assess manual guide carefully to ensure correct usage of portable electrical devices.
Welding	✓ Fumes	✓ Inhalation	✓ Respiratory problems	**M**	✓ Wear respiratory protection
	✓ Sparks	✓ Contact with skin	✓ Skin burns	**L**	✓ Personal Protective Equipment to include face, eye and skin protection
	✓ Sparks	✓ Fire	✓ Damage to property ✓ Fatalities	**H**	✓ Provide fire extinguisher ✓ Provide screens ✓ Remove all sources of combustion and hazardous chemicals from welding area
	✓ Welding arc	✓ Starring welding arc	✓ Eye irritation	**L**	✓ Safety goggles to be worn
Electrical – MCC installation	✓ Lifting equipment	✓ No SWL displayed ✓ Faulty equipment ✓ Employees standing around	✓ Serious injuries ✓ Property damages	**M**	✓ Load testing of lifting equipment ✓ Inspection of lifting tackle and equipment prior to use ✓ Display SWL ✓ Only competent people to operate the lifting equipment ✓ Access control to the lifting area

Cabling	✓ Live electric cables	✓ Electric Shock	✓ Serious injuries	**H**	✓ Ensure that electricity supply is switched off during installation ✓ Implement lockout procedures
	✓ Inadequate wiring	✓ Electric fault ✓ Fire	✓ Serious injuries ✓ Property damages	**H**	✓ Only competent persons to do the electrical work
	✓ Use of faulty cables	✓ Fire ignition	✓ Burns/ damages	**M**	✓ Visual inspection of cable before use
	✓ Cutting	✓ Eye penetration	✓ Eye injuries/ blindness	**M**	✓ Safety goggles shall be worn by employees when cutting steel
	✓ Unit activation	✓ Struck by equipment	✓ Injuries	**M**	✓ Lock out/ Tag out
	✓ Live Yard	✓ Electrocution Injury ✓ Working unauthorized ✓ Mis-communication between employees	✓ Injury or death	**H**	✓ Obtain a permit ✓ Follow cardinal rules ✓ Strict supervision ✓ Fire extinguisher must always be on site ✓ Obtain a permit and follow all procedures listed ✓ Strict supervision ✓ Competent technician operation ✓ Issue test certificate for every testing and inspection done
	✓ Electrical connection ✓ Extension cords	✓ Explosion ✓ Faulty cord failure	✓ Injuries ✓ Property damages ✓ Fire	**M**	✓ Emergency stop button must always be serviceable ✓ Fire extinguishers must always be kept on site

	✓ Electrical equipment ✓ Portable electrical appliances	✓ Use of faulty electrical equipment; ✓ Faulty equipment could also start a fire.	✓ Electric shock / burns ✓ Injuries	**M**	✓ All tools to be checked and tagged before bringing onto site; ✓ Portable electrical appliances examined and where necessary, tested by a competent person within the recommended time limit; ✓ Defective appliances and leads are removed from use and kept secured until they can be repaired or removed from the site; ✓ Electric tools and installations to be in good condition; ✓ Inspect electric tools before use; ✓ Do not use electric tools in wet / damp conditions; ✓ Use personal protective equipment such as insulated gloves.
Commission & testing	✓ Testing ✓ Inspection	✓ Electrocution Injury /Damage to equipment ✓ Chocking ✓ Electrocution Injury ✓ Working unauthorized ✓ Miss-communication between employees	✓ Fatalities ✓ Property damages	**H**	✓ Authorized person with C.O.C must do all the installation ✓ Emergency stop button must always be serviceable ✓ Ensure communication between employees ✓ Technical Skills ✓ Fire extinguisher must always be on site ✓ Implement lockout procedure ✓ Strict supervision

					✓ Competent technician operation ✓ Issue test certificate for every testing and inspection done
Road repair	✓ Preparing the surface	✓ Hot weather conditions ✓ Flying particles ✓ Unsafe working area- incoming traffic	✓ Burns, heat stress and fatigue ✓ Property damage ✓ Personal injuries	**M**	✓ Safe working method must be implemented ✓ Traffic control signs stating the speed zones must be used ✓ Pre-use check must be done for machines
	✓ Compactor ✓ Noise ✓ Dust ✓ Vibration	✓ In-competent employee using the compactor ✓ Hearing loss ✓ Hand-arm vibration syndrome ✓ Collapsing excavation wall ✓ Inhalation of dust	✓ Injury to compactor operator or other employees ✓ Injury or fatality ✓ Respiratory problems	**M**	✓ Use of ear muffs by compactor operator ✓ Dust mask to be worn by compactor operator ✓ Compactor operator to be declared competent before using the machine
	✓ Pouring of concrete	✓ Noise from the compactor ✓ Flying concrete particles ✓ Incoming traffic ✓ Manual handling ✓ Sharp edges for shovels	✓ Personal injuries ✓ Loss of hearing ✓ Irritation to the eyes ✓ Cuts	**L**	✓ Safe working method must be implemented ✓ Traffic control signs must be used and flagmen must in place ✓ Supervision ✓ Correct PPE must be worn
Install generator	✓ Lifting equipment	✓ No SWL displayed ✓ Faulty equipment ✓ Employees standing around	✓ Serious injuries ✓ Property damages	**M**	✓ Load testing of lifting equipment ✓ Inspection of lifting tackle and equipment prior to use ✓ Display SWL ✓ Only competent people to operate the lifting equipment

					✓ Access control to the lifting area
Fueling	✓ Spillages	✓ Slips, trips, falls	✓ Injuries	**L**	✓ Prevent spillages ✓ Use drip trays ✓ Use funnels for fuelling
		✓ Fire	✓ Injuries	**M**	✓ No smoking allowed near the generator
	✓ Diesel fumes	✓ Inhalation	✓ Respiratory problems	**L**	✓ Provide employees with respirators
		✓ Skin contact	✓ Skin irritation	**L**	✓ Provide employees with gloves, safety boots and overalls
	✓ Running engine	✓ Explosion	✓ Injuries	**M**	✓ Switch engine off before refueling and make sure fuel cap is replaced. ✓ No smoking allowed near the generator
Running the engine	✓ Noise	✓ Over-exposure	✓ Noise-induced hearing loss	**M**	✓ Provide employees with hearing protection ✓ Provide rest periods for employees
	✓ Vibration	✓ Over exposure	✓ Raynaud's Syndrome	**L**	✓ Provide employees with vibration gloves. ✓ Rotate employees or provide rest periods.
	✓ Fumes	✓ Inhalation	✓ Respiratory problems	**L**	✓ Provide employees with respirators ✓ Never use indoors
Electricity	✓ Voltage	✓ Contact with live electricity	✓ Electrocution	**M**	✓ Ensure that power is switched off when servicing the generator

					✓ The frame of the generator and any external conducting parts should have proper grounding / earthing wiring. ✓ Do not touch with wet hands
General activities	✓ Overhead power lines	✓ Contact with live electricity	✓ Electrocution	**M**	✓ Always follow SOP when carrying materials
	✓ Site access	✓ Unattended visitors ✓ Not following site rules	✓ Injuries	**L**	✓ Induction to be conducted when entering site ✓ Personnel to be escorted
	✓ Work temperature	✓ Exposure to temperature extremes	✓ Ill health	**L**	✓ Staff to take rest breaks ✓ Drinking water must be available
	✓ Exposure to communicable diseases	✓ Using of communal facilities	✓ Ill heath	**L**	✓ Employees to be informed about the risks
Working alone	✓ Employees working alone	✓ No supervision	✓ Injuries	**M**	✓ Practice buddy system ✓ No employee should work on the roof alone ✓ All work to be supervised.
Reinstatement of the surface	✓ Inadequate compaction ✓ Construction refuse ✓ Inadequate re-surfacing High ✓ Ground collapse ✓ hydraulic/pneumatic pressures	✓ Uneven surfaces	✓ Trip and fall injuries ✓ Personal injuries	**L**	✓ Compaction to specified standard. ✓ Site cleared of debris and refuse. ✓ Re-surface appropriately. ✓ Do not leave gaps in turf or leave uneven surface. ✓ Erect fence around hazardous areas until restored and safe. ✓ Ensure plugs and compressors are installed

					and secured against movement. ✓ Release air before removing plugs. ✓ Clear area of pipe ends being tested.
Pipe laying	✓ Steel ✓ Employees working around the excavation	✓ Rough edges ✓ Heavy steel ✓ Hit by pipe	✓ Injuries	**M**	✓ Provide gloves to employees ✓ Heavy pipes to be lifted mechanically
Pipe laying	✓ Crane	✓ Failure of the crane ✓ Employees	✓ Fatalities	**H**	✓ Inspect the crane prior to use. ✓ Only trained and competent person to operate the crane ✓ Employees to steer clear of lifting operations ✓ Faulty cranes to be tagged and not used ✓ Wind speed and direction to be considered before using the crane ✓ Crane to be load tested ✓ Only certified loads to be carried on the crane
Tie ins & pressure testing	✓ Water ✓ Pressure	✓ Pipe damages ✓ Leaks cracks ✓ Water inside pipe ✓ Burst	✓ Fatalities	**E**	✓ Ensure that the water is shut down ✓ Ensure that the correct class of pipe is used as well as valve specifications are correct ✓ Develop and follow a method statement ✓ Use only competent person to perform the task. ✓ Don’t exceed pipe operating pressure, ensure pipe is correct diameter.

					✓ Ensure pipe not damaged.
Cathodic protection	✓ Sparks	✓ Exposed skin	✓ Burns	**L**	✓ Provide employees with PPE
	✓ Sparks	✓ Combustion fuel	✓ Fire	**H**	✓ Remove all sources of combustion from the work area.
	✓ High voltages	✓ Exposed conductors	✓ Electrocution	**H**	✓ Only a qualified electrician to perform this task. ✓ All equipment to be isolated
	✓ Excavation	✓ Contact with live electricity	✓ Electrocution	**H**	✓ Identify all existing services on drawings ✓ Mechanical excavation to be avoided where services have been identified.
Installation of pumps and valves	✓ Heavy pumps and valves	✓ Falling	✓ Injuries ✓ Property damages	**M**	✓ Use proper lifting equipment ✓ Ensure that only the relevant people are in the work area. ✓ Ensure that lifting equipment is load tested. ✓ Only competent personnel to undertake this task
	✓ Steel fixing	✓ Falling from height ✓ Slip	✓ Injuries	**L**	✓ PPE, including safety boots and goggles must be used
Working on live machinery	✓ Energy	✓ Lockout not done ✓ Improper lockout/ isolation ✓	✓ Electrocution ✓ Fatalities ✓ Burns	**H**	✓ Adhere to the lockout procedure ✓ Appoint competent mechanical and electrical employees ✓ Ensure proper lock out is done ✓ Ensure there is proper communication between

					✓ team members regarding the work ✓ Each employee need to know where the emergency stop button of the conveyor is located
Electrical works	✓ Live electricity	✓ Electric shock	✓ Fatality ✓ Serious injuries	**H**	✓ Ensure that the electrical supply is fully isolated before works commence. ✓ Ensure that system is fully locked off before commencing works to prevent accidental start. ✓ PAT testing of all equipment is carried out
Welding	✓ Fumes	✓ Inhalation	✓ Respiratory problems	**M**	✓ Wear respiratory protection
	✓ Sparks	✓ Contact with skin	✓ Skin burns	**L**	✓ Personal Protective Equipment to include face, eye and skin protection
	✓ Sparks	✓ Fire	✓ Damage to property ✓ Fatalities	**H**	✓ Provide fire extinguisher ✓ Provide screens ✓ Remove all sources of combustion and hazardous chemicals from welding area
	✓ Welding arc	✓ Starring welding arc	✓ Eye irritation	**L**	✓ Safety goggles to be worn
Working at heights	✓ Heights ✓ Unfit employees ✓ Using hand tools ✓ Unsecured tools and equipment	✓ Falls ✓ Unfit for the job ✓ Damaged hand tools ✓ Falling onto employees	✓ Injuries	**M**	✓ Employees to use proper PPE including safety harnesses when working at heights. ✓ Inspect all tools prior to use. ✓ Provide training for using safety harnesses correctly.

					✓ Employees working at heights must be certified fit to work. ✓ Hand tools must be attached to lanyards when working at heights. ✓ Use tool bags ✓ Use netting system below each level. ✓ No work should be done on the ground when work at heights is in progress. ✓ Proper signage to be displayed.
Traffic management	✓ Moving vehicles and pedestrians ✓ Improperly placed signage ✓ Incorrect signage displayed ✓ Poor communication between flagmen	✓ Road accidents ✓ Knocking off by cars ✓ Property damage	✓ Fatalities ✓ Serious injuries	**H**	✓ Adhere to traffic management procedures ✓ Ensure good communication between flagmen ✓ Display correct road signage ✓ Employees should wear reflective PPE ✓ Keep area clean & clear of obstacles.
Storage of HCS	✓ Burning or fires on site ✓ Improper labelling of chemical containers	✓ Property damage ✓ Accidental consumption of flammable liquids	✓ Serious injuries ✓ Illnesses	**M**	✓ A well ventilated cage may be used for storage of all the HCS and flammables ✓ HCS supervisor must record all quantities on a register. ✓ Label containers correctly ✓ Display HCS signage
Access into the completed reservoir	✓ Unstable stairs ✓ Broken staircase ✓ Slippery surface	✓ Employees falling ✓ Slipping & falling ✓ Stairs breaking with employees on	✓ Fatalities ✓ Serious injuries	**H**	✓ Ensure that cat ladder stairs are properly fixed to the wall. ✓ Ensure that ladder surface is not slippery

Reinstatement of the surface	✓ Inadequate compaction ✓ Construction refuse ✓ Inadequate re-surfacing High ✓ Ground collapse ✓ hydraulic/pneumatic pressures	✓ Uneven surfaces	✓ Trip and fall injuries ✓ Personal injuries	**L**	✓ Compaction to specified standard. ✓ Site cleared of debris and refuse. ✓ Re-surface appropriately. ✓ Do not leave gaps in turf or leave uneven surface. ✓ Erect fence around hazardous areas until restored and safe. ✓ Ensure plugs and compressors are installed and secured against movement. ✓ Release air before removing plugs. ✓ Clear area of pipe ends being tested.

RISK ASSESSMENT MATRIX

Likelihood	Consequences				
	Insignificant (minor problem easily handled by normal day to day processes	Minor (Some disruption possible e.g.,damage equal to R150k	Moderate (significant time / resources required. E.g., damage equal to R500k	Major (Operations severely damaged. E.g., damages equal to R1m	Catastrophic (business survival is at risk. Damage equal to R5m – 10m
Almost certain (90% chance)	High	High	Extreme	Extreme	Extreme
Likely (between 50-90%)	Moderate	High	High	Extreme	Extreme
Moderate (between 10-50%)	Low	Moderate	High	Extreme	Extreme
Unlikely (between 3-10%)	Low	Low	Moderate	High	Extreme
Rare (<3%)	Low	Low	Moderate	High	High

ANNEXURE 2:

MEDICAL SCREENING POLICY

JOHANNESBURG WATER (SOC) LTD

MEDICAL SCREENING POLICY

JW 14302: CONSTRUCTION OF 20ML CARLSWALD RESERVOIR

NOTICE

It is the Contractor's responsibility to ensure that medical surveillance requirements specified in the Occupational Health and Safety Act (85/1993) and Regulations and any other applicable legal and Johannesburg Water's requirements are fully complied with.

This document is meant to facilitate the Contractor's compliance to applicable requirements and does not replace the applicable legal requirements.

This document may be revised at any time to include applicable legal requirements not currently included that may come to the attention of Johannesburg Water in future. The Contractor will accordingly be responsible to comply with the revised requirements as might be necessary.

Where methods to ensure legal compliance have been specified in this document, Contractors may submit alternative detailed method statements for consideration and approval by Johannesburg Water. Johannesburg Water may, at its sole discretion, reject or accept such alternative methods.

1 PURPOSE OF THE MEDICAL SURVEILLANCE REQUIREMENTS PROCEDURE

The purpose of this Medical Surveillance Requirements Procedure is to facilitate the achievement of legal compliance relating to medical surveillance by all Consultants, Contractors, Subcontractors and suppliers that will be working on the Johannesburg Water project and to ensure that employees are fit to work in the roles that they have been employed to execute and remain so for their duration on the project site.

This document represents the minimum requirements for medical surveillance and does not replace applicable legal requirements.

2 MEDICAL SURVEILLANCE OBJECTIVES

The Johannesburg Water main objectives for medical surveillance are:

a) To ensure compliance with all applicable medical surveillance legal requirements.
b) To ensure compliance with all Johannesburg Water's requirements regarding medical surveillance.
c) To ensure that employees are fit to execute the work for which they have been employed.
d) To prevent employees from acquiring occupational diseases or illnesses.
e) To ensure early detection and treatment of occupational diseases and to prevent the aggravation of existing medical conditions.
f) To ensure that employees on departure from the project have not contracted any occupational diseases and to enable any such condition that arises to be suitably addressed.

All contractors are required to demonstrate total commitment towards the achievement of these objectives.

3 GENERAL REQUIREMENTS

3.1 The Principal Contractor shall ensure that a medical surveillance programme is implemented for all employees.

3.2 An initial health evaluation shall be carried out by an occupational health practitioner immediately after a person commences employment, where any exposure exists or may exist, which comprises:

- an evaluation of the employees medical and occupational history;
- a physical examination; and
- any other essential examination which in the opinion of the occupational health practitioner is desirable in order to enable the practitioner to do a proper evaluation.

3.3 Medical surveillance & Immunization shall be done accredited institutions or occupational health doctor, including, but not limited to:

a) Audiograms.
b) A cardio-respiratory examination, including full size chest x-rays (If lung function tests are abnormal)
c) Lung function tests.
d) Eye/ sight tests.
e) A general physical examination.
f) A review of previous medical history.
g) Blood pressure tests
h) Glucose tests

Copies of all medical certificates shall be submitted to the Johannesburg Water Project Specialist or Appointed OHS Agent to prior to site establishment and before an employee is allowed to come onto site.

Specific attention shall be given to the physical and psychological fitness of people who will be required to work in elevated positions and operators of mobile machinery.

An exit medical certificate shall be obtained for all workers at the end of the contract and for all workers who leave the employment of the Contractor before the end of the Project. Copies of all exit medical certificates shall be submitted to the Johannesburg Water Project Specialist or Appointed OHS Agent.

Medical surveillance shall address all occupational health risks to which the employee is exposed, identified through the risk assessment referred to in section 4 below.

Retention monies will be withheld if the exit medical is not complete for all employees.

The cost of all medical examinations will be borne by the Contractor as provision is made on the bill of quantities.

4 OCCUPATIONAL HEALTH RISK ASSESSMENT

4.1 The Contractor shall conduct an occupational health risk assessment prior to site establishment.

4.2 The Contractor shall ensure that, as far as is reasonably practicable, ergonomic related hazards are analyzed, evaluated and addressed in the risk assessment.

4.3 The methodology used by the contractor to assess occupational health risks associated with their activities shall be submitted to Johannesburg Water for approval by the Johannesburg Water Project Specialist or Appointed OHS Agent prior to site establishment. The methodology should take the following into consideration, among others:

a) Legal requirements.
b) Normal activities undertaken by the contractor.
c) Abnormal situations (e.g. unanticipated breakdown of equipment etc).
d) Emergency situations (e.g. fires, exposure to chemicals).
e) Changes in work procedures and methods.
f) Previous experience.

4.4 A risk register that will include the following shall be submitted to the Johannesburg Water Project Specialist or Appointed OHS Agent before site establishment.

a) All occupational health risks identified during the occupational health risk assessment.
b) A list of the occupational health risks that have been identified as being significant.
c) Reference to the method statements, measures or procedures that will be followed to either eliminate or reduce the significant risks to tolerable levels.

4.5 The Contractor shall, in writing, clearly explain how each occupational health risk assessed to be significant will be addressed to eliminate or reduce it to a tolerable level and submit it for approval by the Johannesburg Water Project Specialist or Appointed OHS Agent before site establishment. This may be through method statements or written operational control procedures. Associated responsibilities and authorities shall be clearly defined. All method statements shall reflect at least:

a) When the activities relating to the method statement will be conducted (timing).
b) Materials to be used.
c) Equipment and staffing requirements.
d) The proposed construction procedure designed to implement the relevant requirements.
e) The system to be implemented to ensure compliance with the method statement.
f) Any other information deemed to be necessary by the Johannesburg Water Project Specialist or Appointed OHS Agent and/or the contractor's responsible person.

4.6 For significant occupational health risks identified after site establishment, method statements shall be submitted to the Johannesburg Water Project Specialist or Appointed OHS Agent at least 10 working days before the start of the associated activity, when possible.

4.7 All changes to approved method statements or procedures shall be approved in writing by the Johannesburg Water Project Specialist or Appointed OHS Agent.

4.8 The contractor's Responsible Person shall retain records of any amendments and shall ensure that only the most current approved version of any method statement or procedure is used.

4.9 Every occupational health risk that is identified during the risk assessment process shall be conveyed to every employee whose work is associated with the risk. This may be done in the form of a toolbox talk but does not replace the toolbox talk entirely. Each employee shall sign to confirm an understanding of the occupational health risks in the tasks.

4.10 Occupational health risk assessments may be combined with safety and environmental risk assessments, but the consideration of occupational health issues shall be clearly reflected in the records generated and maintained.

4.11 The occupational health risk assessment process and effective implementation of measures to eliminate or reduce identified risks is the responsibility of the Contractor. Johannesburg Water will closely monitor the effectiveness of implemented measures.

Acknowledgement of JW Medical Screening Policy

Name of Contractor

I, the undersigned, hereby acknowledge that I have obtained copies of JW Medical Screening Policy and confirm that I fully understand them and the consequences of non-compliance.

Signed at …… on this …….. Day of …… 20……...

Signature of Contractor / Mandatory **Date**

---------- **----------**

Signature of 16.2 / Construction Manager **Date**

---------- **----------**

Witness 1 …… **Witness 2 ……**

ANNEXURE 3:

SIGN OFF FORM

SHE CONTRACTORS' MANAGEMENT SYSTEM				
TENDER DOCUMENT SHE SPECS SIGN-OFF FORM				Johannesburg Water
REQUESTED BY	**S. TSHUMA**	**DATE**	**27/09/2022**	**JW 14302**

***JW 14302**: Construction of 20ML Carlswald Reservoir*

LIST OF SHE SYSTEM ATTACHED TO THE TENDER DOCUMENT

SHE SYSTEM ATTACHED	Y/N	VERSION	NO PAGES	REMARKS
Volume 2 SHE Specification & Acknowledgement Form	Y	V2 – 05/15	47	For info
Baseline Risk Assessment	Y	V01 – 05/15	23	For info
Medical Screening Policy	Y	V01 – 05/15	8	For info
Returnable Annexure A	Y	V02 - 02/20	1	Return with tender document

ANNEXURE 4:

ENVIRONMENTAL MANAGEMENT PLAN

ENVIRONMENTAL MANAGEMENT PLAN

JOHANNESBURG WATER SOC LTD

ENVIRONMENTAL MANAGEMENT PLAN

REVISION:05

Prepared By:

OHSE & DM

Environmental Management Section

Johannesburg Water SOC (Ltd)

PO Box 61542

Marshalltown

2001

TABLE OF CONTENTS

LIST OF TABLES

LIST OF APPENDICES

LIST OF ACRONYMS Acronym	**Description**
BA	Basic Assessment
BAR	Basic Assessment Report
CA	Competent Authority

DEA	Department of Environmental Affairs
DWS	Department of Water and Sanitation
EA	Environmental Authorisation
EAP	Environmental Assessment Practitioner
EO	Environmental Officer
EIA	Environmental Impact Assessment
EMPr	Environmental Management Programme Report
GDARD	Gauteng Department of Agriculture and Rural Development
GN	Government Notice
I&AP	Interested and Affected Party
JW	Johannesburg Water
km	Kilometre
m	meter
MSDS	Material Safety Data Sheets
NEMA	National Environmental Management Act, 1998 (Act No. 107 of 1998)
NWA	National Water Act, 1998 (Act No. 36 of 1998)
PHRAG	Provincial Heritage Resources Authority for Gauteng
RE	Resident Engineer
WUL	Water Use License
WULA	Water Use License Application
WWTW	Wastewater Treatment Works

DEFINITIONS

Environment

The surroundings in which humans exist and which comprise of:

- Land, water, and atmosphere of the earth.
- Micro-organisms, plant, and animal life.
- Any part or combination of a) and b) and the interrelationships among and between them.
- The physical, chemical, aesthetic, and cultural properties and conditions of the foregoing that can influence human health and well-being.

Environmental Aspect

Those components of the company's activities, products and services that is likely to interact with the environment.

Environmental Authorisation

The written statement from the relevant environmental authority in terms of the National Environmental Management Act (Act 107 of 1998), with or without conditions, that records its approval of a planned activity and the implementation thereof and the mitigating measures required to prevent or reduce the effects of environmental impacts during the life of a contract.

Environmental Impact Assessment (EIA)

The decision-making process of examining the environmental impacts of a development in terms of the NEMA (107 of 1998) and the EIA Regulations (Government Notice No. R982, R983, R984, R985 and R986) as amended.

Environmental Management Programme (EMPR)

An environmental management tool used to ensure that undue or reasonably avoidable adverse impacts of the construction, operation and decommissioning of a project are prevented; and that the positive benefits of the projects are enhanced.

Environmental Management System (EMS)

A set of process and practices that enable an organization to reduce its environmental impacts and increase its operational efficiency. The EMS provides a framework that helps a company achieve its environmental goals through consistent control of its operations.

Auditing

A systematic and objective assessment of an organization's activities and services conducted and documented on a periodic basis internally and externally.

Environmental Objective

An overall environmental goal, arising from the environmental policy, that an organization sets itself to achieve, and which is quantified where practicable.

Environmental Target

A detailed performance requirement quantified where practicable, applicable to the organization or parts thereof, that arises from the environmental objectives and that needs to be set and met in order to achieve those objectives.

Floodplain

A flat expanse of land bordering a river channel, formed through sediment deposition and other alluvial processes, and often characterized by frequent flooding as a result of bank overspill from the river channel.

Groundwater

Sub-surface water in the zone in which permeable rocks, and often the overlying soil, are saturated.

Hazardous waste

Waste that are proven to be toxic, corrosive, explosive, flammable, carcinogenic, radioactive, poisonous or classified as such in legal terms.

Heritage Resource

Any place or object of cultural significance including buildings, structures, landscapes, graves and geological, archaeological artefacts and paleontological sites.

Landscape

Land modified for human use and occupation, embracing both the natural (wilderness) environment and the urban.

Management actions

Practical actions aimed at achieving management objectives and targets.

Management objectives

Desired outcome of management measures for mitigating negative impacts and enhancing the positive impacts related to project activities and aspects (i.e. risk sources).

Monitoring

A systematic and objective observation of an organization's activities and services conducted and reported on regularly.

Natural Vegetation

All existing vegetation species, indigenous or otherwise, of trees, shrubs, groundcover, grasses and all other plants found growing on the site.

Pollution

Any change in the environment caused by substances, radioactive or other waves, or noise, odours, dust or heat, emitted from any activity, including the storage or treatment of waste or substances, construction and the provision of services, whether engaged in by any person or an organ of state, where that change has an adverse effect on human health or well-being or on the composition, resilience

and productivity of natural or managed ecosystems, or on materials useful to people, or will have such an effect in the future. Furthermore, pollution can also be regarded as an undesirable state of the natural environment being contaminated with harmful substances because of human activities.

Protected Plants

Plant species officially listed on the Protected Plants List (each province has one), and which may not be removed or transported without a permit to do so from the relevant provincial authority.

Reinstatement

Reinstatement is defined as the return of a disturbed area to a state, which approximates the state (where possible), which it was before disruption.

Riparian Habitat

The physical structure and associated vegetation of the areas associated with a watercourse which are commonly characterised by alluvial soils, and which are inundated or flooded to an extent and with a frequency sufficient to support vegetation of species with a composition and physical structure distinct from those of adjacent land areas.

Runoff

The total water yield from a catchment including surface and subsurface flow.

Sensitive environmental features

Environmental features protected by legislation (e.g., heritage resources), or identified during the EIA as sensitive through specialists' findings and input received from Interested and Affected Parties.

Subsoil

The soil horizons between the topsoil horizon and the underlying parent rock.

Topsoil

Topsoil can be regarded as the fertile upper part or surface of the soil.

Transplanting

The removal of plant material and replanting the same plants in another designated position.

Veld

Unimproved areas of natural vegetation

Wastewater

Water contaminated by the project activities.

Watercourse

A geomorphological feature characterized by the presence of a stream flow channel, a floodplain and a transitional upland fringe seasonally or permanently conveying surface water.

Waterlogged

Soil or land saturated with water long enough for anaerobic conditions to develop.

Weeds and Alien Invasive Plants

Weeds and Alien Invasive plants are defined as undesirable plant growth that shall include, but not be limited to all declared category 1, 2 and 3 listed Alien Invasive species as set out in the Conservation of Agricultural Resources Act (No 43 of 1983) regulations. Other vegetation deemed to be invasive should be those plant species that show the potential to occupy in number, any area within the defined construction area.

Wetland

Land where a surplus of water (i.e., waterlogging) is the key factor determining the nature of the soil development as well as the types of plants and animals living at the soil surface.

1. BACKGROUND

The purpose of this document is to provide management measures that will ensure that potential negative impacts associated with the activity are minimized whilst positive impacts are optimised, provided that the EMP is implemented by a suitably qualified Environmental Officer (EO). The development proponent, the main contractor and the sub- contractor are responsible for the implementation of the EMP throughout the stages. Therefore, it is imperative that the EMP is circulated to site managers, contractors and Depots who will perform any work on site which has the potential to cause environmental damage. Any parties responsible for transgression of the underlying management measures outlined in this document will be held liable for non- compliances.

The following is a generic EMP to mitigate against “generally occurring impacts” associated with the construction phase of Johannesburg Water’s activities. "Generally occurring impacts" refers to potential impacts typical of Johannesburg Water’s activities and are not restricted to a single or specific site. The findings of this EMP will be implemented at all sites.

This section is an essential component of the contract specification and shall be included during **planning, design, construction, and operational phases.**

PURPOSE

The purpose of this EMP is to ensure that Johannesburg Water conducts all its activities related to the construction and maintenance in accordance with the provisions of NEMA, and other applicable legislations. This EMP has considered the provisions of the Constitution and the principles of Integrated Environmental Management.

2. APPLICABLE LEGISLATIONS

Several laws and regulations apply to the protection of the environment. These laws contain environmental principles and standards that need to be applied when applicable permits and licences that need to be obtained. This EMP will be subject to regulatory control under a range of State, Provincial and Local regulations. Such legislation largely embraces pollution prevention, sustainable resource use, conservation, and socio cultural (heritage) protection. This chapter reviews legislation pertaining to this generic EMP.

According to Section 2 (1, 2 & 3) of the National Environmental Management Act No. 107 of 1998 (NEMA), all organs of state must apply certain principles set out in NEMA when taking decisions that may significantly affect the environment. The key principles of this Act include that all "actions" that they approve must be economically, socially, and environmentally sustainable. It further states that "people and their needs" must be at the forefront of "its concern" and their interests must be served equitably. These legislative requirements include, but are not limited to, the provisions of the legislation represented as described below:

The Constitution of the Republic of South Africa Act No. 108 of 1996)

Section 24 of the Constitution of South Africa (Act 108 of 1996) states that "Everyone has the right (a) to an environment that is not harmful to their health or well-being; and

(b) To have the environment protected, for the benefit of present and future generations through reasonable legislative and other"

Measures that:

- Prevent pollution and ecological degradation;
- Promote conservation; and
- Secure ecologically sustainable development and use of natural resources while promoting justifiable economic and social development".
- Section 152 of the Constitution states that the objectives of local government are to:
- Ensure that services are provided to communities in a sustainable manner.

- Promote social and economic development; and
- Promote a safe and healthy environment.

National Environmental Management Act No. 107 of 1998 (as amended)

The National Environmental Management Act 107 of 1998 (NEMA) requires that an environmental authorization is obtained before activities, which have been listed in terms of NEMA, are commenced with. The failure to obtain such an environmental authorization, before commencing with listed activities, could result in administrative sanctions, including compliance notices or directives ordering the cessation of the operations until authorized; and fines of up to ZAR10 million for each such contravention.

The Environmental Impact Assessment Regulations (EIA Regulations) set out the process to be followed in applying for an environmental authorization, while the listing notices; list the activities that require authorization (the Listing Notices). NEMA 107 of 1998 amended in 07 of April 2017.The following are the listed activities:

- EIA Regulations GNR 326
- Listing Notice 1; Government Notice Number (GNR) 327 (Basic Assessment).
- Listing Notice 2; Government Notice Number (GNR) 325 (Full EIA/ Scoping & Environmental Impact Report).
- Listing Notice 3; GNR 324 (It applies on both Basic Assessment and full EIA).

National Environmental Management: Biodiversity Act No. 10 of 2004

Provides management and conservation of South Africa's biodiversity within the framework of NEMA 107 of 1998; the protection of species and ecosystems that warrant national protection and the sustainable use of indigenous biological resources.

The National Environmental Management Waste Act 59 of 2008

The National Environmental Management Waste Act (NEMWA) reforms the law regulating waste management in order to protect health and the environment providing reasonable measures for the

prevention of pollution and ecological degradation and for securing ecologically sustainable development; to provide for institutional arrangements and planning matters; to provide for national norms and standards for regulating the management of waste by all spheres of government; to provide for specific waste management measures; to provide for licensing and control of waste management activities; to provide for the remediation of contaminated land; to provide for the national waste information system; to provide for compliance and enforcement; and to provide for matters connected therewith.

The Occupational Health and Safety Act No. 85 of 1993

The Occupational Health and Safety Act make provision in regulation

- Section 8 for the general duties of employers to their employees.
- Section 9 of the Regulations makes provision for general duties of employers and self-employed persons to persons other than their employees.

National Heritage Resources Act (NHRA) No. 25 of 1999

The protection and management of South Africa's heritage resources are controlled by the National Heritage Resources Act. The South African National Heritage Resources Agency (SAHRA) is the responsible authority for implementing the National Heritage Resources Act (NHRA) 1999, (Act 25 of 1999).

Section 38(1) of the NHRA lists development activities that would require authorisation by the responsible heritage resources authority. Activities considered applicable to the proposed project include the following:

(a) the construction of a road, wall, powerline, pipeline, canal or other similar form of linear development or barrier exceeding 300m in length.

(b) the construction of a bridge or similar structure exceeding 50 m in length; and

(c) any development or other activity which will change the character of an area of land, or water -

i exceeding 5 000 m² in extent,

ii involving three or more existing erven or subdivisions thereof; or

iii involving three or more erven or divisions thereof which have been consolidated within the past five years; or

iv the costs of which will exceed a sum set in terms of regulations by SAHRA or a Provincial Heritage

v Resources Authority.

(d) the re-zoning of a site exceeding 10 000 m^2 in extent; or

(e) any other category of development provided for in regulations by SAHRA or a Provincial Heritage Resources Authority, must at the very earliest stages of initiating such a development, notify the responsible heritage resources authority and furnish it with details regarding the location, nature, and extent of the proposed development.

Water Services Act No. 108 of 1997

This Act provides for the rights of people to basic water supply amongst others basic sanitation. It acknowledges that that there is a duty on all spheres of government to ensure that sanitation services are provided in a manner which is efficient, equitable and sustainable and that it should be sufficient for subsistence and sustainable economic activity. The provision of sanitation services must be undertaken in a manner consistent with the broader goals of water resource management. This goal is in line with the Act as it aims to provide sufficient sanitation services to the region in a sustainable manner.

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

The CARA aims to ensure the protection of agricultural resources such as land with agricultural potential and water and makes provision for the eradication of alien and invasive species, and protection of topsoil.

NEMA Air Quality Act (AQA), Act No. 39 of 2004

The aim of this law is to regulate air quality and protect the environment in South Africa through reasonable measures to prevent pollution and ecological degradation, while securing sustainable development. The Act also provides national norms and standards for air quality management, monitoring, and control. Under this legislation, Priority Air shed Areas can be proclaimed, where specific

Air Quality Management Plans are applicable. Regulations are also published under this Act for the format of air quality assessments and what should be included in the assessment. Any Air Quality Management Plan which has been compiled for the area and any proposed WwTW should be in line with this Management Plan. This Act may list activities which may result in atmospheric emissions, and which may have a significant detrimental effect on the environment.

Government Gazette 32434 of 24 July 2009 listed activities, which require an atmospheric emission license before it commences. Air quality limits and thresholds are fundamental to effective air quality management, providing the indicators to safe exposure levels for most of the population. The current South African standards have been revised and National Ambient Air Quality Standards were promulgated on the 24th of December 2009 (Government Gazette No. 32816, Notice No. 1210). The newly proposed standards include particulate matter specifically PM10 (particulates with a diameter of less than 10 micrometre), sulphur dioxide (SO2), nitrogen dioxide (NO_2), ozone (O3), lead, carbon monoxide (CO) and benzene. These revised standards have been adopted as the VTAPA air quality objectives. Any emissions from the proposed WWTW should be within these standards.

National Water Act (NWA), 36 of 1998

Water use is controlled by the National Water Act (NWA) Act No. 36 of 1998. The NWA recognises that water is a scarce resource in South Africa and its provisions are aimed at achieving sustainable use of water to the benefit of all users. The provisions of the Act are thus aimed at discouraging pollution and waste of water resources. According to Section 21 of the NWA the following activities require a water use licence (WUL) prior construction:

"21.(a) taking water from a water resource;

21.(b) storing water;

21.(c) impeding or diverting the flow of water in a watercourse;

21.(d) engaging in a stream flow reduction activity contemplated in section 36;

21.(e) engaging in a controlled activity identified as such in section 37(1) or declared under section 38(1);

21.(f) discharging waste or water containing waste into a water resource through a pipe, canal,

sewer, sea outfall or other conduit;

21.(g) disposing of waste in a manner which may detrimentally impact on a water resource;

21.(h) disposing in any manner of water which contains waste from, or which has been heated in, any industrial or power generation process;

21.(I) altering the bed, banks, course or characteristics of a watercourse;

21.(j) removing, discharging or disposing of water found underground if it is necessary for the efficient continuation of an activity or for the safety of people; and

21.(k) using water for recreational purposes."

3. OBJECTIVES OF THE ENVIRONMENTAL MANAGEMENT PROGRAMME

The purpose of this EMP is to provide an easily interpreted reference document that ensures that the project environmental commitments, safeguards and mitigation measures from the environmental planning documents, project approvals, and scope of work are implemented.

The objectives for the EMP are:

- To develop, implement and maintain effective management systems for the environmental aspects.
- To document details of environmental protection infrastructure and controls so that they can provide long term protection for the natural environment.
- To ensure compliance with relevant legislation (National, Provincial and Local), regulatory requirements and environmental documents.
- To maximise the value and outcomes of environmental monitoring activities so that the information can be applied to the planning and implementation of future projects.
- To ensure that all Environmental Management considerations are implemented during the planning, operational and maintenance phases of the project.

All the environmental specifications and the procedures discussed in this document were also developed in accordance with the relevant legislation applicable to the development.

3.1 Phases of the Project

The EMP deals with the following phases as detailed below:

3.1.1 The Planning and Design Phase

Overall Goal for Planning and Design: Undertake the planning and design phase of the development in a way that:

- Ensures that the design of the proposed development responds to the identified environmental constraints and opportunities.
- Ensures that the best environmental options are selected for all components of the project.
- **Ensures that there is sufficient financial provision for environmental assessment, monitoring, rehabilitation, and maintenance. The JW rehabilitation calculation template must be used (See Annexure D).**
- The qualified landscaping specialist must be appointed to undertake rehabilitation on site. The landscaping specialist must pose the following qualifications and work experience:

  - Landscaping Specialist should at least have BA/BSc Honours Degree or 4-year Degree in Natural Sciences/Ecological

  - The Landscaping Specialist must at least be registered with South African Council for Natural Scientific Professions (SACNASP) as a Professional Natural Scientist (Copy of SACNASP Certificate must be submitted).

  - At least three letters from their client/s must be submitted, detailing the landscaping work he/she has undertaken (letters should have the name of the client, description of the project and/or scope of work done, contact details and must be signed). Letters should be in their client's company letterhead, and it must indicate if the work has been completed satisfactorily or not. - Copy of CV must be submitted, specialist should at least have a minimum of five (5) years working experience as landscaping Specialist (See Table 1).

  The EMP offers an ideal opportunity to incorporate pro-active environmental management measures with the goal of attaining sustainable development.

Pro-active environmental measures minimize the chance of impacts taking place during the construction and operational phase. There is still the chance of accidental impacts taking place; however, through the incorporation of contingency plans (e.g., this EMP) during the planning phase, the necessary corrective action can be taken to further limit potential impacts. In order to meet this goal, action plans for planning and design stages of the project must be identified together with monitoring requirements.

3.1.2 The Construction Phase

The bulk of the impacts during this phase will have immediate effect (e.g., noise-, dust- and water pollution etc.) If the site is monitored on a continual basis during the construction phase, it is possible to identify these impacts as they occur. These impacts will then be mitigated through the contingency plans identified in the planning phase, together with a commitment for sound environmental management from Johannesburg Water and its agents.

3.1.3 Rehabilitation and Reinstatement Phase

This phase will involve restoring the land impacted during the construction phase back to its original state (in the case of slopes, gradients, soil profiles, and hydrology) or better. This process will be mainly on rectifying the negative impacts that have been caused during construction by the removing pollution or contaminants and other dangerous substances from groundwater, sediment, or surface water and improvement of the soil.

3.1.4 The Operational Phase

By taking pro-active measures during the planning and construction phases, potential environmental impacts emanating during the operational phase will be minimised. This, in turn, will minimise the risk and reduce the monitoring effort, but it does not make monitoring obsolete.

4. ROLES AND RESPONSIBILITY

The implementation of this EMPr requires the involvement of several stakeholders, each fulfilling a different but vital role to ensure sound environmental management during the construction and operational phases. The stakeholders are discussed below:

4.1 Johannesburg Water and its Agents shall:

Ensure that the EMP is kept on JW's Sites and construction sites.

- Remain ultimately responsible for ensuring that the development is implemented according to the requirements of the EMP.
- Ensure that the Environmental section attends all project related tender briefing sessions.
- Although Johannesburg Water appoints specific role players to perform functions on its behalf, this responsibility is delegated.
- Be liable for restoring the environment in the event of negligence leading to damage to the environment.
- Ensure that the EMP is included in the tender documentation so that the contractor who is appointed is bound to the conditions of the EMP, and there's sufficient budget for environmental assessments and/or assessment during the planning, design, construction, replacement of vegetation and restoration of habitats, decommissioning (rehabilitation) phases of the project.
- Ensure that the contractor appointed understands, acknowledges and fully accepts the content of this EMP and their responsibilities for implementation and compliance.
- Monitor compliance with the conditions of the environmental authorisation and the EMP and compliance audits are undertaken.
- Ensure that the Environmental section signs all close out reports to confirm rehabilitation.

4.2 Appointments and competencies

- The contractor and its appointed sub-contractor must meet the relevant legislative and non-statutory appointments, which must be maintained valid for the entire contract duration.
- All appointees shall be suitably trained and certified competent for the responsibilities they are assigned for.
- Copies of all relevant appointments and the relevant competence certificates must be kept in the relevant Environmental file.

Table 1: Environmental Officer's Appointment Index

Appointment	Project Type	Legislative Ref	Competency requirements (Min)
Contractor SHE Officer	Unauthorised Project	JW EMP/ JW Waste Management Procedure	National Diploma in Safety & ISO14001:2015 (Introduction/Awareness, implementation, and auditing ISO14001:2015) + 2 years' Experience **OR** National Diploma in Environmental Management + 2 years' Experience OR NEBOSH / SAMTRAC & Basic ISO14001:2015/ Basic Environmental Awareness (Introduction and Implementations to ISO14001:2015) + 4 years' Experience. Register with SACPCMP.
Contractor Environmental Liaison Officer/Environmental Officer	Authorised project	JW EMP and Project Specific approved EMP /Directives/Environmental Authorisation/GA/WUL	National Diploma in Environmental Management/ + 3 years' Experience. BA/BSc Environmental Management + 3 years' experience. The recommended and/or market related minimum Salary/wages for ELO/EO should be **R17 000.00.**

DISCLAIMER

1. Should there be any other Environmental related activities issued as non-compliance during construction, the contractor is liable to comply with those requirements
2. Should the contractor deviate from the conditions and requirements of the EMP and/or Environmental Authorisation (if applicable), the contractor is liable for non-compliances, rectification, and associated fines thereof
3. This EMP does not exempt the Contractor from complying with other relevant legislations related to the construction activities.

Environmental Representative/Environmental Rep	Unauthorised Project	JW EMP	Must hold a Senior Certificate (Matric) and one of the following qualifications. National Diploma in Environmental Management/ BA/BSc Environmental Management or Science/ISO 14001:2015(Introduction; Implementation and Auditing/Certificate in Environmental law/National Certificate in Environmental Management. The recommended and/or market related minimum salary/wages for Environmental Representative should be **R10 000.00.**
Consultant Environmental Control Office	Authorised project (as and when required)	JW EMP and Project Specific approved EMP /Directives/Environmental Authorisation/GA/WUL	Reputable Environmental Consulting Company National Diploma or BA/BSc Environmental Science or Management + 3 years' experience as an independent ECO/Consultant
Landscaping Specialist	Unauthorised and Authorised project	JW EMP and Project Specific approved EMP /Directives/Environmental Authorisation/GA/WUL	Reputable Environmental Consulting firm /Landscaping Company.

			Landscaping Specialist should at least have BA/BSc Honours Degree or 4-year Degree in Natural Sciences/Ecological. - The Landscaping Specialist must at least be registered with South African Council for Natural Scientific Professions (SACNASP) as a Professional Natural Scientist (Copy of SACNASP Certificate must be submitted). - Specialist should at least have a minimum of five (5) years working experience as landscaping Specialist (See Table).

4.3 The Contractor shall:

- Be bound to conform to the EMP conditions through his/her contract with Johannesburg Water, and is responsible for ensuring that he adheres to all the conditions of the EMP.
- Thoroughly familiarise with the EMP requirements before construction begins and must request clarification on any aspect of these documents, should they be unclear.
- Be responsible for mitigation and rehabilitating all environmental damage at his/her expense.
- Ensure adherence to, and implementation of, the environmental management specifications.
- Ensure that environmental damage, whether intentional or unintentional, is prevented in the first instance, mitigated and rehabilitated, and must adopt a proactive approach followed by a reactive approach.
- Ensures identification of, and compliance with, all environmental laws, all by laws and regulations.
- Ensure that any instructions (whether verbal or written) issued by the site manager, project manager, site engineer or EO, in terms of the EMP is adhered to.
- Ensure that an environmental compliance report is tabled at each site meeting, which must document all incidents, complaints, and non-compliances, and their close out progress, which has occurred during the period before the site meeting.
- Provide a photographic report to JW upon request showing close out of identified issues.
- Provide any project or compliance information that may be requested by JW in any format as requested.
- Ensure that proposed site camp areas are approved by JW environmental section prior to establishment.
- Ensure compliance with the EMP conditions even if there will be no site camps or the project is an emergency or subject to Directives.
- Take comprehensive site photographs for before, during and after construction.
- Ensure that each individual resident/landowner/stakeholder requirement is documented, pertaining to the area to be disturbed, special features, vegetation to be disturbed, rehabilitation requirements (contractors must state to residents/stakeholders that indigenous vegetation species will be put

back, however, should residents/stakeholder require non-indigenous species to be replaced, these are to be documented before being affected) prior to any disturbance.

- Provide a detailed, site-specific method statement for rehabilitation, which must be approved by JW Engineer and EO.
- Ensure that a report is tabled at each site meeting, which will document all incidents that have occurred during the period before the site meeting.
- Ensure that incidents register is kept in the site office.
- Ensure that a register of all public complaints is maintained.
- Ensure that all employees, including those of sub-contractors receive Environmental Induction before the commencement of construction in order that they can constructively contribute towards the successful implementation of the EMP (i.e., ensure their staff are appropriately trained as to the environmental obligations).
- Ensure that all disturbed areas are rehabilitated and at least 85% healthy grass/ground cover has established, that rehabilitation is maintained, the sites are free of erosion, waste and pollution of any kind including rubble and spills, and free of weeds and alien invasive species.
- Appoint an Environmental Liaison Officer (ELO) prior Construction for Environmental Authorised Projects.
- Appoint SHE Officer prior Construction for unauthorized projects i.e., the SHE Officer with Environmental Management experience or be trained on Environmental legislation.
- Provide accurate and factual information pertaining to the projects, communications, and discussions at all times.
- Is responsible for NEMA Duty of Care, and Polluter pays principle.

4.4 Environmental Liaison Officer (ELO)/ SHE Officer shall:

- Ensure that the project team is involved in all aspects of project planning that can influence environmental conditions on the site.
- Be permanently on site during the construction phase to oversee the Contractor's internal compliance with the EMP requirements and ensuring that the environmental specifications are adhered to.

- Assist with day-to-day monitoring of the construction activities. Ensure that any issues raised by the EO will be routed to the SHE Officer for the contractors' attention.
- The ELO/ SHE Officer shall be permanently on site during the construction phase to oversee the Contractor's internal compliance with the EMP requirements and ensuring that the environmental specifications are adhered to.
- Be responsible for keeping detailed records of all site activities that may pertain to the environment and include all these aspects in an environmental register.
- Maintain site documentation and records related to environmental management (EMP, authorisations, permits, way-eaves, method statements, audit reports, monitoring results, receipts for waste removal, environmental file, etc.)
- The ELO/SHE Officer must keep a register of complaints from any community members on environmental issues.
- The ELO /SHE Officer will be required to keep a record of all on-site environmentally related incidents and how these incidents were dealt with.
- Ensure daily implementation of the EMP conditions, and monitoring of the contractor's compliance with EMP conditions, using checklists and visual inspections.
- Provide location details for possible site camp locations to JW environmental section and await approval from this section before establishing.
- Inform JW environmental section when actual work is about to commence.
- Inform JW environmental section of pending completion activities and intention to de-establish, prior.
- Ensure proper rehabilitation is undertaken before site closure.

4.5 Resident Engineer (RE)/ Site Agent shall:

- Liaise with the Contractor and Environmental Officer (EO) on environmental matters, as well as any pertinent engineering matters where these may have environmental consequences.
- Oversee the general compliance of the Contractor with the EMP and other pertinent site specifications.

- Familiarise him/herself with the EMP specifications and further monitor the Contractor's compliance with the Environmental Specifications daily through the Site Diary and enforce compliance.
- Ensure that Monthly Audits reach the contractor before Monthly Progress Meeting.
- Ensure proper rehabilitation is undertaken before site closure.

4.6 Project Engineer /Inspectors (PE/PI) shall:

- Ensure that there is a sufficient budget for complying with all EMP conditions at the tender stage.
- Ensure sufficient budget is provided for rehabilitation/ Reinstatement.
- Ensure proper rehabilitation is undertaken before site closure.
- Ensure of all specifications and legal constraints specifically with regards to the environment are highlighted to the Contractor(s) so that they are aware of these.
- Ensure that Contractor(s) are made aware of all stipulations within the EMP.
- Ensure that the EMP is correctly implemented throughout the project by means of site inspections and meetings. This will be documented as part of the site meeting minutes.
- Be fully conversant with the EIA for the project, the EMP, the conditions of the Environmental Authorisation (if applicable), and all relevant environmental legislation.
- Ensure compliance monitoring of contractors on a day-to-day basis.
- Ensure adherence and implementation of the tender requirements.
- Ensure reference of specific non-compliance/non-conformance issues to the responsible units and/or contractors.

4.7 Environmental Officers shall:

- Be responsible for informing the contractors of any decisions that are taken concerning environmental management during the project phase.
- This would also include informing the contractors of the necessary corrective actions to be taken, issuing stop work orders and rehabilitation and remediation instructions if necessary.
- Liaise with environmental authorities where necessary.
- Review all the environmental documents submitted by the Contractor, including sign off.

- Review all the environmental documents from the Contractor, including sign off.
- Conduct environmental monthly audits of all contractors' work on site where necessary
- Maintain site documentation of related to environmental management (EMP, Method statements, audit reports, monitoring results, receipts of waste removal etc.). Documents to be maintained on the relevant site Documents Control Systems.
- Inspect and report on environmental incidents and check corrective actions.
- Conduct environmental incidents enquiries.
- Review and sign off method statements prepared by Contractors.
- Ensure that an environmental compliance monitoring strategy/framework is implemented.

4.8 Environmental Control Officer (ECO)

The role of the ECO shall be to:

- Act as site 'custodian' for the implementation, integration, and maintenance of the EMPr in accordance with the contractual requirements.
- Ensure successful implementation of the EMPr; and
- Ensure that the Contractor, his employees and/or Subcontractors receive the appropriate environmental awareness training prior to commencing activities.

The responsibilities of the ECO will be to:

- Liaise with the JW Environmental Section and Project Engineer on the level of compliance with the EMPr achieved by the Contractor on a regular basis for the duration of the contract.
- Advise the Project Engineer on the interpretation and enforcement of the Environmental Specifications (ES), including evaluation of non-compliances.
- Enforce compliance with the EA and EMP through audit report and checklist
- Supply environmental information as and when required.
- Review and approve Method Statements produced by the Contractor, in conjunction with the PM and EO.
- Monitor any basic physical changes to the environment because of the construction works according to an audit schedule.

- Attend regular site meetings and project steering committee meetings.
- Undertake regular monthly audits of the construction works and to generate monthly audit reports. These reports are to be forwarded to the JW EO who will communicate the results and conclusions with the principal Contractor.
- Submit audit reports to the authority as per the requirement of issued Environmental Authorisation.
- Communicate frequently and openly with the Contractor and the Project Engineer to ensure effective, proactive environmental management, with the overall objective of preventing or reducing negative environmental impacts and/or enhancing positive environmental impacts.
- Advise the Project Engineer on remedial actions for the protection of the environment in the event of any accidents or emergencies during construction, and to advise on appropriate clean-up activities.
- Review complaints received and made instructions as necessary; and
- Identify and make recommendations for minor amendments to the EMPr as and when required.

4.9 Environmental Representative (Environmental Rep) shall:

- Review the effectiveness of environmental measures in the workspace/construction environment for which he/she was appointed.
- Identify potential impacts in the workplace.
- Investigate environmental incidents and identify root causes.
- Investigate Environmental Complaints.
- Conduct Awareness training.
- Participate in Environmental inspections.
- Ensure compliance with JW EMP and other environmental management related legislations.
- Ensure Proper Rehabilitation is conducted.
- Attend site SHE meetings where Environmental issues are addressed.
- Guide Construction crew/team on environmental requirements as per JW EMP.
- Assist in day-to-day monitoring of construction activities.

- Assist in implementation of ISO 14001:2015 standard.
- Assist the SHE Officer/EO with preparation of audits /inspections.

5. CONTENTS FOR CONTRACTOR'S ENVIRONMENTAL FILE

The following documents must be submitted by the contractor in the Environmental file before Construction commences on site. The file must be submitted to the Environmental Section prior construction for approval. The Contractor should achieve a minimum score of 80% for the file to be approved (**Refer to Annexure B: Environmental File Specification).**

6. ENVIRONMENTAL SPECIFICATIONS

Table 2: Environmental Management and Mitigation Measures that must be implemented during the Design Phase and Construction Phase

Design Phase Measures						
Aspects	**ID**	**Mitigation Measure/Procedure**	**Responsible**	**Implementation Timeframe**	**Monitoring Methods**	**Performance indicators**
Project Planning/Design	**1**	• Proposed project is submitted to Environmental Section for screening (Project scope/layout/Maps), • CAPEX and Ops must ensure that there is budget allocated for environmental management throughout the project life cycle i.e., planned project and Directives.	Johannesburg Water (CAPEX/Ops)	Before project commences	• Screening report • Tender document	Keep the records of the project screening report and scope of work as per Directives
Authorisation	**2**	• Appoint Consulting Company • Ensure that all required licences and permits have been obtained before the start of construction. • Ensure that ECO and/or ELO is appointed as per the authorisation and EMP requirement during project execution (as when and required).	Johannesburg Water (CAPEX/ Environmental Section)	Before construction commences	Keep record of all permits, licences and authorisations	Keep record of all permits, licences and authorisations
Project Handover	**3**	• The scope of a project is outlined by CAPEX Engineer during the handover meeting. • Environmental Management Requirements are outlined during the handover meeting.	Johannesburg Water (CAPEX/ Environmental Section)	Before construction commences	Meeting invite EA/GA/WUL/ Screening report	Keep record of all permits, licences and authorisations
Environmental Awareness Training/Inductions	**4**	• Environmental awareness training is given to the Project Team Leaders • Environmental File Specification provided to the Contractor.	Johannesburg Water (CAPEX/ Environmental Section)	Before construction commences	Meeting invite	Meeting records

		• JW Environmental Management Plan and other procedures are provided to the Contractor.				
Environmental File & Evaluation	**5**	• Contractor submits environmental file for approval prior work commences on site. • Construction activities/work (including site establishment) should ONLY commence when file is approved.	Appointed Contractor/Environmental Section	Before construction commences	Environmental evaluation report.	Approval/ rejection letter records
Construction Phase Measures						
Aspects	**ID**	**Mitigation Measure/Procedure**	**Responsible**	**Implementation Timeframe**	**Monitoring Methods**	**Performance indicators**
Site camp establishment	**1**	• Invite the Environmental Officer for the site inspection of proposed site camp prior establishment. • Submit a method statement for Site Camp establishment for approval by JW Environmental Officer/ECO prior commencement of works. • Establish a suitably fenced Site Camp at the start of the contract, which will allow for site offices, vehicle, equipment, material, and waste storage areas to be consolidated as much as possible. Locate the Site Camp at a position approved by the JW EO, at least 100m from watercourses and in an area which is not ecologically sensitive. • Provide water and/or washing facilities at the Site Camp for personnel. • Lim it construction and lay down areas to areas within the development footprint. • Ensure that environmentally friendly on-site sanitation options are selected, and these facilities are properly managed and maintained. • Designated eating areas shall be provided on site. • These eating areas shall be clearly demarcated and shall be provided with bins with lids.	All Contractors	Before commencement of Project	• Visual inspection • Site establishment checklist/Method statement	Method statements approved by CAPEX and the Environmental Officer • Position of Site Camp approved by ECO • Security and access to Site Camp controlled • Clear demarcation of no-go areas as agreed with JW EO. • Detailed site layout plan

		• Staff will be prohibited from consuming meals anywhere other than at these eating areas and that noise is limited. • All eating areas shall include provision for a water and smoking area.				• Environmental file approval letter.
Environmental Awareness Training	**2**	• Provide environmental awareness training to all personnel on site at the start of their employment. Training should include discussion of: • Potential impact of construction waste and activities on the environment. • Suitable disposal of construction waste and litter. • Key measures in the EMPr relevant to worker's activities. • How incidences and suggestions for improvement can be reported. • Ensure that all attendees remain for the duration of the training and on completion sign an attendance register that clearly indicates participants' names.	All Contractors	• Before workers start working onsite • Before new activities are undertaken	• Check training attendance register • Observe whether activities are executed in line with EMPr requirements	• Proportion of workers that completed. • Environmental training Compliance of workers with EMP
Plant Search and Rescue/Vegetation clearing	**3**	• From information gathered during the plant marking exercise, establish the size. • Requirements for the plant rescue team workforce, and the methodology to be employed during the rescue to maximise the likelihood of success; Document and motivate which species found on site are considered to be conservation worthy. • Follow a multi-pronged approach to maximise the likelihood of success wherever feasible. In addition to transplanting of whole plants, seed can be collected and sown in situ in suitable habitats and/or in an off-site nursery. • Any plants not suitable for transplantation must be considered for transplanting to existing conservation	All Contractors	Before commencement of activities	Visual Inspection/ inspection by Botanist/Ecologist	• Incidents of harm coming to fauna/ flora. • Number of incidents of disturbance of vegetation outside construction site boundary; and

		areas nearby. This could involve growing these plants on in an off-site nursery for a period of time. • Depending on the conservation worthy species found, the location of suitable existing conservation areas nearby and the location of the off-site nursery, the most appropriate plant rescue options must be detailed in the search and rescue plan, and could be a combination of the following options: • All required permits must be obtained from the appropriate authority covering plants to be affected by the plant rescue operation prior to the removal of the plants. • Demarcate the area for construction prior to each phase and prevent access by construction personnel outside of this area. • Appoint a suitably qualified botanist to undertake search and rescue of key plant species in the development footprint where necessary (Where is applicable. Clearly demarcate sensitive areas, including buffers, with appropriate signage. • Do not allow personnel to enter calcrete vegetation areas. • Do not allow personnel to pick or destroy plants outside of the construction footprint. • Limit clearing to those areas within the footprint of construction for each phase. • Restrict construction vehicles to designated roadways. • Do not allow the temporary storage of building material within sensitive areas. **Aftercare and monitoring**				• Size of area cleared relative to development footprint • Size of area disturbed outside of construction site boundary. • Areas of development footprint must be clearly demarcated

		• Record numbers and diversity of propagated plants and the health of the same, until they can be planted out. • Aftercare of transplanted plants to be done in accordance with the plant search and rescue plan by an appropriate agent (e.g., staff from the commercial nursery or an appropriately trained onsite Contractor), including watering and alien plant control requirements. If done correctly, the frequency of input will decrease with time. • Record numbers and diversity of transplanted plants and the health of the same. • Monitoring must be undertaken as per requirements of the plant search and rescue plan approved by GDARD, including monitoring of alien plants and maintenance of a photographic record; and • Provide a detailed record (including photographic record) that indicates the success of the plant rescue operation. Records of corrective action taken to improve management of transplanted plants, where relevant, must also be completed. **Applicable Legislation** • National Environmental Management Act: Biodiversity Act (Act 10 of 2004) including Threatened or Protected Species Regulations. • National Environmental Management Act (Act 107 of 1998). • Gauteng Nature Conservation Bill, 2014/Transvaal Nature Conservation Ordinance 12 of 1983; and • National Forests Act (Act 30 of 1998).				

Excavation	**4**	• The process of excavation and back filling must be carried out as a sequential process following one another as quickly as possible. • Excavations must only remain open for a minimum period of time and during this time they must be clearly demarcated. If excavations place the public at risk these sites must be fenced. • Where possible, close excavations immediately after pipe is laid. • The residents directly affected by open trenches must be notified of the dangers. This will be done during the site-specific phase. • Danger tape shall not be utilised to prevent personnel from open excavations, orange nets should be used for all open excavations on site. Construction vehicles should avoid creating new roads, use existing roads. • Wet exposed surfaces using a water cart, bowser or use a biodegradable and environmentally friendly soil binder to prevent dust emissions. • Dewater excavations regularly and channel water to areas of grass cover. If dewatering is near/within a watercourse and is to be discharged to a watercourse, ensure a silt fence/net and sandbags are used to reduce silt loads. • Topsoil must be cleared (considered to be the upper 150mm of soil surface) and retained as it contains most inorganic matter and nutrients. Topsoil must be kept separate from subsoil and stored in windrows parallel to excavations. • Harvested grass should be retained and used as a mulch to combat erosion.	All Contractors	Throughout construction	Visual inspection	• Daily site inspection. • Damage to the environment (sensitive environment)

		• Soil should be exposed for the minimum time possible once cleared of indigenous or invasive vegetation. • Avoid prolonged exposure of soils to wind and water erosion when clearing and grubbing. • The stockpiled topsoil (which will be left standing for more than 1 month) must be covered with suitable fabric, and / seeded, to prevent erosion and weed invasion. • Stockpiled topsoil must be covered with suitable fabric to prevent erosion and weed invasion. • No vehicles are allowed to access onto the stockpiles after they have been placed. • Topsoil and subsoil must be kept separate throughout construction and rehabilitation. • A marsh wire or snow netting shall be erected around the exposed excavations to warn the public. • The contractor must rip and rehabilitate temporal roads after project completion. • The Contractor shall be in possession of an emergency oil and chemical spill kit, drip trays and bioremediation substances/enzymes that must be always complete and available on site.				
Topsoil and subsoil	**5**	• The contractor should remove 150mm of topsoil and stockpile at a height of not more than 1m. • Topsoil should be temporarily stockpiled, separately from (clay) subsoil and rocky material, when areas are cleared. If mixed with clay sub-soil the usefulness of the topsoil for rehabilitation of the site will be lost. • Stockpiled topsoil should not be compacted and should be replaced as the final soil layer. No	All Contractors	During Vegetation clearance	Visual inspection	• Incident of incorrect storage and harvesting. • Manifestation of alien invasive plants. • Incident of erosions.

		vehicles are allowed access onto the stockpiles after they have been placed. • Stockpiled soil should be protected by erosion-control berms if exposed for a period of greater than 14 days during the wet season and seeded. • Topsoil must be hydro seeded during shut down in December. • Topsoil stripped from different sites must be stockpiled separately and clearly identified as such. • Topsoil obtained from sites with different soil types must not be mixed. • Topsoil stockpiles must not be contaminated with oil, diesel, petrol, waste or any other foreign matter, which may inhibit the later growth of vegetation and micro-organisms in the soil. • Soil must not be stockpiled on drainage lines or near watercourses without prior consent from the Project Manager. • Soil should be exposed for the minimum time possible once cleared of invasive vegetation, that is the timing of clearing and grubbing should be co-ordinated as much as possible to avoid prolonged exposure of soils to wind and water erosion. • Stockpiled topsoil must be either vegetated with indigenous grasses or covered with a suitable fabric to prevent erosion and invasion by weeds. • Limited vehicular access is allowed across rocky outcrops and ridges. • All cut and fill surfaces need to be stabilized with appropriate material or measures when major civil works are complete. • Erosion and donga crossings must be dealt with as river crossings. Appropriate soil erosion and control				

		procedures must be applied to all embankments that are disturbed and destabilized as per the Authorisation • All equipment must be inspected regularly for oil or fuel leaks before it is operated. Leakages must be repaired on mobile equipment or containment trays placed underneath immobile equipment until such leakage has been repaired. • Soil contaminated with oil must be appropriately treated and disposed of at a permitted landfill site or the soil can be regenerated using bio-remediation methods. • Runoff must be reduced by channelling water into existing surface drainage system.				
Protection of archaeological and heritage resources	**6**	• Alert the construction workforce of the potential existence of artefacts at the site. • Empower staff to stop works on (chance) discovery of artefacts at the site. • Cease construction on (chance) discovery of archaeological sites of heritage importance or redirect machinery away from finds until an archaeologist is able to make a site inspection and establish the importance of the find and make recommendations for preservation and/or record keeping. • Report the presence of graves or human remains, fragments of fossil bone, ostrich egg and stone fragments to HWC. • Obtain a permit for the removal of artefacts from the site if any are discovered during construction.	All Contractors/Johannesburg Water	• Before Construction commences • During earthworks	Visual inspection	• Discovery of possible archaeological material • Rescue and reporting of identified material when discovered
Protection of paleontological resources	**7**	• Identify a stand-by palaeontologist to inspect fossils if they are discovered during construction activities.	Johannesburg Water	Prior commencement	Visual inspection	• Discovery of possible

		• Empower staff to stop works on (chance) discovery of fossils at the site. • Alert the construction workforce of the potential existence of fossils at the site. • Cease construction on (chance) discovery of fossils and artefacts of paleontological importance or direct machinery away from finds until the identified palaeontologist can make a site inspection and establish the importance of the find and make recommendations for preservation, collection or record keeping.	All Contractors	During earthworks		archaeological material. • Rescue and reporting of identified material when discovered.
Concrete / cement Work/Batching plant	**8**	• Use Ready-Mix concrete rather than batching where possible. • Ensure that no cement truck delivery chutes are cleaned on site. Cleaning operations are to take place off site at a location where wastewater can be disposed of in the correct manner. If this is not possible a suitable washing facility is to be developed on site in consultation with the ECO. • Concrete must be mixed only in an area demarcated for this purpose, ideally on an impervious surface (e.g., cement mixing pit). • Batching operations to take place in a designated area, which will be kept clean at all times. • All concrete spilled outside this area, must be promptly removed by the Contractor and taken to a permitted waste disposal site. • After all concrete mixing is complete; all waste concrete must be removed from the batching area and disposed of at an approved dumpsite. • Ensure separation of clean and dirty water from batching plant.	All Contractors	Throughout construction	Visual inspection and JW EO/ECO approval.	• Number of incidents of batching outside works footprint. • Contamination of water and soil; and • Visible litter / waste on site.

		• Storm water must not be allowed to flow through the batching area. Water laden with cement must be collected in a retention area for evaporation and not allowed to escape the batching area. • Operators must wear suitable safety clothing. • Wastewater from batching operations to be suitably disposed of. • Waste concrete and cement sludge to be removed on a regular basis (to prevent overflowing) and to be disposed of at a suitable facility. • Unused cement bags will be stored in an area not exposed to the weather and packed neatly to prevent hardening or leakage of cement. • Used cement bags will be stored to prevent windblown dust and potential water contamination. Used bags will be disposed of adequately at a licenced waste disposal facility. • Limit concrete batching to single sites where possible. • Concrete transportation will not result in spillage. • Cleaning of equipment and flushing of mixers will not result in pollution, with all contaminated wash water entering the wastewater collection system. • To prevent spillage onto roads, ready mix trucks will rinse off the delivery shoot into a suitable sump prior to leaving the site. The Contractor shall ensure such designated concrete wash bay area's/ sumps are created and that all concrete trucks delivering concrete to site first empty and clean their shoots at this point before leaving the site. The dried waste product shall be handled as construction rubble.				

		• Suitable screening and containment will be in place to prevent windblown contamination from cement storage, mixing, loading and batching operations. • All contaminated water and fines from exposed aggregate finishes will be collected and stored in sumps and will be adequately disposed of. • All visible remains of excess concrete will be physically removed on completion of the plastering or concrete pouring and disposed of in an acceptable manner. • Any spilled concrete to be cleaned up immediately. • In practice all wastes arising from construction activities are to be handled; transported and disposed of in accordance with the relevant regulations. All efforts should be made to minimise, reclaim or recycle waste, and failing that, dispose of it in a manner licensed by the government for that purpose.				
Water Management	**9**	• Con serve water wherever possible (e.g., ensure that areas are not watered excessively, and all leaking pipes are replaced and repaired immediately). • Adequate erosion, runoff and sedimentation prevention, control and mitigation measures must be instituted at all sensitive areas, such as embankments, slopes, river crossings/watercourses/drainage lines, wetlands, when excavations or disturbance occurs within these areas, within the buffers, beds, and banks. • These control measures must include use of silt fences/traps, sandbags, retention of vegetation, berms, immediate replacement of vegetation. Additionally, reno mattresses, riprap, stone pitching,	All Contractors	Throughout construction/post construction	Visual inspection	• Incidence of storm water contamination. • Visible leaks/ water wastage. • And Visible surface erosion.

		gabions, use of geotextiles) e.g., biojute must be used at the direction of the JW Engineer. • Adequate sedimentation control measures must be instituted at any river crossings when excavations or disturbance of a riverbanks or riverbeds takes place. • Adequate sedimentation control measures must be implemented where excavations or disturbance of drainage lines of a wetland may take place. • All fuel, chemical, oil, etc. spills must be confined to areas where the drainage of water can be controlled. Use appropriate structures and methods to confine spillages such as the construction of berms and pans, or through the application of surface treatments that neutralise the toxic effects prior to the entry into a water course. • The drip trays and spill kits must be used to contain oil from spilling into the water. Ensure adequate drip trays are available. • During construction through a wetland or watercourse, most of the flow of the wetland should be allowed to pass downstream. • Vehicular traffic across wetland and watercourse areas must be avoided. • No dumping of foreign material in streams, rivers and/or wetland areas is allowed. • The wetland area and/or river must not be drained, filled or altered in any way including alteration of a bed and/or, banks, without prior consent from the DWS. The necessary licenses must be obtained in terms of Section 21 and 22 of the National Water Act, 36 of 1998 from DWS. • No fires or open flames are allowed in the vicinity of the wetland, especially during the dry season.				

		• No swimming, washing (including vehicles and equipment), fishing or related activity is permitted in a wetland or river. • Disturbances to nesting, breeding and roaming sites of animals in or adjacent to wetland areas must be minimized. • Portable Water shall be the last resort info dust suppression on site.				
Air Pollution	**10**	• Speed limits must be implemented in all areas, including public roads and private property to limit the levels of dust pollution. • Dust must be suppressed on access roads and construction sites during dry periods by the regular application of water or a biodegradable soil stabilisation agent. Water used for this purpose must be used in quantities that must not result in the generation of run-off. • Where possible the use of potable water should be minimised for dust suppression purposes, preferably recycled or reused water. • The site-specific investigation will quantify the impact of dust on nearby wetlands, rivers and dams in terms of sedimentation. Mitigation measures identified during the site-specific study must be implemented. • The Contractor must notify the principal of all schools within 50m of the site of proposed activities. The principal must in turn ensure that children with allergies and respiratory ailments take the necessary precautionary measures during the construction period. The Contractor must ensure that construction activities do not disturb school	All Contractors	Throughout construction	Visual inspection	• Visible air pollution.

		activities e.g., dust clouds may reduce visibility affecting sports activities. • Waste must be disposed of, as soon as possible at a municipal transfer station, skip or on a permitted landfill site. Waste must not be allowed to stand on site to decay, resulting in malodours. • Noise control measures must be implemented. All noise levels must be controlled at the source. All employees must be given the necessary ear protection gear. IAP's must be informed of the excessive noise factors. • The Contractor must inform all adjacent landowners of any after-hour construction activities and any other activity that could cause a nuisance e.g., the application of chemicals to the work surface. Normal working hours must be clearly indicated to adjacent landowners. • No loud music is allowed on site and in construction camps. • No fires are allowed if smoke from such fires will cause a nuisance to IAPs.				
Social and cultural	**11**	• Access by non-construction people onto any construction sites must be restricted. The Contractors activities and movement of staff must be restricted to designated construction areas only. • The Contractors crew must be easily identifiable due to clothing, identification cards or other methods. • Rapid migration of job seekers could lead to squatting and social conflict with resident communities and increase in social pathologies if not properly addressed. The Contractor must ensure that signs indicating the availability of jobs are installed.	All Contractors	Throughout construction	Visual inspection	• Community complaints. • Complaints register. • Daily environmental inspection

		• Criteria for selection and appointment (by the Contractor) of construction labour must be established to allow for preferential employment of local communities. The Local Authority must be actively involved in the process of appointing temporary labourers. • Sub-Contractors and their employees must comply with all the requirements of this document and supporting documents e.g., the Contract document that applies to the Contractor. Absence of specific reference to the sub-contractor in any specification does not imply that the sub-contractor is not bound by this document. • No member of the construction workforce is allowed to wander around private property, except within the immediate surroundings of the site. • The Contractor must provide suitable sanitation facilities for site staff. Sanitation provided during the construction phase should be managed so that it does not cause environmental health problems. The use of the surrounding veld for toilet purposes is not permitted under any circumstance. • The Contractor must arrange for all his employees and those of his sub-contractors to be informed of the findings of the environmental report before the commencement of construction to ensure: • A basic understanding of the key environmental features of the work site and environments, and • Familiarity with the requirements of this document and the site-specific report. • Supervisory staff of the Contractor or his sub-contractors must not direct any person to undertake any activities which would place such person in				

		contravention of the specifications of this document endanger his/her life or cause him/her to damage the environment. • The demand for construction materials and supplies will have an effect on the local economy. This impact can be optimised by sourcing and purchasing materials locally and regionally wherever possible, insofar as the material complies with the design specification. • The Contractor must maintain a detailed complaints register. This must be forwarded, together with solutions, to the authorities when requested.				
Aesthetics	**12**	• Scenic Quality • Damage to the natural environment must be minimized. • The contractor may not remove any trees. If trees are in the way of the pipe route or with the development sites, the contractor must inform the environmental section who will then liaise with city parks for permission or recommendation. • Trees and tall woody shrubs must be protected from damage to provide a natural visual shield. Excavated material must not be placed on such plants and movement across them must not be allowed, as far as practical. • The clearing of all sites must be kept to a minimum and surrounding vegetation must, as far as possible, be left intact as a natural shield. • No painting or marking of natural features must be allowed. • Above-ground Structures (reservoirs, water hammer tanks, valve chambers, pump stations etc.)	All Contractors	Throughout construction	• Visual inspection. • Wayleaves	• Daily inspection • Environmental incident.

		• All above ground structures should be located in areas where the visual impact from roads, houses etc. is minimised. • All above ground structures could be treated or painted to blend in with the natural environment. • Cut and fill areas, river and stream crossings and other soil stabilisation works must be constructed to blend in with the natural environment. • Natural outcrops, rocky ridges and other natural linear features must not be bisected. Vegetation on such features must, as far as possible, not be cut unless necessary for construction. • Excavated material must be flattened (not compacted) or removed from site. No heaps of spoil material must be left on site once the Contractor has moved to a new construction site. • Any complaints from IAP's regarding the appearance of the construction site must be recorded and addressed promptly by the Contractor.				
Fauna and Flora	**13**	**Flora** • All suitable and rare flora and seeds must be rescued and removed from the site. They must be suitably stored, for future use in rehabilitation. • The felling and/or cutting of trees and clearing of bush must be minimised. • Bush must only be cleared to provide essential access for construction purposes. • The spread of alien vegetation must be minimized. • Any incident of unauthorised removal of plant material, as well as accidental damage to priority plants, must be documented by the Contractor. • Woody vegetative matter stripped during construction must either be spread randomly	All Contractors	Throughout construction	• Visual inspection • Wayleave from City Parks. • Biodiversity permit from Gauteng Department of Rural and Development	• Environmental incident register • Daily inspection • Number of environmental incidents. • Fauna and flora removal and relocation register

		throughout the surrounding veld to provide biomass for other micro-organisms and habitats for small mammals and birds, or it may be stockpiled for later redistribution over the reinstated top soiled surface. No vegetative matter must be burnt or removed for firewood other than those removed during the grubbing and clearing phase. Such vegetation can be made available to the local inhabitants to be used as firewood. • No tree outside the footprint of the Works area must be damaged. **Fauna** • No species of animal may be poached, snared, hunted, captured, or wilfully damaged or destroyed. • Snakes and other reptiles that may be encountered on the construction site must not be killed unless the animal endangers the life of an employee. • Anthills and/or termite nests that occur must not be disturbed unless it is unavoidable for construction purposes. • Disturbances to nesting sites of birds must be minimized. • The Contractor must ensure that the work site is kept clean and free from rubbish, which could attract pests.				
Infrastructure	**14**	• The relevant authorities must be notified of any interruptions of services, especially the Local Municipality, National Road Agency, Transnet, TELKOM, and ESKOM. In addition, care must be taken to avoid damaging major and minor pipelines and other services. • The integrity of property fences must be maintained.	All Contractors	Throughout construction	• Visual inspection • Wayleaves from different entities.	• Incident register. • Permit/ Way-leave register • Complaints register.

		• No telephone lines must be dropped during the construction operations, except where prior agreement by relevant parties is obtained. All crossings must be protected, raised, or relocated as necessary. • All complaints and/or problems related to impacts on man-made facilities and activities must be promptly addressed by the Contractor and documented. • Proper storage facilities should be provided for the storage of oils, grease, fuels, chemicals, and hazardous materials. • The Contractor must ensure that accidental spillage does not pollute soil and water resources. • Fuel stock reconciliation must be done on all underground tanks to ensure no loss of oil, which could pollute groundwater resources. • Cement must be stored and mixed on an impermeable surface. • The Contractor shall ensure that existing services (e.g., roads, pipelines, and power lines and telephone services) are not damaged or disrupted unless required by the contract and with the permission of the RE. • The Contractor shall be responsible for the repair and reinstatement of any existing infrastructure that is damaged or services which are interrupted. • A time limit for the repairs may be stipulated by the RE in consultation with the Contractor.				
Blasting	**15**	• Blasting must not endanger public or private property. • Noise mufflers and/or soft explosives must be used to minimize the impact on animals.	All Contractors	Throughout construction	Visual inspection/ Engineer report	• Incident register. • Complaints register.

		• All the provisions of the Explosives Act, 26 of 1956 and the Minerals Act, 50 of 1991 must be complied with. • The Contractor must take measures to limit fly rock. • Certificate of competence. In file • Blasting permit must be obtained from the South African police station issued in terms of section 9 of explosive Act, Act 26 of 1956) prior blasting. • Method statement for drilling and blasting (NB: Submitted for acceptance before any works) in file • Provide the MSDS's for the chemicals are to be used. • Proof of notification to the affected community. • The Appropriate PPE.				• Permit register.
Workshops, storage areas and materials handling	**16**	• These areas shall be chosen to cause the least impact on the biophysical and social elements of the area. • The siting of workshops, maintenance and refuelling sites and materials storage areas shall not be in the vicinity of sensitive sites e.g., wetlands, cultivated fields or drainage lines, or where local landowners can be disturbed. • Storm water shall be diverted around the storage area. Storm water falling on the storage area shall be discharged if it meets the required water quality standards. • Proper storage facilities, placed on an impermeable surface, shall be provided for the storage of oils, grease, fuels, chemicals, and other hazardous materials to be used during the construction phase of the project. If fuel is required on site, it shall be stored in a secure area in a steel tank supplied and	All Contractors	Throughout Construction	• Visual inspection • Method statement for handling hazardous substances. • MSDS	• Hazardous substances register. • MSDS file • Spill register • Incident register.

		maintained by the fuel suppliers. Leakage of fuel shall be avoided. • An adequate bund wall, 110% of volume, shall be provided for fuel and diesel areas to accommodate any spillage or overflow from these substances. The area inside the bund wall shall be lined with an impervious lining to prevent infiltration of the fuel into the soil. • In addition, hazard signs indicating the nature of the stored materials shall be displayed on the storage facility or container and Material Safety Data Sheets (MSDS's) will be made available for all hazardous chemicals. Before containers or storage facilities are erected, emergency procedures in the event of misuse or spillage that may negatively affect an individual or the environment will be in place. • The storage facilities (including any tanks) shall be surrounded by a bund wall, in order to ensure that accidental spillage does not pollute local soil or water resources. • The storage areas shall not be utilised for accommodation purposes and shall be access controlled. • The storage area shall be kept tidy, and the area shall be rehabilitated after use. • An inventory of any hazardous chemicals/substances (including that within equipment) kept on site, along with a description of possible ill effects and treatment of health-related afflictions resulting from accidents, shall be kept in the storage area as well as by the appropriate manager. These areas shall be securely fenced.				

		• Gas welding cylinders and LPG cylinders shall be stored in a secure, well-ventilated area. • A notice board with the contact details of the responsible party shall be displayed at the gate to the storage area. • The contractor shall ensure that any delivery drivers are informed of all procedures and restrictions required to comply with the EMP. Someone with an adequate understanding of the CEMP shall supervise drivers during delivery and off-loading. • All vehicles and machinery will be inspected for any leaks or malfunctions regularly. Vehicle servicing or repairs is prohibited from site, unless in an emergency. • Drip trays shall be inspected and emptied daily and serviced when necessary. Drip trays shall be closely monitored during rain events to ensure that they do not overflow. The contents must be disposed of at a recognised site. • All repairs done on machinery using hydrocarbons as fuels or lubricants shall have a drip tray placed strategically to avoid incidental spillage. • Workers shall be made aware of the health risks associated with any hazardous substances used (e.g., smoking near refuelling depots), and shall be provided with appropriate protective clothing / equipment in case of spillages or accidents. • Cement and other potential environmental pollutants shall be stored and mixed on plastic sheeting or ready-mix trucks shall be used. There shall be no opportunity for environmental contamination.				

		• Workshop areas shall be monitored for oil and fuel spills and such spills shall be cleaned and remediate to the satisfaction of the EO. • The Contractor shall be in possession of an emergency spill kit that must be always complete and available on site.				
Waste Management	**17**	Methods for waste management and waste minimisation shall be implemented from the outset of the contract as per the Waste Management Plan to be submitted to Client. All personnel shall be instructed to dispose of all waste in the proper manner. A waste avoidance and minimisation approach will be encouraged for the duration of the project. The following steps in order will be applied. • Prevention – avoid and minimise waste • Recycle – reuse and recover all general waste • Treat – treatment to reduce toxicity reduce waste quantities • Dispose – waste removal into a registered landfill facility **Solid waste** Waste with the potential for market re-use will be stored in separate containers, this includes, scrap metal, used tyres and paper. This waste will be recycled wherever possible. Solid waste shall be temporarily stored in tip – poof metal drums or waste skips at an approved area on site for collection and disposal. This area shall be away from drainage lines or water courses. • All general waste drums or skips will be appropriately labelled GENERAL WASTE	All Contractors	Throughout Construction	• Visual inspection/Environmental inspection checklist. • Legal Documents: Transport certificate obtained from GDARD for transporting general or hazardous waste. • Transport certificate obtained from City of Johannesburg for transporting general waste within COJ. • Waste manifest/	• Littering • Soil contamination • Water pollution.

		• A refuse control system shall be established for the collection and removal of refuse to the satisfaction of Client and ECO. • No waste shall be burned at the site offices or anywhere else on the site. • All building rubble shall be a) removed from the site and disposed of at an appropriate dumping site, or b) temporarily stored in a clearly demarcated area on site for future use. • All waste shall be disposed at an appropriate waste disposal facility. **Litter** • No littering by construction workers shall be allowed. During the construction period, the facilities shall be maintained in a neat and tidy condition and the site shall be kept free of litter. • Measures shall be taken to reduce the potential for litter and negligent behaviour regarding the disposal of all refuse. • Littering, discarding, or burying of any materials shall not be allowed on site. **Hazardous waste** • Hazardous waste shall be temporarily stored in tip – poof metal drums or waste skips at an approved area on site for collection and disposal. This area shall be away from drainage lines or water courses. • All hazardous waste drums or skips will be appropriately labelled.			waste disposal certificate/ weighbridge slip.	

		• Hazardous waste must not be temporary stored on site for a period exceeding 90 days as per the National Environmental Management Waste Act (Act 59 of 2008) as amended in 2014) (Schedule 19 (2)). **HAZARDOUS WASTE.** • Hazardous waste such as bitumen, tar and oil shall be disposed of at a registered waste disposal facility. Special care shall be taken to avoid spillage of tar products such as tar prime or pre-coating fluid to avoid water-soluble phenols from entering the ground or contaminating water. • All used filter materials shall be stored in a secure bin for disposal off site. Any contaminated soil shall be removed and replaced with clean soil. Soil contaminated by oils and lubricants shall be collected and disposed of at a facility designated by the local authority to accept contaminated materials. • Used oil, lubricants, and cleaning materials from the maintenance of vehicles and machinery shall be collected in a holding tank and returned to the supplier. Water and oil shall be separated in an oil trap. Oils collected in this manner shall be retained in a safe holding tank and removed from site by a specialist oil recycling company for disposal at an approved hazardous waste disposal site. Oil collected by a mobile servicing unit shall be stored in the service unit's sludge tank and discharged into the safe holding tank for collection by the specialist oil recycling company. • Sludge should be managed in accordance with the Sludge Guideline 2010.				

		• Sludge should be kept only at the drying bed and no sludge should be stored at a permeable ground or natural ground. • Hazardous waste shall be disposed of at a registered hazardous waste disposal site, disposal certificates shall be kept in the site file for record. **Medical Waste** • All medical waste will be contained in the special bins provided. All sharp needles must be separated from other medical waste, • All outdated and disused medicines will be disposed of as a hazardous medical waste or returned to the supplier for disposal. (Tablets and syrups will be crushed and/or dissolved before disposal as hazardous waste), • Medical waste used on personnel coming for treatment at the clinic are to be placed on a demarcated container storage room, • The Occupational Health Nurse (OHN) will notify a service provider for removal of the medical waste prior exceeding 90 days. • The service provider to provide Waste Manifest as well as the Safe Disposal Certificate, to the OHN who will maintain the copies of the waste manifest and safe disposal certificate. • The OHN will arrange for an approved hazardous waste disposal company to collect and dispose of this medical waste. The OHN is responsible for and authorised to keep all records in connection herewith (disposal certificates).				

Ablution facilities	**18**	• Provide ablution facilities (i.e., chemical toilets) for all site staff at a ratio of 1 toilet per 15 workers (absolute minimum 1:25). • Secure all temporary/portable toilets to the ground within the Site Camp to the satisfaction of JW EO/ECO to prevent them toppling due to wind or any other cause. • Maintain toilets in a hygienic state (i.e., toilet dispensers to be provided, toilets to be cleaned and serviced regularly (by registered appropriate waste contractor), and toilets to be emptied before long weekends and builders' holidays). • Remove/ appoint an appropriate supplier to remove accumulations of chemicals and treated sewage from the site and dispose of at an approved waste disposal site or sewage plant. • Ensure that no spillages occur when the toilets are cleaned or emptied. Repeated incidents of spillage of chemicals and or waste (i.e., more than one incident), will require toilets to be placed on a solid base with a sump. • Ablution facilities must be located at least 50m from any watercourse. • Ablution facilities shall be provided on site. • The positioning of the ablution facilities shall be done in consultation with Client and shall be placed so that it cannot contaminate the natural streams and rivers. One toilet shall be provided per 10 staff members on site. Toilets shall be positioned within walking distance of wherever employees are employed on the site. Toilets shall be provided with locks and doors shall be secured to prevent the toilets from blowing over.	All Contractors	Throughout construction	• Visual inspection • Records of waste manifest/disposal certificates/ weighbridge slip	• Incidence of staff not using Facilities • Incidence of pollution

		• The toilets shall be placed outside of areas susceptible to flooding. • Chemical toilets shall be serviced regularly by an authorised service provider and removed to a registered wastewater treatment works and disposal certificates shall be obtained from the waste disposal facility for each disposal and retained on site. • Polluted run-off must be discharged in the local sewerage main and not overland or into public streams. In instances where a sewerage main is not available, polluted run-off will be collected in sub-surface tanks and a reputable effluent removal contractor will be contracted to dispose of the waste in an environmentally acceptable manner. Official documentation shall be obtained from the waste disposal facility for each disposal and retained on site. • Toilets situated close to the site boundaries or within sight of residential areas shall be hidden behind screens or other cover as approved by the Engineer. • Discharge of waste from toilets into the environment and burial of waste is strictly prohibited. • Only flushable toilets should be utilised on site. • If the Ablution facilities are to be connected to the Municipal sewer line, method statement and a letter for municipal tax and rates should be submitted to JW Environmental section and responsible Depot for approval. • A letter or agreement for disposing waste must be obtained from the applicable WWTW; this must be provided by service provider. Waste manifests, disposal certificates and service certificates are				

		required; these must be provided by service provider. • The contractor shall not appoint service providers who do not have registration certificates with GDARD and CoJ for transporting hazardous (and general waste), and copies of permits for landfills, and agreement letter from WWTW, to be used for disposals. The contractors themselves are encouraged to register as general and hazardous waste transporters, and open accounts with Pikitup, so disposal slips may be obtained.				
Access road and traffic control	**19**	**Access Roads** • The Contractor and the affected landowner must collaborate on the planning and construction of new access routes and the repair or upgrading of existing routes. • Access to the site must be controlled such that only vehicles and persons directly associated with the work gains access to the site. • Temporary access roads must not be opened until required and must be restored to its former state as soon as the road is no longer needed**.** **Traffic Control** • All reasonable precautions must be taken during construction to avoid severely interrupting the traffic flow on existing roads, especially during peak periods. • Before any work can start the Local Traffic, Department must be consulted about measures to be taken regarding pedestrian and vehicular traffic control and obtain proper road signage's	All Contractors	Throughout construction	• Method statement for access road and traffic control. • Wayleave	• Daily Inspection checklist. • Environmental incident. • Incident register.

Electrical	**20**	• Measures must be taken during thunderstorms to protect workers and equipment from lightning strikes. • All tall structures must be properly earthed and protected against lightning strikes.	All Contractors	Throughout construction	• Permit • OHS approval letter • Wayleave	• Approval letter • Electrical certificate
Development Footprint	**21**	• The development footprints and disturbed areas surrounding the proposed project infrastructure should be kept at minimum as possible and the areas cleared of natural vegetation and topsoil must be kept to a minimum. • The extent of all development footprint areas and permanent/ temporary structures must be limited to what is essential. • As far as possible, existing roads are to be utilised, to limit cumulative impacts from roads and traffic. • The height of any temporary structures such as topsoil stockpiles should be kept as low as possible below 1m.	All Contractors	Throughout construction	• Agreement letter. • Wayleave	• Incident register. • Complaints register.
Fire Prevention	**22**	• The Contractor must take all the necessary precautions to protect the materials on site and to avoid veld fires. • No fires or open flames are allowed on site unless directly used for construction purposes, • Review all SANS standards relating to fire precautions and fire control namely, SANS 0131-3 Section 8 and SANS 089-1 or as amended. • The Contractor must have fire-fighting equipment and a first aid box available on site and on all vehicles working on site. • All waste bins must be kept away from fuel tank installations.	All Contractors	Throughout construction	• Visual inspection • Emergency Response Plan.	• Fire extinguisher inspection checklist. • Incident register • Mock drill report.

		• All fuel tanks must be installed above ground, depending on the volume of stored fuel, for easy detection of fuel leaks. • Any welding or other sources of heating of materials must be done in a controlled environment, wherever possible and under appropriate supervision, in such a manner as to minimise the risk of veld fires and/or injury to staff. • Fires lit for comfort (warmth) must be actively discouraged by the Contractor, due to the risk of veld fires and the risk to adjacent properties. Also, no waste material must be burnt.				
Noise Pollution	**23**	• Temporary noise pollution due to construction works should be controlled by proper maintenance of equipment and vehicles and tuning of engines and mufflers. Construction works should be completed in as short a period as possible by assigning qualified engineers and foremen. • It is the responsibility of the Contractor to monitor for the mitigation of such impacts. Noise problems should be reduced to normally acceptable levels by incorporating low-noise equipment in the design and/or locating such mechanical equipment in properly acoustically lined buildings or enclosures. In the presence of adequate buffer zones between the facility and residential areas, noise control measures must be minimized.	All Contractors	Throughout Construction	Random noise measurements	• Results of random noise measurements • Number of registered complaints
Complaints	**24**	Maintain complaints register for all complaints. The register must list: • Complainant name and contact details. • Date complaint was lodged. • Person who recorded the complaint. • Nature of the complaint.	All Contractors	Throughout construction	Complaints register	• Availability of register on site • Designated person to

		• Actions taken to investigate the complaint and • outcome of the investigation. • Action taken to remedy the situation. • Date on which feedback was provided to complainant.				maintain register • Complaints logged • Complaints followed up and Closed out.
Housekeeping	**25**	• All construction and operational areas must be always kept in a neat and orderly condition. • An efficient removal system of waste and rubble must be ensured during all development phases. • All operational facilities, including vehicles, should be actively maintained. • Any areas for material storage, waste sorting and other potentially intrusive activities must be screened from view as far as considered feasible. • Regularly inspect all construction machinery and holding tanks for leaks or damages. • Place generators on drip trays. • Repair any defects as soon as possible. In the case of leaks, ensure that the leaking water or effluent is captured and not released into the environment. • Service and refuel equipment that uses hydrocarbon fuels, oils, lubricants, and other hazardous chemicals at the designated area at the Site Camp only under conditions approved by JW EO/ECO • Ensure that absorbent pads (or equivalent) and/ or drip trays are available to collect any oil, fluid, etc. in the case of a breakdown or emergency repair outside the designated area. Keep a copy of fuels and hazardous substance inventory on site.	All Contractors	Throughout	Visual inspection of site camp/ construction site	Regular inspection reports by SHE Officer and JW EO

		• Keep spill containment and clean-up equipment at all work sites and for all polluting materials used at the site. • Prevent discharge of any hazardous substances or pollutants, such as cements, concrete, chemicals, and other contaminated wastewater and fuels into the ground, surface, or storm water systems on site. • Control litter and keep construction areas as clean and neat as possible.				
Transportation and refuelling	**26**	• Undertake regular maintenance of vehicles and machinery to identify and repair minor leaks and prevent equipment failures. • Undertake any on-site refuelling and maintenance of vehicles/machinery in designated areas. Line these areas with an impermeable surface and install oil traps. • Ensure that oils and lubricants used for maintenance of equipment in the field are correctly contained. • Use appropriately sized drip trays for all refuelling and/or repairs done on machinery – ensure these are strategically placed to capture any spillage of fuel, oil, etc. • Use drip trays under all equipment and plants that are parked overnight or for long periods. • Store and handle fuels, oils and chemicals so as to avoid the risk of spillage, i.e., in waterproof and impervious	All Contractors	Throughout Construction	Visual inspection of vehicles, barges, machinery and refuelling / maintenance areas	• Incidence of non-compliance • Incidence of leaks and spills • Cost of cleaning up spills
Safety and Security	**27**	• Do not allow any open fires on the site. • Do not allow smoking on the site except within designated areas. Suitable fire-fighting equipment must be readily available in these areas.	All Contractors	Throughout construction	• Inspect attendance register for training sessions	• Number of fire incidents

		• Equip all fuel stores and waste storage areas with fire extinguishers. • Ensure that all personnel on site are aware of the location of fire-fighting equipment on the site and how the equipment is operated. • Suitably maintain fire-fighting equipment. • Ensure that emergency procedures (in relation to fire, spills, contamination of the ground, accidents to employees, use of hazardous substances, etc.) are established prior to commencing construction. • Make all emergency procedures available, including responsible personnel, contact details of emergency services, etc. to all the relevant personnel. Clearly demarcate emergency procedures at the relevant locations around the site. • Secure the Site Camp, particularly to restrict • Unauthorised access to fuels and other hazardous substances. • Provide suitable emergency and safety signage on site and demarcate any areas which may pose a safety risk (including hazardous substances, deep excavations, etc.). • Advise the ECO of any emergencies on site, together with a record of action taken.	All Contractors	Before and during construction	• Inspect fire extinguishers and certificates Visual inspection	• Certified extinguishers in appropriate locations Number of safety / emergency incidents.
Response to environmental pollution	**28**	• In the event of environmental pollution, e.g., through spillages, immediately stop the activity causing the problem. • Maintain relevant Material Safety Data Sheets (MSDS) at the site for all potentially hazardous substances (as defined in the regulations for hazardous chemical substances). In the event of an emergency, procedures detailed in the MSDS shall be followed. Clean up any spills immediately,	All Contractors	Throughout construction	• Maintain register of pollution events and response • Following resumption of activities, frequently	• Number of incidents • Time activities stopped • Number of recurring Incidents

		through containment and removal of free product and appropriate disposal of contaminated soils. • Immediately remediate and rehabilitate areas in the event of a spill of an environmentally hazardous substance. • Only resume activity once the problem has been stopped or (in the case of spillages) the pollutant can be captured without reaching the environment. Repair faulty equipment as soon as possible. • Treat hydrocarbon spills, e.g., during refuelling, with adequate absorbent material, which then needs to be disposed of at a suitable landfill. • Ensure a quantity of appropriate remedial agent, capable of containing and/or remediating a hydrocarbon spill is available on site at all times in case of an emergency spill. The material shall be capable of handling a spill of at least 200l. • Report all fuel, oil or hydraulic fluid spills to the JW EO/ECO so that appropriate clean-up measures can be implemented. • Report all incidents within 24 hours to JW environmental section. • All environmental incidents must be investigated within seven (7) working days.			inspect repaired equipment to ensure proper functioning	• Availability and 66complete ness of register
Storm Water Management	**28**	**Objective** • To minimise erosion of soil from site during construction. • To minimise deposition of soil into drainage. • Minimise loss of vegetation cover due to construction related activities.	All Contractors	Throughout Construction	• Visual inspection. • Storm water management Plan. • Wayleave from JRA	• Daily inspection checklist. • Incident register.

		Mitigation Measures • Identify and demarcate construction areas for general construction work and restrict construction activity to these areas. Prevent unnecessary destructive activity within construction areas (prevent over-excavations) • Stockpile topsoil for re-use in rehabilitation phase. Maintain stockpile shape and protect from erosion. All stockpiles must be positioned at least 50 m away from drainage lines and wetlands. • Erosion control measures: Run-off control and attenuation on slopes (sandbags, logs), silt fences, storm water channels and catch-pits, shade nets, soil binding, geofabrics, hydro seeding or mulching over cleared areas. • Control depth of excavations and stability of cut faces/sidewalls. • Compile a comprehensive storm water management plan as part of the final design of the project and implement during construction and operation.				
Indigenous Vegetation, Re-vegetation, Rehabilitation, Reinstatement	**29**	**Objective** To ensure that suitable rehabilitation and re-vegetation of disturbed areas is undertaken the following legislations are applicable: **Legislation and Standards** • Conservation of Agricultural Resources Act (Act 43 of 1983 • Environment Conservation Act (Act 73 of 1989 • National Forestry Act (Act 84 of 1998	All Contractors	Throughout Construction	• Rehabilitation Plan • JW EMP • Visual inspection • Ecologist Specialist report • Environmental Authorisation/ GA	• Daily inspection checklist. • Rehabilitation report • Waste management collection report (Waste Disposal Certificate).

		• National Environmental Management Act 107 of 1998 and Gauteng Nature Conservation Bill, 2014. • National Environmental Management Biodiversity Act 10,2004. **Mitigation measures** In order to meet this goal, the following objective, actions, and monitoring requirements are relevant: • Disturbed areas must be rehabilitated/re-vegetated with appropriate natural vegetation and/or local seed mix. Re-use native/indigenous plant species removed from disturbance areas in the rehabilitation phase as per the re-vegetation and rehabilitation management plan. • Alien/non-native species must not be used. If these are requested/ required by stakeholders, then this must be documented by contractor. • Re-vegetated areas may have to be protected from wind erosion and maintained until an acceptable plant cover has been achieved. • On-going alien plant monitoring and removal within the disturbed project footprint (where the initial clearing for construction took place) must be undertaken on all areas of natural vegetation on an annual basis. • All temporary facilities, equipment and waste materials must be removed from site and appropriately disposed of. • All temporary access road must be rehabilitated to their original condition			• Practical and completion certificate. • Community Happy Letters.	

		• Necessary drainage works and anti-erosion measures must be installed, where required, to minimise loss of topsoil and control erosion. • On-going inspection of rehabilitated areas to determine effectiveness of rehabilitation measures implemented. • On-going alien plant monitoring and removal should be undertaken as per the approved Rehabilitation/Re-vegetation plan. **Management and Mitigation Requirement** • Conduct a detailed search of at the area. As a minimum, this should take place during the spring and summer months prior to impoundment so positive identification of flowering plants can be made. This should be done taking due cognisance of specialist studies already undertaken as part of the EIA process. • Allow time for additional searches if these are deemed necessary, based on progress and diversity of plant species found. • Identify and physically mark all conservation worthy plants found on the ground; and • Capture markers and reference in a retrievable system, so that these can be located again for transplanting (e.g., using a combination of aerial photography, GPS, and GIS, as appropriate).				
Practical and Final completion inspection	**30**	• Ensure that practical inspection is conducted before the Contractor hands over the project back to JW in order to ascertain if the reinstatement or rehabilitation has been done accordingly.	CAPEX/ OHSE& DM/ All Contractors	During the final stage of project	• Meeting invite • Visual inspection	• Meeting invite • Attendance register • Snag list

		• The snag list is to be compiled and accepted by all parties (JW CAPEX Representatives, JW environmental section as applicable, and appointed Contractor) All responsible personnel including Environmental representative sign both practical and final completion letter.				• Signed practical and final completion inspection letter.
Final close out report	**31**	• Conduct final audit on site. • EO must ensure that audit reports are signed by RE/Engineer and Contractor. • Environmental File is returned to JW, after rehabilitation has been deemed successful.	OHSE & DM	During the final stage of project.	• Final audit report. • Signing of Audit reports.	• Final Audit report. • Signed Audit report. • Environmental file.

Table 3: Environmental Management and Mitigation Measures that must be implemented during the Operational Phase

Operational Phase Measures						
Aspects	**ID**	**Mitigation Measure/Procedure**	**Responsible**	**Implementation Timeframe**	**Monitoring Methods**	**Performance indicators**
Waste Management	**1**	Sanitation Facilities • Ablution facilities shall be provided on site. • The positioning of the ablution facilities shall be done in consultation with Client and shall be placed so that it cannot contaminate the natural streams and rivers. One toilet shall be provided per 15 staff members on site. Toilets shall be positioned within walking distance of wherever employees are employed on the site. Toilets shall be provided with locks and doors shall be secured to prevent the toilets from blowing over. • The toilets shall be placed outside of areas susceptible to flooding.	Johannesburg Water	During operation and maintenance activities	• Visual inspection of Waste collection and disposal areas. • Visual inspection of site. • Check waste	• Presence of litter • Availability of waste bins and skips. • Degree to which rubbish bins and skips are filled • Total volume of general and hazardous waste storage capacity • Total volume of general and

		• Chemical toilets shall be serviced regularly by an authorised service provider and removed to a registered wastewater treatment works and disposal certificates shall be obtained from the waste disposal facility for each disposal and retained on site. • Polluted run-off must be discharged in the local sewerage main and not overland or into public streams. In instances where a sewerage main is not available, polluted run-off will be collected in sub-surface tanks and a reputable effluent removal contractor will be contracted to dispose of the waste in an environmentally acceptable manner. Official documentation shall be obtained from the waste disposal facility for each disposal and retained on site. • Any cooking on Site shall be done on well-maintained gas cookers with fire extinguishers present. No cooking shall be permitted to occur on open fires. • Toilets situated close to the site boundaries or within sight of residential areas shall be hidden behind screens or other cover as approved by the Engineer. • No spillage shall occur when the toilets are cleaned or emptied and the contents shall be properly stored and removed from site. • Discharge of waste from toilets into the environment and burial of waste is strictly prohibited. • All building rubble and rubble from the demolished structures, solid and liquid waste must be disposed of as necessary at an appropriately licensed refuse facility. • Ensure that no refuse wastes are burnt on the premises or on surrounding premises. No fires will be allowed on site.			disposal slips. • Monitor activities against JW Waste Management Plan. • Waste Inventory Register.	hazardous waste stored on site • Degree to which different waste is separated. • Frequency of waste collection. • Total volume of recycled and reused waste.

		Contaminated water •Workshops, refuelling depots and washing areas shall be bunded. •Any wastewater or spilled fuel collected within bunded areas around the refuelling area shall be disposed of as hazardous waste •Wastewater containing hydrocarbons, paints oil etc. shall be treated as hazardous waste				
Protection of Vegetation	**2**	• Limit the footprint of the maintenance and operational activities to the minimum to minimise environmental damage. • Designate vegetated areas outside the development footprint as "No go" areas. • Limit the off-road driving within the Johannesburg Water Sites. • Protected or endangered species of plants shall not be removed unless they are interfering with a structure. • All trees and vegetation cleared from the site shall be cut into manageable lengths. • Big trees with large root systems shall be cut manually and removed, as the use of a bulldozer will cause major damage to the soil when the root system is removed. • Stumps shall be treated with herbicide. • Protected or endangered species of plants shall not be removed unless they are interfering with a structure. • Where such species have to be removed due to interference with a structure, the necessary permission and permits shall be obtained from	Johannesburg Water	• During operation and maintenance activities/. • When is necessary?	Visual inspection	• Incidents of vegetation damage. • Number of incidents of disturbance of vegetation outside site boundary.

		Provincial Department of Agriculture and Rural Development. • All protected species not to be removed must be clearly marked and such areas fenced off if required. • The use of herbicides shall only be allowed after a proper investigation into the necessity, the type to be used, the long-term effects and the effectiveness of the agent. • No scalping shall be allowed on any part of Johannesburg Water Sites.				
Alien invasive/weeds control	**3**	• Some of the areas of JW area are covered with moderate to very dense invasive alien shrubs and trees. Clearing of such vegetation will be necessary to gain access. However, clearing of this vegetation from the entire project area as far as possible will reduce the re-establishment rate of this vegetation over time, and will thus not only benefit the environment also put the proposed project and potential future phases of the project in the long term. • The type of invasive, however, will require regular follow-up eradication of seedlings after clearing, as extensive seedbanks of these species are present underneath present infestations. • Wood from alien vegetation can be used. However, care must be taken not to leave any of the leaf- or seed material on the site where the vegetation was cleared. Rather, identify a particular area that no longer has any indigenous vegetation, demarcate that area and dump excess material of alien species there. • Once the material is sufficiently dry, it should be burned to destroy any regenerating capacity of stems and roots as well as seeds.	Johannesburg Water	During operation and maintenance activities	• Visual inspection. • Monitoring against Vegetation Management Plan. • PCO certificate.	• Daily inspections register. • Incident register.

		• Only registered PCO with Certificate for competency to handle the hazardous substances (e.g., Herbicides) is allowed to use herbicide. • Only environmentally friendly herbicide is allowed within JW sites. • MSDS for the herbicides must be kept in the storage area. • Method Statement for applying and handling herbicides and Risk Assessment for applying and handling herbicides. • Appropriate PPE for handling herbicides. • Herbicides stored only in a designated storage. • Empty containers of herbicides disposed of accordingly to the registered hazardous landfill site. • Proof of disposal provided to JW Environmental Section.				
Sludge Management	**4**	• The sludge must be managed according to the sludge guideline. • All agreements or Contract must be placed in the file. • The sludge must be kept on a designated bunded and concrete lined drying bed.	Johannesburg Water/Bulk Waste	During operations activities	• Visual inspection according to Sludge SOP. • Monitoring against Sludge Guideline. • Monitoring against WUL.	• Sludge test report • Complaints register. • Sludge spill register. • Environmental Officers Internal WUL Audit Report.
Workshop and storage Area	**5**	• The siting of workshops, maintenance and refuelling sites and materials storage areas shall not be in the vicinity of sensitive sites e.g., wetlands, cultivated fields or drainage lines, or where local landowners can be disturbed.	Johannesburg Water	During operations and maintenance activities	• Visual inspection • SOP for handling hazardous	• Workshop and storage register. • MSDS register. • Incident register.

		• Storm water shall be diverted around the storage area. Storm water falling on the storage area shall be discharged if it meets the required water quality standards. • Proper storage facilities, placed on an impermeable surface, shall be provided for the storage of oils, grease, fuels, chemicals, and other hazardous materials to be used during the construction phase of the project. If fuel is required on site, it shall be stored in a secure area in a steel tank supplied and maintained by the fuel suppliers. Leakage of fuel shall be avoided. • An adequate bund walls, 110% of volume, shall be provided for fuel and diesel areas to accommodate any spillage or overflow from these substances. The area inside the bund wall shall be lined with an impervious lining to prevent infiltration of the fuel into the soil. • In addition, hazard signs indicating the nature of the stored materials shall be displayed on the storage facility or container and Material Safety Data Sheets (MSDS's) will be made available for all hazardous chemicals. Before containers or storage facilities are erected, emergency procedures in the event of misuse or spillage that may negatively affect an individual or the environment will be in place. • The storage facilities (including any tanks) shall be surrounded by a bund wall, in order to ensure that accidental spillage does not pollute local soil or water resources. • The storage areas shall not be utilised for accommodation purposes and shall be access controlled.			substances. • MSDS register	

		• The storage area shall be kept tidy, and the area shall be rehabilitated after use. • An inventory of any hazardous chemicals/substances (including that within equipment) kept on site, along with a description of possible ill effects and treatment of health-related afflictions resulting from accidents, shall be kept in the storage area as well as by the appropriate manager. These areas shall be securely fenced. • Gas welding cylinders and LPG cylinders shall be stored in a secure, well-ventilated area. • A notice board with the contact details of the responsible party shall be displayed at the gate to the storage area. • All vehicles and machinery will be inspected for any leaks or malfunctions regularly. Vehicle servicing or repairs is prohibited from site, unless in an emergency. • Drip trays shall be inspected and emptied daily and serviced when necessary. In particular drip trays shall be closely monitored during rain events to ensure that they do not overflow. The contents must be disposed of at a recognised site. • All repairs done on machinery using hydrocarbons as fuels or lubricants shall have a drip tray placed strategically to avoid incidental spillage. • Workers shall be made aware of the health risks associated with any hazardous substances used (e.g., smoking near refuelling depots), and shall be provided with appropriate protective clothing / equipment in case of spillages or accidents. • Cement shall be mixed on a plank, mental plate or a plank only or ready-mix trucks shall be used, and				

		other potential environmental pollutants shall be stored at the designated area. There shall be no opportunity for environmental contamination. • Workshop areas shall be monitored for oil and fuel spills and such spills shall be cleaned and remediate to the satisfaction of the EO. • The site shall be in possession of an emergency spill kit that must be complete and available at all times on site.				
Complaints	**6**	• Maintain complaints register for all complaints. The register must list: • Complainant name and contact details. • Date complaint was lodged. • Person who recorded the complaint. • Nature of the complaint. • Actions taken to investigate the complaint and outcome of the investigation. • Action taken to remedy the situation. • Date on which feedback was provided to complainant.	Johannesburg Water	During operations and maintenance activities	• Complaints register. • GDARD complaints reference number.	• Availability of register on site • Designated person to maintain register • Complaints logged • Complaints followed up and closed out.
Collection of water sample	**7**	• Water sampling shall be undertaken at the selected sampling points as per the WUL. • Any incident or non-compliance with the WUL parameters or DWS Water Quality Guidelines shall be reported accordingly and investigated • Unused sampling bottle shall be disposed of accordingly.	Johannesburg Water/CDYNA	During operation activities	• Visual inspection. • Online Lab reports	• Daily water sample report. • Incident register.
Environmental Incident reporting and Emergency Response and Preparedness	**8**	• NEMA Section 30 and 30A emergency incidents and situations must be reported to GDARD or DEA immediately after as an incident or situation occurs. NWA Section 20 emergency must be reported to DWS, mostly by Operations Department. This can be done via phone, fax, or email. JW must implement	Johannesburg Water Sites	During operation and maintenance activities.	• Visual inspection. • Flash report/ Incident	• Incident register • Bioremediation report. • Section 30A Directive.

		measures to contain the incident or situation immediately. Thereafter the Emergency Incident Report (EIR) or Emergency Situation Report (ESR) must be submitted to the authorities ASAP. The reports must provide as much information as possible, if not; the reports can be updated later as the investigation progresses. Not reporting an incident could result in the authorities issuing a directive or a compliance notice to the responsible person. • Important Note: For Section 30A Emergency Situation, an oral or written directive must be obtained from GDARD or DEA before works can be undertaken in the watercourse to avoid undertaking listed activities without obtaining EA. • Johannesburg Water takes responsibility in order to effectively respond to emergency incidences such as fire, hydrocarbon and sewer spills or leakages, disturbance of wildlife and archaeological artefacts. The SHE Rep must conduct daily inspections to ensure that the required equipment needed to handle environmental incidents/ emergencies are readily available and in working condition. Quick response to an incident prevents escalation to an emergency:			investigation report. • Section 30A Annexure A. • JW Environmental Emergency Preparedness and Response Procedure.	• Corrective Action Plan

9. Water Management

- Water is a scarce resource and water shall be conserved wherever possible.
- Improved and protected watercourses to Class C classification which is moderately modified in terms of determined class of water resource and resource quality objectives of chapter 3 (Part 2) of National Water Act (Act 36 of 1998).
- Demand reduction/ Alternative sources.
- Building a water sensitive city.
- Well managed and maintained water infrastructure networks**.**

Water Usage	**9.1**	• The site must be kept tidy and hygienic at all times with special reference to sanitation & water management. • Maintain a monthly water usage. • Reporting of water pipe burst and damaged meters	Johannesburg Water Sites	During operation	• Visual inspection • Meter readings	• Records of Monthly water Usage.
Reduce water demand	**9.2**	• Implement effective demand-side management practices while exploring investment into smart infrastructure and alternative supplies to increase levels of net water savings. • Establish Task Team with different law enforcement agencies to develop and implement solution for infrastructure abuse problem. • Promote the implementation of Sustainable Urban Drainage System practice.	Johannesburg Water (Network)	During operation	• Monthly Monitoring • Monthly water management report	• Records of percentage reduction on non-revenue water. • Records of Percentage reduction of Rand Water system input volume.
Incentivise water saving interventions across domestic and economic sector users.	**9.3**	• Implementation of command-and-control base mechanism that promote water saving (CoJ By-laws). • Implementation of incentives base mechanism • Develop partnerships beyond the City to encourage water savings. • Expand current CoJ drought policy to build greater resilience of the water system. • Integrate water conservation requirements in conditions of planning approval. • Develop an awareness and communications campaign using available technology.	Johannesburg Water	CoJ/Operations	• Monthly water management report	• Records of reduction in annual water consumption per capita • Water from alternative sources as % of total water supply
Rehabilitation/ Reinstatement	**10**	• Clean up and remove any spills and contaminated soil in the appropriate manner.	Johannesburg Water	During operation and maintenance activities	• EO compliance	• Inspection report. • Audit report by External Auditor.

		• Ensure that no discarded materials are buried on site or on any other land not designated for this purpose. • Rehabilitate any disturbed areas as soon as maintenance or construction in the area is complete. • If disturbed areas are left to rehabilitate naturally, they must be frequently monitored and interventions put in place immediately should it become necessary. Special attention must be given to the potential for soil erosion and the associated environmental degradation. It is also essential to undertake alien vegetation control and management.			monitoring. • Visual inspection. • Compliance inspection against rehabilitation plan. • JW EMP.	• Photos before and after.

6.1 Method Statement

The objective is to ensure all construction activities are undertaken with the appropriate level of environmental awareness to minimise environmental risk. The environmental specifications are required to be underpinned by a series of Method statements, within which the Contractors and Service Providers are required to outline how any identified environmental risks will practically be mitigated and managed for the duration of the contract, and how specifications within this EMPr will be met. That is, the Contractor will be required to describe how specified requirements will be achieved through the submission of written Method Statements to Johannesburg Water Environmental Section and ECO.

Method Statement is defined as “a written submission by the Contractor in response to the environmental specification or a request by the Site Manager, setting out the plan, materials, labour and method the Contractor proposes using to conduct an activity, in such detail that the Site Manager and Environmental Officers are able to assess whether the Contractor's proposal is in accordance with the Specifications and/or will produce results in accordance with the Specifications”. The Method Statement must cover applicable details with regard to:

- Construction procedures
- Materials and equipment to be used
- Getting the equipment to and from site
- How the equipment/material will be moved while on-site
- How and where material will be stored
- The containment (or action to be taken if containment is not possible) of leaks or spills of any liquid or material that may occur
- Timing and location of activities
- Compliance/non-compliance with the Specifications, and
- Any other information deemed necessary by the Johannesburg Water.

The Contractor may not commence the activity covered by the Method Statement until it has been approved by the Site Manager, except in the case of emergency activities and then only with the consent of the Site Manager. Approval of the Method Statement will not absolve the Contractor from their obligations or responsibilities in terms of their contract.

Failure to submit a method statement may result in suspension of the activity concerned until such time as a method statement has been submitted and approved. The EO and ECO should monitor the

construction activities to ensure that these are undertaken in accordance with the approved Method Statement.

6.2 Monitoring

- Regular inspections of the site by EO/SHE and Environmental Reps
- Immediate reporting of ineffective sediment control systems.
- Public complaints register must be developed and maintained on site.

6.2.1 Monitoring Program

OBJECTIVE: Monitor the performance of the control strategies employed against environmental objectives and standards

A monitoring programme must be in place not only to ensure conformance with the EMP, but also to monitor any environmental issues and impacts which have not been accounted for in the EMPr that are or could result in significant environmental impacts for which corrective action is required. The period and frequency of monitoring will be stipulated by the environmental authorisation (once issued). Where this is not clearly dictated, Johannesburg Water will determine and stipulate the frequency of monitoring required in consultation with the relevant authority. The contractor project manager will work with the site manager of the contractor to ensure that monitoring is conducted and reported.

The aim of the monitoring and auditing process would be to routinely monitor the implementation of the specified environmental specifications, in order to:

- Monitor and audit compliance with the prescriptive and procedural terms of the environmental specifications.
- Ensure adequate and appropriate interventions to address non-compliance.
- Ensure adequate and appropriate interventions to address environmental degradation.
- Provide a mechanism for the lodging and resolution of public complaints.
- Ensure appropriate and adequate record keeping related to environmental compliance.
- Determine the effectiveness of the environmental specifications and recommend the requisite changes and updates based on audit outcomes, to enhance the efficacy of environmental management on site.
- Aid communication and feedback to authorities and stakeholders.

6.2.2 Method of Monitoring

The Environmental Officer will ensure compliance with the EMP and will conduct monitoring activities. The EO will undertake site inspections monthly or as specified in the environmental authorisation once issued.

6.2.3 Monitoring Reports

Environmental Monthly reports will be compiled by the EO monthly and must be submitted to Environmental Specialist. The report should include details of the activities undertaken in the reporting period, any non-conformances or incidences recorded, corrective action required and details of these non-conformances or incidents which have been closed out.

A document handling system must be established to ensure accurate updating of EMP documents, and availability of all documents required for the effective functioning of the EMP. The complied environmental file must be ISO14001:2015 conformant as per JW environmental file specification (Annexure B). Supplementary EMP documentation could include:

- Method Statements.
- Environmental Action Plan
- Environmental File Site instructions.
- Emergency preparedness and response procedures.
- Record of environmental incidents.
- Non-conformance register
- Training records.
- Site inspection reports.
- Waste Register
- Water Usage Register
- Fauna and Flora Register
- Hazardous chemical Inventory list
- Monitoring reports.
- Auditing reports; and
- Public complaints register (single register for maintained for overall site).

Table 4: Monitoring Programme

ISSUE	FREQUENCIES OF MONITORING	RESPONSIBLE PERSON
WATER		
Prevention of water pollution Prevention of stagnant water on site. Proper functioning of sanitation facilities	Weekly in rainy season Weekly in rainy season Weekly	Contractor's Representative (CR)/ Johannesburg Water

ISSUE	FREQUENCIES OF MONITORING	RESPONSIBLE PERSON
SOIL		
Surface or gully erosion on site Soil contamination with oils If small, clean up. If large, appoint a suitable contractor for clean-up.	Weekly in rainy season Monthly Immediately	CR/JW CR/JW CR/JW
Air		
Control domestic fires. Heavy vehicle emission control. Dust control of access roads. Wetting when required.	Weekly Monthly Weekly inspection	CR/ JW CR/JW CR
WASTE		
Efficiency of domestic waste collection. Prevention of burning of solid/liquid wastes on site. Proper collection and containment of liquid wastes (petroleum, oils, paints, resins & cooking oils) The recycling and/or disposal thereof. The collection and disposal of construction waste (concrete, wood, steel) Collection of hazardous waste.	Weekly Weekly Monthly Biweekly Monthly Biweekly	CR/JW CR/JW CR/JW CR CR/JW CR/JW
WILDLIFE		
Weed Control Control of illegal hunting or snaring of game, birds, or other wild animals.	On-going On-going	CR/JW CR/JW
SOCIAL		
Inspect overall appearance of site.	Weekly	CR

ISSUE	FREQUENCIES OF MONITORING	RESPONSIBLE PERSON
(Paint work, cleanliness & housekeeping) Resolve complaints Monitor behaviour of labourers	 Daily Daily	 CR/JW CR/JW
SAFETY		
Inspect road signs, pedestrian, and vehicle behaviour	At least once a week	CR/JW

6.3 Internal Audits and Reporting

Typically, an audit analyses the results obtained from monitoring, assesses whether objectives and targets have been met and whether there are variances from the stipulated EMP and legal requirements. In addition, the audit assesses whether EMP implementation has been undertaken according to planned arrangements and that the EMP itself is being appropriately updated. The audit should confirm that identified corrective actions have been undertaken and then assess the effectiveness of such actions. The timing of audits should be included in the implementation schedule in the EMP.

The key steps in a successful audit are:

- Establish audit procedures.
- Determine the frequency of audits.
- Ensure that the auditors are competent, in that they must be able to undertake the audit objectively and competently. Audits may be undertaken by internal or external parties, although certain I&AP requirements may define a need for external auditors.
- Maintain records of audits.

A procedure is to be developed by the project management team for conducting EMP audits, and should incorporate processes for scheduling and reporting, as well as the timing and frequency of the audits. This procedure should also address responsibilities and required resources. The EO is usually responsible for the maintenance of the environmental audit information that is required prior, during and

after an audit. Internal audits must be undertaken by Johannesburg Water Environmental Section on monthly basis.

6.3.1 Monthly compliance rating

A monthly compliance rating will be calculated for each Principal Contractor as per a formula determined by Johannesburg Water SOC Ltd focussing on or incorporating outcomes of assurance (e.g., monthly audit), operational assessments and other requirements, as necessary. Johannesburg Water SOC Ltd reserves the right to adjust the monthly compliance calculation formula as and when required – each revision of the monthly compliance calculation formula will be communicated to the Principal Contractor before implementation (**Each Principal Contractor is required to maintain a minimum compliance rating of 93% (Ninety-Three Percent).**

Table 5: Compliance Rating Protocol

Classification	Scoring	Classification description
Good	**93 – 100%**	Substantial compliance
Average	**80-92%**	Compliance status needs to be improved
Poor	**61-79%**	Methods to ensure compliance require substantial improvement
Very poor	<60%	Methods to ensure compliance failed completely - no system in place

6.3.2 Work Stoppage

Work stoppages will be identified for 2 (two) types of work stoppages to be implemented:

- Overall work stoppage – the Principal Contractor and its Contractors are not allowed to continue with any type of construction / site work up until the work stoppage has been closed-out.
- Activity work stoppage – The Principal Contractor and its Contractors are not allowed to continue with the specific activity / task / job up until the work stoppage has been closed-out (**Overall work stoppages will be issued where non-conformances are identified against the criteria in Annexure C).**

6.4 Environmental Awareness Plan

OBJECTIVE: Ensure all operation personnel have the appropriate level of environmental awareness and competence to ensure continued environmental due diligence and on-going minimisation of environmental harm (Environmental Awareness Plan).

To achieve effective environmental management, it is important that Contractors and site employees are aware of the responsibilities in terms of the relevant environmental legislation and the contents of this EMP. Johannesburg Water is responsible for informing its employees and contractors (transportation contractor) of their environmental obligations in terms of the environmental specifications, 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. Johannesburg Water's obligations in this regard include the following:

- Employees must have a basic understanding of the key environmental features of the depot and its surrounding environment.
- Ensuring that a copy of the EMP is readily available on-site and that all site staff is aware of the location and has access to the document.
- Employees must be familiar with the requirements of the EMP and the environmental specifications as they apply to the operation of the facility.
- Ensuring that, prior to commencing any new site works, all employees have attended an Environmental Awareness Training course. The course must provide the site staff with an appreciation of the project's environmental requirements, and how they are to be implemented.
- Awareness of any other environmental matters, which are deemed to be necessary by the depot manager.
- Ensure that construction workers have received basic training in environmental management, including the storage and handling of hazardous substances, minimise of disturbance to sensitive areas (wetland), management of waste and prevention of water pollution
- Records must be kept of those that have completed the relevant training.
- Training should be done either in a written or verbal format but must be in an appropriate format

and language for the receiving audience

- Refresher sessions must be held to ensure the operating staffs are aware of their environmental obligations.

Therefore, prior to the commencement of construction activities on site and before any person commences with work on site thereafter, adequate environmental awareness and responsibility are to be appropriately presented to all staff present onsite, clearly describing their obligations towards environmental controls and methodologies in terms of this EMPr. This training and awareness will be achieved in the following ways:

6.4.1 Environmental Awareness and Training

Environmental Awareness and Training must be undertaken by the Environmental Officer or SHE/ELO and must take the form of an on-site talk and demonstration by the Environmental Officer before the commencement of construction activities on site. A record of attendance of this training must be maintained by the Environmental Liaison Officer/SHE Officer on site.

6.4.2 Formal Environmental Training

NB: JW must ensure that there is a budget allocated for environmental formal training in CAPEX projects for the skills development of contractor staff, development of community where project is being undertaken. The principal Contractor shall identify short courses and include them on the training matrix that can be done on site during project duration. The following are some of the trainings that can be done on site:

- ISO14001:2015 Environmental Management System Awareness
- Handling of beehives
- Snake awareness and handling
- Environmental legal Liability.
- Waste Management
- Environmental Site Representative
- Recycling
- Grass cutting training

The principal Contractor must ensure that they are appointing a registered company that meet all the requirements and before appointment of service provider, the files shall be submitted to Environmental Section for evaluation.

6.4.3 Induction Training

Environmental induction training must be presented to all persons who are to work on the site, be it for short or long durations. Contractors or Engineers staff, site staff, sub-contractors, or visitors to site. This induction training should include discussing Johannesburg Water's environmental policy and values, the function of the EMP and the importance and reasons for compliance to these. The induction training must highlight overall dos and don'ts on site and clarify the repercussions of not complying with these. The reporting procedure must be explained during the induction as well. Opportunity for questions and clarifications must form part of this training. A record of attendance of this training must be maintained by the SHE officer on site.

6.4.4 Toolbox Talks

Toolbox talks should be held on a scheduled and regular basis (at least once a month) where the foreman/site supervision manager, environmental and safety representative and all employees on site hold talks relating to environmental practices and safety awareness on site. These talks should also include discussions on possible common incidents occurring on site and the prevention of reoccurrence thereof. Records of attendance and the awareness talk subject must be kept on file.

6.5 Erosion Management Plan

The objective to control soil erosion from an ecological perspective is:

- To reduce the effects of raindrop splash erosion on exposed soil surfaces.
- To keep rainwater on the soil surface for as long as possible to increase the infiltration rate and reduce surface runoff.
- To reduce the speed of surface runoff to reduce the erosion effect of the soil surface.
- To provide methods to retain soil, debris, seed banks and organic matter being carried away by runoff.
- To improve water retention of the area (Coetzee, 2005).

a) Areas with a high soil erosion potential on the site

Areas identified as being of high soil erosion potential on the site include:

- Any areas without vegetation cover
- Excavated areas
- Steep areas
- Areas which undergo overland flow of water.
- Areas close to water
- Irrigated areas
- Compacted areas
- Rivers
- Drainage lines
- Any areas where developments cause water flow to accelerate on a soil surface.

If any erosion features are present as a result of the activities mentioned above the ELO must:

Assess the situation.

- Take photographs of the soil degradation.
- Determine the cause of the soil erosion.
- Inform and show the relevant contractors the soil degradation.
- Inform the contractor that rehabilitation must take place and that the contractor is to implement a rehabilitation method statement and management plan.
- Monitor that the contractor is taking action to stop the erosion and assist them where needed.
- The progress of the rehabilitation must be monitored weekly and recorded in the site diary.
- All actions with regards to the incidents must be reported on in the monthly Audit report.
- If the erosion incident has not been addressed by the contractor within 14 days of you reporting it, the Johannesburg Water 's Environmental Section must be informed.

The contractor/ developer (with the EO's consultation) must:

- Select a system to treat the erosion
- Design the treatment system
- Implement the system
- Monitor the area to see if the system functions like it should, if it the system fails adapt or adjust the system to ensure erosion is controlled.
- Monitoring must continue until the area has been stabilized

b) General Erosion

The civil works contractor may use the following instruments to combat erosion when necessary:

- Reno matrices
- Slope attenuation
- Shade catches nets
- Mulching
- Hydro-seeding or transplanting
- Re-vegetating
- Tilling (roughing the surface)

c) Erosion Management control measures

- Areas susceptible to erosion must be protected by appropriate measures and repair of any damage caused by erosion due to construction activities must be undertaken as soon as possible.
- Minimise erosion and sedimentation into water courses through effective stabilisation (gabions and reno-mattresses) and re-vegetation of disturbed riverbanks (Refer to rehabilitation specifications and erosion control measures below).
- Stabilisation of sandy, dispersive slopes or slopes steeper than 1:3 will be required. Ensure that bare soil is covered, and hydro seeded to reduce topsoil loss.

- Ensure that all soil surfaces are protected by vegetation or a covering to avoid the surface being eroded by wind or water.
- Ensure that heavy machinery don't compact areas that are not meant to be compacted as this will result in compacted hydrophobic, water repellent soils which increase the erosion potential of the area.

d) Surface water control measures

- Prevent the concentration or flow of surface water or storm water down cut or fill slopes or along pipeline routes or roads and ensure measures to prevent erosion are in place prior to construction.
- Storm water and any runoff generated by hard surfaces should be discharged into retention swales or areas with rock riprap.
- These areas should be grassed with indigenous vegetation.
- These energy dissipation structures should be placed in a manner that flows are managed prior to being discharged back into the natural water courses, thus not only preventing erosion, but also supporting the maintenance of natural base flows within these systems, i.e., hydrological regime (water quantity and quality) is maintained.
- Mitigate against siltation and sedimentation using the above-mentioned structures and ensure that all structures do not cause erosion.
- Ensure that all storm water control features have soft engineered areas that attenuate flows, allowing for water to percolate into the local aquifers.
- Minimise and restrict site clearing to areas required for construction purposes only and restrict disturbance to adjacent undisturbed natural vegetation.
- Vegetation clearing should occur in parallel with the construction progress to minimize erosion and/or run-off. Large tracts of bare soil will either cause dust pollution or quickly erode and then cause sedimentation in the lower portions of the catchment.
- Minimise the diversion of flows into different catchments.

- If implementing dust control measures, prevent over-wetting, saturation and run-off that may cause erosion and sedimentation.
- Water course (stream) crossings should not trap any run-off, thereby creating inundated areas, but allow for free-flowing water courses.

e) Environmental Incident/Accident

All environmental related incidents should be reported to environmental section. The ELO should compile and keep an Incidents and Accidents Register on the file/book in which all environmental related incidents and accidents are recorded, e.g., chemical spills, fires, accidents involving workers and vehicles, etc.

The following information must be recorded in the Incidents Register:

- The name and contact details of the persons involved
- The person recording the incident
- The date and time of incident
- The nature, extent, and cause of the accident
- The name and contact details of any persons notified of the incident
- The actions taken to deal with the incident and whether the accident has been sufficiently
- Dealt with additional steps required to prevent recurrence of the incident.

7. RECORD KEEPING, COMPLIANCE AND PENALTIES

Various records will be kept on site for monitoring purposes these include but not limited to:

- Copy of Environmental Management Plan
- Approved Environmental Method Statements
- Environmental Authorisation
- Environmental induction attendance register
- Hazardous chemicals register
- Waste disposals register and disposal certificates

- Oil/fuel spill register

Records of non-compliance shall also be kept on record and will include the nature and magnitude of the non-compliance in a register, the action taken to discontinue the non-compliance, the action taken to mitigate its effects and the results of the actions. External complaints received regarding activities on the construction site pertaining to the environment shall be recorded in public complaints register and the response noted with the date and action taken. This record shall be submitted with the monthly reports and a verbal report given at the monthly site meetings. A score of 90% is required for the Monthly Audit undertaken by the Johannesburg Water 's Environmental Officers.

8. DECOMMISSIONING

Objective

- To avoid and or minimise the potential environmental and social impacts associated with the decommissioning phase

Mitigation Measures

Mitigation measures as detailed in the construction phase on the EMP regarding impacts on flora, fauna, habitats, and wetlands would be applicable to this phase.

- Rehabilitation to be undertaken in terms of specifications outlined in the Rehabilitation section of this EMP as well as in terms of any specific requirements applicable at the time.
- Johannesburg Water EO will need to supervise and monitor all decommissioning activities as per the snag list.
- All disturbed areas should be rehabilitated closer to its original state and more.

Retainable Annexure A (Ref: Annexure 5 of JW 6.4): Acknowledgement of EMP specification by the Contractor.

Environmental Requirement for Contractors and Suppliers working for Johannesburg Capital Expenditure (CAPEX) projects	**Unique no**	**JWEMP:122017**
	Revision no	**00**

I, the undersigned, hereby acknowledge that I have obtained copies of the following listed documentation and confirm that I fully understand the contents thereof and the consequences of non-compliance. The Contractor furthermore reiterates its commitment to compliance of the requirements contained within the following provided documentation:

Name of the Contractor	
Vendor Number	
Project Number	
Scope of Work	
Declaration by Capital Expenditure Projects Contractor	
• I undertake to adhere to the requirements as set out in: - Johannesburg Water Environmental Management Plan and Waste Management Plan - Environmental requirements for Contractors working on Capital Expenditure Projects • I undertake to comply with all applicable environmental legal and other requirements. • Undertake to comply with Johannesburg Water 's environmental standards, policies, and procedures where applicable. • I pledge to inform all staff of their role in managing environmental impacts on site. • I am fully aware that incidents must be reported within 24 hours of occurrence. • I pledge to always implement environmental best practice on site during the contract. • I pledge that all non-conformances issued to us will be addressed promptly.	

I …… hereby acknowledge that I have obtained copies of Johannesburg Water Environmental Management Plan and Waste Management Plan and confirm that I fully understand the contents thereof and the consequences of non-compliance. The Contractor furthermore reiterates their commitments to compliance of the requirements contained within the following provided documentations and conform to all above mentioned requirements.

Signed at …… on this …….. Day of …… 20……...

Contractor Reperesentative Name: Designation:	Signature:	Date:
JW Project Engineer/Manger (Witness) Name:	Signature:	Date:

Annexure B: Contractors Environmental File Evaluation Form

	CONTRACTORS ENVIRONMENTAL FILE EVALUATION FORM		
	A minimum score of 80% is required on all sections for the approval of the submitted Environmental file System. Failure to achieve the required score will result in non-approval of the Environmental file, and the project will not commence prior file approval.		
ENVIRONMENTAL SYSTEM EVALUATION OUTCOME			
AVERAGE SCORE OBTAINED			**0.00%**
		APPROVED/REJECTED	
EVALUATED BY:	**REVIEWED BY:**	**APPROVED/REJECTED BY:**	**ACKNOWLEDGED BY:**
DESIGNATION:	**DESIGNATION:**	**DESIGNATION:**	**DESIGNATION:**
SIGNATURE:	**SIGNATURE:**	**SIGNATURE:**	**SIGNATURE:**
DATE:	**DATE:**	**DATE:**	**DATE:**

PROJECT DETAILS			
Contract Number			
Project Title			
Name of Contractor			
Is the project screened?	YES/NO	IF NO	Construction activities/work (including site establishment) should ONLY commence when after the project is Screened

DISCLAIMER

1.Should there be any other Environmental related activities issued as non-compliance during construction, the contractor is liable to comply with those requirements

2.Should the contractor deviate from the conditions and requirements of the EMP and/or Environmental Authorisation (if applicable), the contractor is liable for non-compliances, rectification, and associated fines thereof

3.This EMP does not exempt the Contractor from complying with other relevant legislations related to the construction activities.

Specialist Studies/Report				
Environmental Authorisation (If applicable)				
Water Use Licence /General Authorisation (If applicable)				

SCORE ANALYSIS		
	Satisfactory (Approved)	Requirements have been met
0.00%	Unsatisfactory (Not Approved)	Requires substantial improvement / partially achieved

ENVIRONMENTAL REQUIRED DOCUMENTS		
1	Copy EMP and signed acknowledgement letter for JW EMP	0
2	SHE/ELO appointment letter	0
3	Contractor Environmental Induction presentation	0
3	Environmental Toolbox talk and copy of attendance register template	0
5	Environmental Objective (Site specific)	0
6	Environmental Policy Statement	0
7	**Registers**	0
3	Legal Register (Site specific)	0
9	Environmental Aspect and Impact register (site specific)	0
10	Permit register	0
11	Non-Conformance Register	0
12	Waste register template	0
13	Complaint register	0
14	Incident register	0

15	Method statement register	0
16	Hazardous substances register	0
17	Daily Environmental checklist/ weekly checklist and spill kit checklist	0
18	Spill kit checklist	0
19	**Method statements or procedures**	0
20	Document control procedure	0
21	Storm water management plan/ Erosion control	0
22	Alien invasive and weeds control plan	0
23	Hazardous Management Plan/ Procedure (i.e., handling of hazardous substances)	0
24	Method statement for the activities to be undertake/ (include environmental aspects on the technical MS)	0
25	Waste management plan/ Method statement for waste management	0
26	Incident report template (Flash report/Investigation report)	0
3	Emergency Response Plan	0
28	Training Matrix	0
29	Dust Management Plan or Method Statement for dust suppression	0
30	Contractor Audit procedure/template	0
31	Rehabilitation Plan or Method Statement for Rehabilitation/Reinstatement	0
TOTAL		**0**

Annexure C: Environmental Work instruction

ENVIRONMENTAL MANAGEMENT (EM) SITE INSTRUCTION Document No: JW- EMS-HO—R014	

1. All JW rules and regulation including JW Environmental Management Plan and other applicable legislation, standard and by-laws must be adhered to at all times.
2. Copies of Environmental Authorisation, Water Use License/General Authorization, Rehabilitation plan, EMP shall be kept on site **(where applicable).**
3. All JW sites must have waste bins, drip trays, spill kit and designated hazardous storage **(where applicable).**
4. Only registered Waste Service providers who comply with National Environmental Management Waste Act and Municipal By-laws shall be appointed.
5. No burning or burying of waste is allowed on site.
6. The conservation of water and the use of energy efficiently shall be implemented in all JW sites.
7. The letter from City Parks for occupying the open space shall be received and kept in the file and if the land belongs to the private owner, the copy of an agreement letter shall be kept in the file **(where applicable).**
8. The photos are taken before and during and after the project **(where applicable).**
9. The Environmental file must be approved before the commencement of works on site **(where applicable).**
10. The Environmental file will be kept on site all the times and shall be made available to competent authority and JW environmental representative **(where applicable).**
11. Rehabilitation/ reinstatement of the site must be done as per the JW EMP, rehabilitation method statement.
12. The hazardous waste must only be stored not more than 90 days on site as per the legislation.
13. Only asbestos registered service providers shall be appointed to handle and dispose asbestos to registered landfill site.
14. No mixing of general and hazardous waste will be allowed.
15. No cutting of trees is allowed on site without permit.
16. If archaeological artefacts or anything of heritage importance are found at JW sites/ servitude Environmental Section must be informed.
17. Everyone working within JW sites shall familiarize with the EMP requirements and other applicable JW environmental procedures.

18. All the environmental incidents shall be reported within 24 hours to JW environmental Section.
19. Ensure that all JW employees and its service providers or suppliers receive environmental induction.
20. All work must be carried out under close supervision by the competent persons.
21. Repetitive findings or non-compliances shall be avoided.
22. Topsoil stockpile shall be protected by erosions control berms if it is exposed to a period of 14 days during wet season (where applicable).
23. Only 150mm of topsoil shall be removed and stockpile at a height of not more than 1m.
24. All hazardous material must be stored on a bunded and ventilated storage, and MSDS must be available for all of them.
25. No painting or marking of natural features is allowed on site.
26. Pollution of the environment shall be prevented all the times.
27. No leaking mobile plant is allowed on site.
28. Dust control measures shall be implemented on site (where applicable).
29. No sewer spillage shall spill into the storm water or the watercourse.
30. All environmental related incidents and/or emergencies shall be investigated within 48 hours from the date of notice.
31. Killing of fauna and/or Avifauna is prohibited.
32. Alien invasive and weeds must be eradicated.
33. Fumigation shall be done by trained personnel that is registered with DAFF.
34. No smoking is allowed in restricted areas. All such areas are posted appropriately.
35. Personal protective equipment is required to be worn at all times in production areas.
36. Maintain good housekeeping in your work area.
37. Keep fire lanes, roadways, walkways, and aisles free and clear of material.
38. The use of unsafe or defective equipment or tools is not permitted.
39. A contractor or subcontractor shall leave no unused materials on site. At the completion of a project the contractor shall remove all unused material and all waste shall be properly disposed of at a registered landfill site.
40. Any contractor or subcontractor found to be in violation of any EH&S rules can be ejected or escorted off premises if deemed necessary.
41. This file shall be kept on site and will be available at all times to the JW Reps and authorities (upon request).

ENVIRONMENTAL MANAGEMENT PLAN

ACKNOWLEDGEMENT BY MANAGER/CONTRACTOR
I, _____ the Manager/Contractor, do hereby declare that my site/company _____ _____acknowledges having read and understood the conditions contained in this document and furthermore, the employees agree to abide by these conditions.

CONTRACTORS/FACILITY REP.	SIGNATURE	DATE

ENVIRONMENTAL SITE INSTRUCTION		Document No: **JW- EMS-HO—R014**	
Name of Contractor/Facility			
Responsible Manager/ Engineer			
Project No. ***(where applicable):***	Date Issued:	Date of Inspection:	
Environmental Representative:		Designation:	

DISCLAIMER

1.Should there be any other Environmental related activities issued as non-compliance during construction, the contractor is liable to comply with those requirements

2.Should the contractor deviate from the conditions and requirements of the EMP and/or Environmental Authorisation (if applicable), the contractor is liable for non-compliances, rectification, and associated fines thereof

3.This EMP does not exempt the Contractor from complying with other relevant legislations related to the construction activities.

Should the responsible persons fail to comply with any term of this instruction, JW may demand compliance in writing from the defaulting party. Should the defaulting party fail to comply within the stipulated time frames, JW shall take the necessary steps to remedy the situation.	**PROJECT DESCRIPTION**

Reference No. of Non-Conformances	**Action Required**
EM-1.	
EM-2.	
EM-3.	
EM-4.	
EM-5.	
EM-6.	
EM-7.	
EM-8.	
EM-9.	
EM-10.	

Received & Acknowledged by	**Signature**	**Date**
Responsible Manager/Contractor		
Responsible Consultant ***(where applicable)***		

JW Environmental Representative			
JW Project Inspector / Engineer ***(where applicable)***			
Contractor SHE/EL Officer ***(where applicable)***			
COMMENTS BY RESPONSIBLE MANAGER/ENGINEER:		**Target date for corrections**	
		Accepted/Acknowledged by Manager/Contractor	
COMMENTS BY CONTRACTOR *(WHERE APPLICABLE)*:		**Follow up comments by JW Environmental Representative**	

Annexure D: Johannesburg Water General Surface Rehabilitation Specification

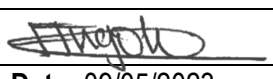
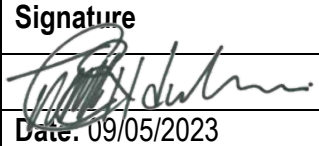
Johannesburg Water General Surface Rehabilitation Specification

Doc No: JW-EMS-CAPEX-T040
Effective Date:14/9/2021

No.	Description	Unit	A Quantity	B Master Rate	C Multiplication factor	D Weighting factor 1	E=A*B*C*D Amount (Rands)
1	Rehabilitation Plan	m2	0	10.05	1	1	0
2	Rehabilitation of disturbed area/s including roads (prepare the ground/level profiling, soil surfaces including	m2	0	22.05	1	1	0
2	Replacement/import of topsoil (if required)	m2	0	22.05	1	1	0
3	Planting of grass/hydroseeding (Including hydro seeding seed mix ratio).	m2	0	22.05	1	1	0
4	Maintenance for 3 months (weed removal, replanting, soil conditioner, erosion repairs etc.)	m2	0	17.4	1	1	0
5	Rehabilitation close-out report	m2	0	10.05	1	1	0
6	Bioremediation (ONLY if applicable for contaminated areas/land) Process to be determined if required.	m2	0	22.05	1	1	0
					Sub Total 1		0

7	Preliminary and General	0	weighting factor 2 1	0
8	Contingencies		0	0
			Subtotal 2	0.00
			VAT (15%)	0.00
			Grand Total	0

Vegetation Management & Maintenance Procedure

Vegetation Management & Maintenance Procedure			
Document No	**JW- IMS-OHSE –P26**		**Effective Date: 09/05/2023**
Compiled by	**Reviewed by**	**Authorised**	**Approved by**
Environmental Section	Thendo Makuya	Joyce Ngobele	Edward Nduvheni
Environmental Section	**Environmental Specialist**	**Environmental Manager**	**OHSE & DM Manager**
	Signatures	**Signature**	**Signature**
			
Date: 30/04/2023	**Date:** 09/05/2023	**Date:** 09/05/2023	**Date:** 09/05/2023

DISCLAIMER

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Table of Contents

DISCLAIMER

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1. This procedure does not exempt the JW and Suppliers from complying with other relevant legislations related to the vegetation management within the City of Johannesburg.

LIST OF TABLES

LIST OF FIGURES

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Abbreviations

Abbreviation	Description
CAPEX	Capital Project
CFL	Compact Fluorescent Lamps
CARA	CARA Conservation of Agricultural Resources Act (Act No. 43 of 1983)
CR	Critically Endangered
COJ	City of Johannesburg
C-Plan Gauteng	C-Plan Gauteng Conservation Plan version 3.3.
DFFE	Department of Fisheries, Forestry and Environment
ECO	Environmental Control Officer
EO	Environmental Officer
ESA	ESA Ecological Support Area
EIA	Environmental Impact Assessment
ELC	Environmental Liaison Committee
EM	Environmental Manager
EMP	Environmental Management Plan
EN	Endangered
ES	Environmental Specialist
FDI	Fire Danger Index
GDARD	Gauteng Department of Agriculture & Rural Development
H:H	High Hazard
HSEP	Health, Safety & Environmental Practitioner
IUCN	International Union for Conservation of Nature
JW	Johannesburg Water
OHSE& DM	Occupational Health Safety, Environment and Disaster Management Manager
OPEX	Operational
PACA	Protected and Conservation Areas
PCO	Pesticide Control Officer
MAP	Mean Annual Precipitation
MSDS	Material Safety Data Sheets

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NEMA	National Environmental Management Act (Act 107 of 1998)
NEM:BA	National Environmental Management: Biodiversity Act (Act 10 of 2008)
NT	Near Threatened
PPC/E	Personal Protective Clothing/Equipment
PS	Project Specialist
SCC	Species of Conservation Concern
SHE	Safety, Health, and Environment
VU	Vulnerable
WM	Works Manager
WwTW	Wastewater Treatment Works

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1. Introduction

This procedure specifically deals with vegetation management and maintenance within Johannesburg Water sites. It sets the minimum standards for vegetation clearing and maintenance. Johannesburg Water has a legal obligation to manage vegetation within its sites.

2. Scope

2.1 Purpose

The purpose of this document is to provide generic guidelines for the management of vegetation in a sustainable manner that will also reduce risk of fire and alien invasive infestation within JW sites

2.2 Applicability

This document will apply to all Johannesburg Water Sites and contractors, suppliers and service providers of Johannesburg Water where significant vegetation management impacts and risks may occur. This procedure will be applied in those areas directly under the control of Johannesburg Water, and due process will be followed to influence the entity or operation to comply with the requirements of this procedure.

3. References

- ISO 14001:2015 Environmental Management System
- Agricultural Pests Act, 1983 (act no. 36 of 1983)
- National Environmental Management Act No. 107 of 1998
- National Environmental Management: Biodiversity Act No. 10 of 2004,
- National Environmental Management: Protected Areas Act No. 57 of 2003
- National Environmental Management: Waste Act No. 59 of 2008
- National Environmental Management: Air Quality Act No. 39 of 2004
- National Veld and Forest Fire Act No. 101 of 1998

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- National Forest Act, Act No. 84 of 1998
- Tobacco Products Control Act No. 83 of 1993
- National Water Act No. 36 OF 1998
- Hazardous Substances Act No. 15 of 1974
- Conservation of Agricultural Resources Act No. 43 OF 1983
- Occupational Health and Safety Act No 85 of 1993 and Construction Regulations 2014
- South African National Legislation and Municipal By-Laws
- Gauteng Conservation Plan (C-Plan; 2011)
- Fertilizers, Farm Feeds, Agricultural Remedies and Stock Remedies Act, 1947 (Act no. 36 of 1947)

4. Definitions

Table 1: Definitions

Definition	Description
Alien species	(a) a species that is not an indigenous species; or (b) an indigenous species translocated or intended to be translocated to a place outside its natural distribution range in nature, but not an indigenous species that has extended its natural distribution range by natural means of migration or dispersal without human intervention (National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004).
Biodiversity	Is defined as the variety and variability among living organisms and the ecological complexes in which they occur (Scott *et al*,1995).
Course certificate	A certificate given to the trainee after undergoing adequate/appropriate herbicide training, as provided by a registered pest control operator.
Critically endangered	Ecosystems that have undergone severe degradation of their ecological structure, function, or composition because of human intervention and are subject to an extremely high risk of irreversible transformation (National Environmental Management: Biodiversity Act (Act No. 10 of 2004)
Ecosystem	A dynamic system of plant, animal and micro-organism communities and their non-living environment interacting as a functional unit (National Environmental Management Act, 1998 (Act No. 107 of 1998).
Johannesburg Water Sites	Any land and/or servitude and/or any real right registered in the Deeds Office in Johannesburg Water name or favour. It also includes rights of way granted to the entity
Habitat	A place where a species or ecological community naturally occurs (National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004)
Herbicide	A chemical substance or cultured biological organism used to control, suppress or

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	kill plants, or severely interrupt their normal growth processes.
Indigenous species	In relation to a specific protected area, means a species that occurred, naturally in a free state in nature within that specific protected area, but excludes a species introduced in that protected area as a result of human activity.1
National Park	(a) an area which was a park in terms of the National Parks Act, 1976 (Act No. 57 of 1976), immediately before the repeal of that Act by section 90(1) of this Act, and includes a park established in terms of an agreement between a local community and the Minister which has been ratified by Parliament; or (b) an area declared or regarded as having been declared in terms of section 20 as a national park, and includes an area declared in terms of section 20 as part of an area referred to in paragraph (a) or (b) of the National Environmental Management: Protected Areas Act 57 Of 2003.
Pesticide	Means any substance or mixture of substances intended to prevent, destroy or control any pest, including vectors of human or animal disease, unwanted species of plants or animals causing harm during or otherwise interfering with the production, processing, storage, transport, or marketing of food, agricultural commodities, wood and wood products, or animal feedstuffs, or which may be administered to animals for the control of insects, arachnids or other pests in or on their bodies. The term includes substances intended for use as a plant growth regulator, defoliant. Desiccant, or agent for thinning fruit or preventing the premature fall of fruit, and substances applied to crops either before or after harvest to protect the commodity from deterioration during storage and transport.
Pest Control Operator	Means a person who as, or in the course of, his trade or occupation administers agricultural remedies for the purposes for which they are intended.
Plantation	Any trees planted and managed by commercial timber growers for commercial purposes (see Commercial Timber Growers' Guideline).
Protected species	Means any species listed as a protected species in terms of section 56.
Servitude	A servitude is a real right (i.e. registered in the Deeds Office against the title deed of an erf), the content of which is to allow limited access to an erf for a specific purpose. It does not entail ownership and must be exercised in a reasonable way, within the boundaries of the specific purpose. In this standard, the reference is specifically to servitudes which allow Johannesburg Water only to build, operate and maintain infrastructure for the supply of water and sanitation purposes.
Special nature reserve	(a) an area which was a special nature reserve in terms of the Environment Conservation Act, 1989 (Act No. 73 of 1989), immediately before the repeal of section 18 of that Act by section 90 of the National Environmental Management: Protected Areas Act, 2003 (Act No. 57 of 2003); or (b) an area declared, or regarded as having been declared, in terms of section 18 of the National Environmental Management: Protected Areas Act, 2003 (Act No. 57 of 2003) as a special nature reserve;

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	© and includes an area declared in terms of section 18 of the National Environmental Management: Protected Areas Act, 2003 (Act No. 57 of 2003) as part of an area referred to in paragraph (a) or (b) above.
Species	A kind of animal, plant or other organism that does not normally interbreed with individuals of another kind, and includes any subspecies, cultivar, variety, geographic race, strain, hybrid or geographically separate population (National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004).
Wayleave	Permission to cross or a right of way across land.
Weed	Any kind of plant which has under section 2 (3) been declared a weed and includes the seed of such plant and any vegetative part of such plant which reproduces itself asexually (Conservation of Agricultural Resources Act, 1983 (Act No. 43 of 1983).
Open Space	Open space is an area identified as a critical biodiversity area or ecological support area in terms of Activity 12 of Listing Notice 3 (GN R.985) of the EIA Regulations (2014) as amended, published under NEMA and will require an EA and municipal by-laws.
Fire danger Index	It provides information on where fire potential is high so fire management officials can plan resources accordingly and thus minimise negative impacts of wildfires. Many fires potential indices have been developed but their usefulness in South Africa has not been verified.
Near Threatened	A taxon is Near Threatened when available evidence indicates that it is close to meeting any of the five IUCN criteria for Vulnerable and is therefore likely to qualify for a threatened category in the near future.

5. Legislative Background

5.1.1 National List of Threatened Ecosystems (2011)

The NEMBA provides for the listing of threatened or protected ecosystems in one of four categories: 'Critically Endangered (CR)', 'Endangered (EN)', 'Vulnerable (VU)' or 'Protected'. Threatened ecosystems are listed in order to reduce the rate of ecosystem and species extinction by preventing further degradation and loss of structure, function, and composition of threatened ecosystems.

5.1.2 Threatened or Protected Species Regulations (2015)

The NEMBA provides for listing of Threatened or Protected Species (TOPS). If a species is listed as threatened, it must be further classified as Critically Endangered (CR), Endangered (EN) or Vulnerable VU). In addition to these categories, protected species are defined as "any species which is of such high

conservation value or national importance that it requires national protection". Species listed in this category include, amongst others, species listed in terms of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES).

Certain activities, referred to as Restricted Activities, are regulated on listed species using permits by a special set of regulations published under the Act. Restricted activities regulated under the Act are keeping, moving, having in possession, importing, and exporting, and selling.

5.1.3 National Forests Act (Act No. 84 of 1998)

An updated list of protected tree species was published under section 12(1) (d) of the National Forests Act (Act No. 84 of 1998) on 7 September 2018 (note that amore recent notice was published on 6 December 2019, but no species list was included). In terms of section 15(1) of the National Forests Act\ (Act No. 84 of 1998), no person may cut, disturb, damage or destroy any protected tree or possess, collect, remove, transport, export, purchase, sell, donate or in any other manner acquire or dispose of any protected tree or any product derived from a protected tree, except under a licence or exemption granted by the Minister to an applicant and subject to such period and conditions as may be stipulated.

GDARD (2014) also requires that surveys be undertaken to determine whether any of the following protected tree species are present on site: Vachellia (Acacia) erioloba, Boscia albitrunca, Combretum imberbe, Ilex mitis var. mitis, Pittosporum viridiflorum, Prunus africana, Sclerocarya birrea subsp. caffra.

5.1.4 National Environmental Management: Protected Areas Act (NEMPAA; Act No. 57 of 2003)

The NEMPAA was promulgated in order to provide for (among other things) the protection and conservation of ecologically viable areas representative of South Africa's biological diversity and its natural landscapes and seascapes, for the establishment of a national Register of Protected Areas, and for the management of those areas in accordance with national norms and standards.

5.1.5 South African Protected Areas Database (SAPAD, 2019) and South African Conservation Areas Database (SACAD, 2019).

The SAPAD and SACAD are Geographic Information System (GIS) inventories of all Protected and Conservation areas in South Africa. The Protected and Conservation Areas (PACA) database2 also includes data on privately owned protected areas. This Register comprises of all data required for the Register of Protected Areas (legally declared) as well as data on Conservation Areas (areas responsibly managed for biodiversity conservation but not legally declared as Protected Areas).

5.1.6 The National Protected Areas Expansion Strategy (NPAES; 2010)

Focus areas for land-based protected area expansion are large, intact and unfragmented areas of high importance for biodiversity representation and ecological persistence, suitable for the creation or expansion of large, protected areas. The focus areas were identified through a systematic biodiversity planning process undertaken as part of the development of the 2008 National Protected Area Expansion Strategy (NPAES).

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

Amendments to regulations under the CARA provide for the declaration of weeds and invader plants, with weeds regarded as alien plants with no known useful economic purpose, while certain invader plants may serve useful purposes as ornamentals, as sources of timber and may provide other benefits despite their aggressive nature. Declared weeds, which are prohibited plants, are described as Category 1 plants, declared invader plants with a commercial or utility value are described as Category 2 plants, and Category 3 plants include mostly ornamental plants of which no further planting is allowed, except with special permission.

5.1.8 Transvaal Nature Conservation Ordinance (TNCO; No. 12 of 1983)

The TNCO provides for the protection of Protected and Specially Protected plant species, as per Schedules 11 and 12 respectively, whereby a permit is required to pick, donate, sell, export, or remove such species. No floral species protected in terms of the TNCO were recorded in the study area. The Gauteng Nature Conservation Bill of 2014, which will repeal the TNCO, has not yet been promulgated.

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5.1.9 National Biodiversity Assessment (NBA; 2018)

The NBA is the primary tool for monitoring and reporting on the state of biodiversity in South Africa. It is prepared as part of SANBI's mandate to monitor and report regularly on the status of South Africa's biodiversity and is a collaborative effort from many institutions and individuals. The NBA focusses primarily on assessing biodiversity at the ecosystem and species level, with efforts being made to include genetic level assessments. Two headline indicators that are applied to both ecosystems and species are used in the NBA: threat status and protection level. The products of the NBA include seven technical reports, a technical synthesis report and several popular outputs (Skowno *et al*., 2019).

5.1.10 Gauteng Conservation Plan (C-Plan) Version 3.3 (GDARD, 2011)

The Gauteng C-Plan v3.3 focuses on the mapping of biodiversity priority areas within Gauteng, as compiled by GDARD (2011). The C-Plan v3.3 was consulted in order to determine if any site-specific

issues and areas are considered to be of increased ecological or conservational importance and sensitivity within the vicinity of the study area.

CBAs are areas containing Irreplaceable, Important and Protected Areas and are defined as areas of the landscape that need to be maintained in a natural or near-natural state in order to ensure the continued existence and functioning of species and ecosystems and the delivery of ecosystem services. In other words, if these areas are not maintained in a natural or near natural state then biodiversity conservation targets cannot be met. Maintaining an area in a natural state can include a variety of biodiversity-compatible land uses and resource uses (SANBI; BGIS 2013).

5.1.11 Gauteng Red List Species Guidelines (2006)

The Gauteng Red List Species Guidelines (2006) aim to facilitate the conservation of the Red List Plant species of Gauteng and are to be used by the Department, applicants and any other person or organisation that is responsible for managing, or whose actions affect, areas in Gauteng where populations of Red List Plant species grow. The purpose of the guidelines is as follows:

To promote the conservation of Red List Plant Species in Gauteng, which are species of flora that face risk of extinction in the wild:

- To promote the conservation of diverse landscapes which forms part of the overall environmental preservation of diverse ecosystems, habitats, communities, populations, species and genes in Gauteng; and
- To provide a decision-making support tool to any person or organisation that is responsible for managing, or whose actions affect, areas in Gauteng where populations of Red List Plant Species grow, whether such person or organisation be an organ of state or private entity or individual; thereby enabling the conservation of the Red List Plant Species that occur in Gauteng.

5.1.12 Gauteng Development Guidelines for Ridges (2001, updated 2004, 2006, 2019)

The Gauteng C-Plan Version 3.3 database (2011) identifies a number of key areas which represent a high diversity of environmental parameters in relatively small areas as CBAs or ESAs. Designated CBA

and ESA areas include the ridges and higher-altitude areas occurring in the Gauteng province, because of the relatively large topographic and geological diversity within these areas, which are critical for ensuring the long-term persistence of both species and ecosystems. These areas include the ecological gradients required to allow species and habitats to adjust to climate change impacts and are also likely to include important refuge areas (City of Tshwane, 2016). The aforementioned is further supported by the GDARD Requirements for Biodiversity Assessments (2014) which states that all ridges must be designated as sensitive.

6. Hydrology, Topography, Climate, and vegetation type

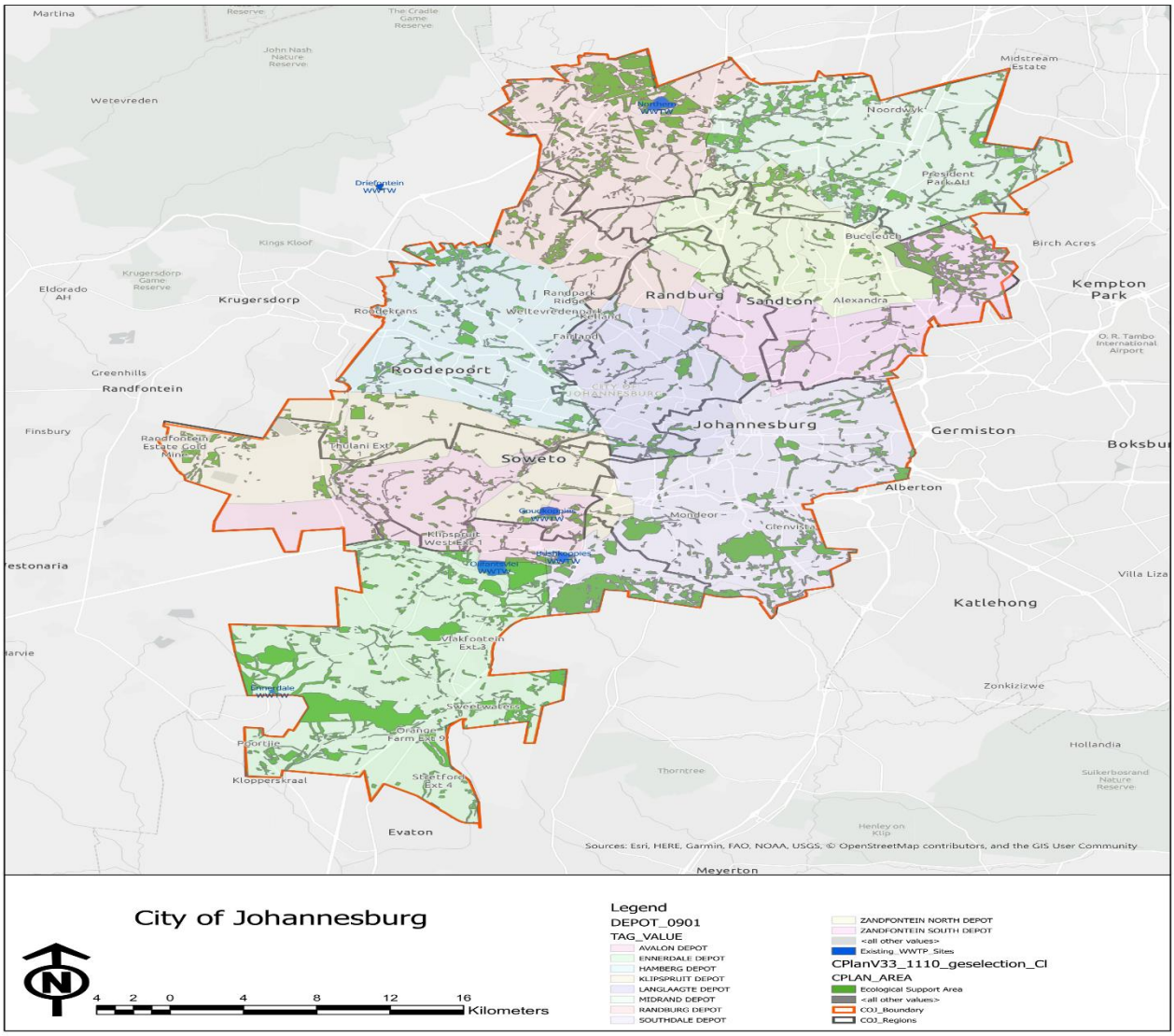

Figure 1: City of Johannesburg

6.1 Soils and Topography

The geology on the southern region of CoJ is characterised by dolomite and chert of the Malmani Subgroup (Transvaal Supergroup) supporting mostly shallow Mispah and Glenrosa soil forms typical of the Fa land type, which dominates the landscapes of this unit. Deeper red to yellow apedal soils (Hutton and Clovelly forms) occur sporadically, representing the Ab land type (Mucina & Rutherford, 2006). On

the northern region, the geology is comprising of granite and gneiss (Huizenga and Harmse, 2005). The granite outcrops in the Jukskei riverbed are a medium-to-coarse-textured pink or grey rock.

6.2 Climate conditions

Gauteng is said to offer one of the world's best climates: summer days are warm and wind free and winter days are crisp and clear. Johannesburg and Pretoria differ in temperature by about 2%, last being the warmer. Johannesburg has a delightfully mild climate, neither humid nor too hot for comfort. There are about six weeks of chill in mid-winter (from July to August). Summer, offering warm African sunshine followed by balmy nights, runs from October to March. The seasons are flexible, one running into the next, and summer habitually spills over into spring and autumn. The nights can be chilly particularly in winter. The rainy season is in summer rather than winter. Rainstorms are often harsh accompanied by much thunder and lightning and occasional hail, but they are brief and followed by warm sunshine.

6.3 Vegetation Type

6.3.1 What is a vegetation?

Vegetation can be described as the group of plants forming the plant cover of a geographic area. As humans, we tend to classify things, and so vegetation has been classified too. Vegetation types are typically used in classifying biomes. South Africa has 7 biomes and Gauteng Province is covered only by two biomes, which are grassland and savannah. See figure 2.

Gauteng is the smallest of South Africa's nine provinces (Figure 1) and is generally regarded as the economic powerhouse of South Africa. It is the most densely populated province in the country with the highest population growth rate and the demand for urban land in this rapidly urbanising province is therefore high

Despite its small size (approximately 18 178 km²), Gauteng is rich in biodiversity. The province is situated within both the savanna and grassland biomes, with approximately 80% of its area designated as Highveld Grassland, one of the two richest primary grasslands in the world, that is also particularly poorly conserved (< 2%) protected) (Low & Rebelo 1996; Mucina & Rutherford2006). An estimated 2183 plant

taxa (SANBI 2013), 125 mammal species (Low & Rebelo 1996), 488 bird species (South African Bird Atlas Project 2), 21 amphibian species (Whittington-Jones et al.2009) and 92 reptile species (Whittington-Jones *et al* 2008) occur in Gauteng. At least 11 taxa are endemic to the province.

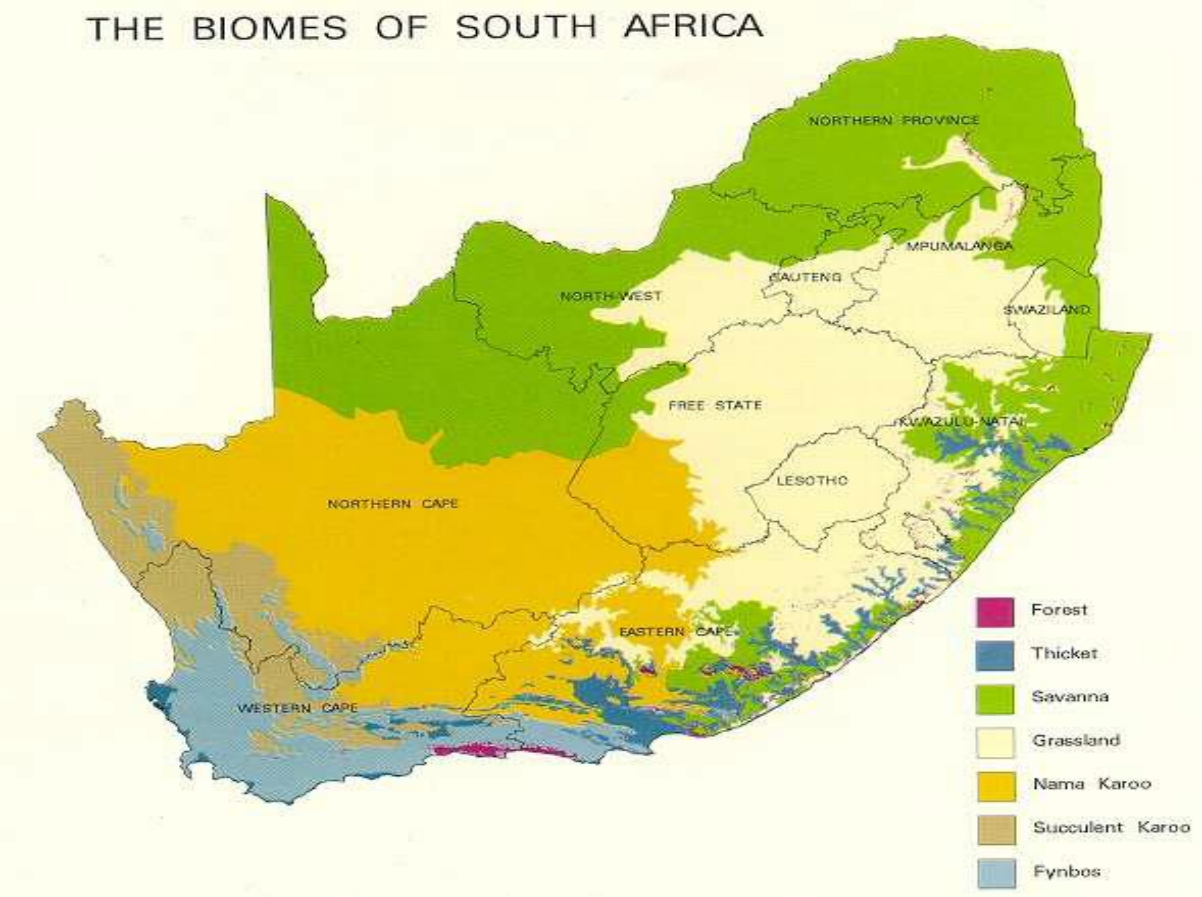

Figure 2: The Biome of South Africa

Most of Gauteng is part of the grassland biome, dominated by grass species, bulbous plants and smaller trees or bushes. These are not green in the same way as a forest would be, and do not show up as green on the map, but they are very important in their own right. The CoJ is dominated by grassland biome.

6.3.2 The type of Biomes that are found in the City of Johannesburg

6.3.2.1 Grassland Biome

The grassland biome is found mainly on the high central plateau of South Africa, and the inland areas. The topography is mainly flat and rolling but includes the escarpment itself. Altitude varies from near sea level to 2850m above sea level. It is a summer rainfall region with an average of 450mm – 1900mm of rainfall per year. Grassland is generally dominated by a single layer of grasses. The amount of cover depends largely on rainfall and degree of disturbances i.e., fire or grazing which also results in trees being absent expect in a few smaller more localised habitats. This biome supports a large variety of plant and animal life due to its variable climate conditions based on altitude.

There are two categories of grass plants: sweet grasses have a lower fiber content, maintain their nutrients in the leaves in winter and are therefore palatable to stock. Sour grasses have a higher fiber content and tend to withdraw their nutrients from the leaves during winter so that they are unpalatable stock and have low nutritional value. At higher rainfall and on more acidic soils, sour grasses prevail, with 625 mm per year taken as the level at which unpalatable grasses predominate.

Urbanisation is a major additional influence on the loss of natural areas - the Witwatersrand (Greater Johannesburg) is centered in this biome. The Grassland Biome is considered to have an extremely high biodiversity, second only to the Fynbos Biome. Rare plants are often found in the grasslands, especially in the escarpment area. These rare species are often endangered, comprising mainly endemic geophytes or dicotyledonous herbaceous plants. Very few grasses are rare or endangered.

6.3.2.2 Savannah Biome

Savanna is described in broad terms by Scholes as consisting of a two layered structure (tree and grass layer) within intermediate layer of shrubs that is sometimes present. These groups of lants are inter-linked and activity in the tree and bush layers will have an effect on the grass layer. Fire in savannas is limited by the availability of grass fuels and the sparse grass production in arid savannas usually does not support fire. Rainfall, soils and grass production should therefore form an important part of the vegetation management strategy.

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A phenomenon known as bush densification occurs when the natural balance between the grass, shrub and tree layers is disturbed through change in interaction with grazers, browsers, and the exclusion of fire. Bush densification, as defined above, represents a problem in the savanna biome as it produces an abundance of fine fuels for fire.

The clearing of this biome generates a high volume of cut material, which poses a fire risk of it own. The clearing activities should therefore be done in a way that reduces the fire risk within JW sites. These activities should also be done in a way that will not have a negative effect on the remaining plants and soils. Methods of disposing of unwanted material shall follow JW Waste Management Procedure.

7. Vegetation management

7.1 Indigenous Species

What is an indigenous species?

In terms of national Environmental Management Biodiversity Act (Act 10 of 2004), means a species that occurs, or has historically occurred, naturally in a free state in nature within the borders of the Republic, but excludes a species that has been introduced in the Republic as a result of human activity.

7.1.1 Management of Indigenous Vegetation within City of Johannesburg

- Various species of indigenous vegetation are protected by law in terms of which is necessary to obtain a permit from the relevant authority, in order to cut them. The list of “protected tree species under the national forest act, 1998 (Act No 84 of 1998)” Gazetted by the department of Forestry, Fisheries and Environment from time to time: will be sourced and referenced by the of the specific requirements in terms of protected species.
- No protected vegetation as per above act shall be cut without the required permits or licences. Where there is any doubt as to whether a plant species is protected or not, the Department of Forestry, Fisheries, and the Environment (DFFE) or JW Environmental Section shall be consulted. At JW sites all vegetation proclaimed in terms of the Regulation shall be subject to control in terms of legislation.
- The responsibility for obtaining the appropriate permit/s from the relevant authority will be that of Johannesburg Water.

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- Indigenous vegetation which does not interfere with the safe operation of the plant/construction site should be left undisturbed.
- Vegetation should be trimmed where it is likely that it will affect the safe operations.
- Any illegal cutting or felling of a tree without a wayleave or permission letter from City of Parks leads to issuing of penalties.

7.2 Disposal of unwanted materials

The disposal of large quantities of cut materials generates its own problems. The stacking of cut material around the site may pose fire threat to the site. It has also the potential to sterilise the seedbed under hot burning conditions.

Cut material can be spread equally inside and avoid the disposal of cut materials, which may come with an additional cost. In certain areas cut wood may be utilised as firewood. However, everything must follow the JW internal procedure.

7.3 Threatened Species, Species of Conservation Concern, and provincially protected plants

According to the South African Red data list categories done by SANBI, threatened species are species that are facing a high risk of extinction. Any species classified in the IUCN categories Critically Endangered, Endangered or Vulnerable is a threatened species whereas Species of conservation concern are species that have a high conservation importance in terms of preserving South Africa's high floristic diversity and include not only threatened species, but also those classified in the categories Extinct in the Wild (EW), Regionally Extinct (RE), Near Threatened (NT), Critically Rare, Rare, Declining and Data Deficient - Insufficient Information (DDD).

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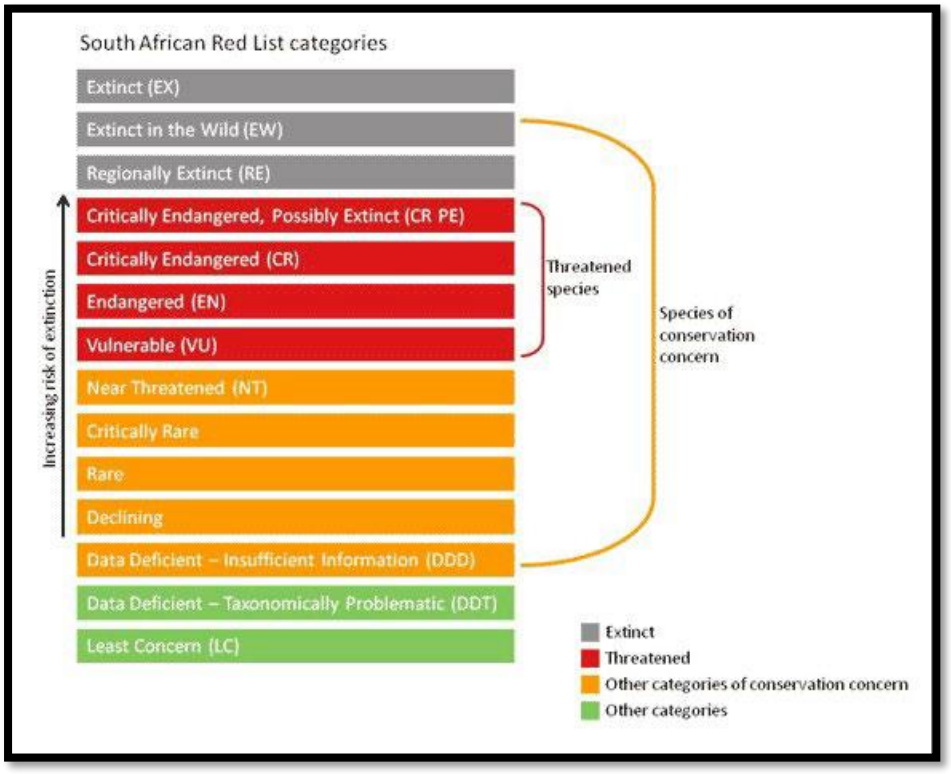

Figure 3: South African Red Data list categories

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Table 2: List of indigenous vegetation are found within Johannesburg Water Sites

Common name	Scientific Name	Classification	Photos
Cabbage trees	*Cussonia spp*	The following plant species is listed as "Protected Plants" in terms of Schedule 11 (Section 86 (1) (a)) of Transvaal Nature Conservation Ordinance No. 12 of 1983, namely All species of cabbage trees (Cussonia spp.) (Cussonia paniculata subsp. sinuata). According to the information obtained from GDARD, the threatened and all provincially protected plant species found on site, should not be disturbed or destroyed, and incorporated into the landscaping around the project site. Where this proves not to be possible, a permit will be required from GDARD to transplant this plant species outside of the project site.	

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African potato	*Hypoxis hemerocallidea*	A plant species such as *Hypoxis hemerocallidea*, is listed as Orange Listed Plant species. Orange lists are those within the Red list that are categorised as rare, Data deficient, declining or near threatened. *Hypoxis hemerocallidea* occurs in an open grassland and woodland and is widespread in South Africa in the eastern summer rainfall provinces (Eastern Cape, Free State, KwaZulu-Natal, Mpumalanga, Gauteng and Limpopo). This species used to be classified as Declining (Raimondo et al 2009), but now de-classified as Least concern. Species classified as Least concern are considered at low risk of extinction and are widespread and abundant, however, GDARD has indicated that this species must	

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		remain classified as Orange list plant species due to its provincial level pressures. Therefore, in order to mitigate the impacts to this plant species, a Search, Rescue and Relocation Plan should be developed and must be supervised by a competent Ecologist/Botanist.	
Albuca virens	*Ornithogalum tenuifolium*	Is known as a medicinal plant species. However, if the translocation of these plant species, a Permit from GDARD is required.	

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Spotted aloe Kgopane	*Aloe greatheadii var. davyana*	Is known as a medicinal plant species. However, if the translocation of these plant species, a Permit from GDARD is required.	

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White stinkwood	*Celtis Africana*	One of Southern Africa's most attractive indigenous trees, and one of the finest trees coming into leaf in spring, when it produces magnificent pale green foliage. It is a fairly rapid grower that casts dense shade and is semi-hardy to frost. Many white stinkwood trees in the Pretoria area have a virus that gives the leaves a yellow margin or tips. This tree attracts birds and insects to the garden.	

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Olive Tree	*Olea Europeea*	The olive tree is a beautiful slow-growing evergreen tree with a short trunk, vast crown, numerous branches, and oblong, silvery-green leaves up to 4 inches (10 cm) in length. The height of the olive tree may seek more than 40 feet (12 meters), however, most olive trees grow to an ultimate height of about 25 feet (7.5 meters).	

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(Afr) Basboom, Kannabas, Speldekussing. (Eng) Dias, Pincushion tree, Pompon-tree. (siSwati) inTfocwane. (isiXhosa) Intozane. (isiZulu) intozane-emnyama.	*Dais cotinifolia L.*	Dais cotinifolia, known as the pompom tree, is a small Southern African tree belonging to the Thymelaeaceae family. It occurs along the east coast northwards from the Eastern Cape, inland along the Drakensberg escarpment through KwaZulu-Natal and the Transvaal, with an isolated population in the Eastern Highlands of Zimbabwe.	

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7.3.1 Potential occurrence of Red Data plant species

Data sourced from GDARD and SANBI website (BODATSA) indicates that there are plant species on the Red Data List that are known to occur in or on areas surrounding JW Sites. The Probability of Occurrence is based on suitable habitat and known distribution ranges. The plant species and their probability of occurrence are indicated in Table 3 below. Only plant species which have higher probability to occur on the area are shown in the table below.

Table 3: Probability of occurrence of Red Data Plant species which could potentially occur on the project

Species	Threat status	Suitable habitat and ecology	Probability of Occurrence
Northern Region			
Stenostelma umbelluliferum	Near Threatened	Deep black turf in open woodland mainly in the vicinity of drainage lines	Low
Aloe peglerae	Critically Endangered	It occurs in shallow, gravely quarzitic soils on rocky, north-facing slopes or summits of ridges.	Low
Cleome conrathii	Near Threatened	Stony quartzite slopes, usually in red sandy soil, grassland or deciduous woodland, all aspects.	Low
Adromischus umbraticola sbsp. umbraticola	Near Threatened	South-facing rock crevices on ridges, restricted to Gold Reef Mountain Bushveld in the northern parts of its range, and Andesite Mountain Bushveld in the south.	Low
Melolobium subspicatum	Vulnerable	Grassland	Low

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Pearsonia bracteata	Near Threatened	Plateau grassland.	Low
Bowiea volubilis subsp. volubilis	Vulnerable	In Gauteng, Mpumalanga and Northwest Provinces, it is often found in open woodland or on steep rocky hills usually in well-shaded situations. Tolerates wet and dry conditions, growing predominantly in summer rainfall areas	Low
Drimia sanguinea	Near Threatened	Open veld and scrubby woodland in a variety of soil types.	Medium
Prunus africana	Vulnerable	Evergreen forests near the coast, inland mistbelt forests and afromontane	Low
Habenaria mossii	Endangered	Open grassland on dolomite or in black, sandy soil.	Low
Southern Region			
Boophone disticha (L.f.) Herb.	Least Concern	In dry grassland and rocky areas	Low
Ilex mitis (L.) Radlk. var. mitis	Least Concern	Grows on the banks of rivers and streams and moist spots in woods and forests	Medium
Callilepis leptophylla Harv.	Least Concern	Grassland or open woodland, often on rocky outcrops or rocky hillslopes.	Low

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Cineraria austrotransvaalensis Cron	Near Threatened	Amongst rocks on steep hills and ridges, at the edge of thick bush or under trees on a range of rock types: quartzite, dolomite and shale	Low
Melolobium subspicatum Conrath	Vulnerable	Grassland.	Low
Pearsonia bracteata (Benth.) Polhill	Near Threatened	Occur in gently sloping Highveld grassland	Low
Hypoxis hemerocallidea Fisch., C.A.Mey. & Avé-Lall.	Least Concern	Occurs in a wide range of habitats, from sandy hills on the margins of dune forests to open rocky grassland;	Low
Brachycorythis conica (Summerh.) Summerh. subsp. transvaalensis Summerh.	Critically Endangered	Short, open grassland and wooded grassland, on sandy gravel overlying dolomite, sometimes also on quartzite, 1 000-1 705 m.	Low
Habenaria barbertoni Kraenzl. & Schltr.	Near Threatened	In grassland on rocky hillsides.	Low

7.4 Alien and Invasive Species

What is an alien and invasive species?

A species that is not an indigenous species; or an indigenous species translocated or intended to be translocated to a place outside its nature distribution range in nature, but not an indigenous species that has extended its natural distribution range by natural means of migration or dispersal without human intervention.

What does the regulations say about alien and invasive species?

The NEMBA Alien and Invasive Species Regulations (2014) aims to:

- Prevent the unauthorised introduction and spread of alien and invasive species to ecosystems and habitats where they do not naturally occur.
- Manage and control alien and invasive species, to prevent or minimise harm to the environment and biodiversity; and
- Eradicate alien and invasive species from ecosystems and habitats where they may harm such ecosystems or habitats.

Categories according to the Alien and Invasive Species Regulations (2014) are as follows:

- **Category 1a**: Invasive species requiring compulsory control. Plants are to be removed and destroyed. Any Category 1a listed plants must be combatted or eradicated.
- **Category 1b**: Invasive species that require control by means of an invasive species management programme.
- **Category 2:** Invasive species which require a permit to carry out a restricted activity within an area, as specified in the permit. If an Invasive Species Management Programme has been developed, a person must control the listed invasive species in accordance with such a programme.
- **Category 3**: Any plant species identified as a Category 3 Listed Invasive Species that occurs in riparian areas, must, for the purpose of the regulation be considered to be a Category 1b Listed Invasive Species. If an Invasive Species Management Programme has been developed, a person must control the listed invasive species in accordance with such a programme.

The NEBMA Alien and Invasive Species Lists (2016) include national lists of invasive species to be read together with the Alien and Invasive Species Regulations (2014). A list of alien floral species recorded in the study area, including the applicable alien and invasive species category is included in Section. See below.

Who is allowed to utilise pesticide in terms of Fertilizers, Farm Feeds, Agricultural Remedies and Stock Remedies Act, 1947 (Act No. 36 of 1947)?

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Any person who for reward OR in the course of a business, industry or trade uses an agricultural remedy must register as a Pest Control Operator in terms of the Fertilizers, Farm Feeds, Agricultural Remedies and Stock Remedies Act, 1947 (Act No. 36 of 1947) as amended and the regulations relating thereto as published in Government Notice No. R1449 of 1 July 1983.

7.4.1 Management of Alien and Invasive Species

- Map the extent of invasion as well as density and height of alien species.
- Determine costs and priorities and produce a plan of operations detailing Initial control (drastic reduction of the existing population), Follow-up control (control of seedlings and coppice re-growth) and Maintenance (on-going, low-level control) and include targets and timeframes.
- Prioritise the clearing of the most lightly infested areas first
- Prioritise the clearing of highly invasive species which may not have become well established to date.
- Prioritise clearing before the burning of a block
- Prioritise clearing within the first season after a burn.
- Prioritise follow up clearing.
- To restore/rehabilitate areas cleared of alien vegetation.
- Keep record of clearing operations and stands.

Where should you start?

- The area immediately around buildings if there is a risk of fire.
- Low-density infestations, to curb the spread of invasive plants into surrounding areas.
- The tops of slopes, watercourses, and steep, long bare slopes, to inhibit the spread of seeds downhill or downstream, where they will infest new areas.
- Sites where initial control work has been completed and regrowth is present, to prevent densification and further infestation.
- Disturbed sites, to prevent new infestations from mass germination of alien seeds in the soil.
- Seedlings should be controlled when shorter than 0.5 m to avoid costly control work at a later stage.

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7.4.2 Control Methods

The following section contains generic guidelines/principles for the removal of alien plants. Specific removal methods for each plant are provided further below.

Invasive alien plant control relies on four main methods - manual, mechanical, chemical and biological control. Long-term success of any programme is best achieved through a combination of these. This is called an integrated control approach.

7.4.2.1 When using herbicide

Do

- Spray when plants are actively growing, ensure that herbicide is mixed according to label application rates,
- Always ensure correct wearing of safety gear,
- Plan the application of herbicides before the operation commences,
- Spray when the sun is shining,
- Use a drip sheet and keep herbicide in a demarcated area in the veld out of direct sunlight,
- Apply spray to the canopy and stems,
- Include dye to assist in the identification of areas that have been cleared,
- include a wetting agent should be added to the herbicide mix to allow for better absorption.

Do not

- Spray during strong wind, or where there is the slightest evidence of drift,
- Spray when it is very hot,
- Spray when plants are stressed or dormant,
- Apply herbicide in the rain or on wet, damp leaves,
- Allow pregnant women to be directly involved in herbicide operations, or spray near children, animals, or water bodies.

Using labour intensive methods

- Always start at the highest point and work downwards i.e., downhill, or downstream
- Start from the edge of the infestation and work towards the centre

Hand pulling

- Hand pulling is most effective with small (30cm), immature or shallow rooted plants.
- Shake the excess sandy material from the plant, this makes the plant easier to stockpile and lighter to transport.

Chopping/ cutting/ slashing

- This method is most effective for plants in the immature stage, or for plants that have relatively woody stems/ trunks.
- This is an effective method for non-resprouters or in the case of resprouters (coppicing), if done in conjunction with chemical treatment of the cut stumps.
- Cut/slash the stem of the plant as near as possible to ground level.
- Paint resprouting plants (i.e. black wattle, lantana and port jackson) with an appropriate herbicide immediately after they have been cut.
- Stockpile removed material into piles as prescribed.

Basal bark

- Application of suitable herbicide in water can be carried out to the bottom 250mm of the stem. Applications should be by means of a low pressure, coarse droplet spray from a narrow angle solid cone nozzle or by using a paintbrush.
- If plant is multi stemmed, then each stem needs to be treated.

Ring barking

- Remove the bark and cambium around the trunk of the tree in a continuous band around the tree at least 25cm wide, starting as low as possible.
- Where clean de-barking is not possible due to crevices in the stem or where roots are exposed, a combination of bark removal and basal stem treatments should be carried out.

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- For aggressively coppicing species pull off the bark below the cut to ground level (bark stripping), to avoid the use of herbicide.
- This method is not used for stands but rather individual large trees

Bark stripping

- All the bark shall be stripped from the trunk between the ground level and 1m above ground level. Application of suitable herbicide can also be used with this method.
- Applications should be by means of a low pressure, coarse droplet spray from a narrow angle solid cone nozzle or by using a paintbrush.

Frilling

- Using an axe or bush knife, make a series of overlapping cuts around the trunk of the tree, through the bark into the softwood (Approximately 500mm from ground level).
- The thickness of the blade should force the bark open slightly, ensuring access to the cambium layer.
- Ensure to affect the cuts around the entire stem.
- Apply the herbicide immediately to the cuts by spraying into the frill. The frill needs to be deep enough to retain the herbicide.

Using mechanical methods

Felling

- De-branch cut trees and where possible remove all material.
- Where possible large trees are to be felled so that they fall uphill.
- Cut the plant down as low as possible to the ground.
- Apply herbicide immediately (no later than 30mins) to the cambium layer.
- Ensure all the cuts in the cambium layer are treated.

Bark stripping

Where bark stripping is used, then all the bark shall be stripped from the trunk between the ground level and 1m above ground level.

- Application of suitable herbicide can also be used with this method.
- Applications should be by means of a low pressure, coarse droplet spray from a narrow angle solid cone nozzle or by using a paintbrush.

Using chemical control

- Chemical control of alien plants is not recommended in aquatic systems due to the risk of pollution but may be used on the floodplain in conjunction with cutting or slashing of plants.
- Chemicals should only be applied by qualified personnel.
- Only herbicide registered for use on target species may be used.
- Follow the manufacturer's instructions carefully.
- Appropriate protective clothing must be worn.
- Only designated spray bottles to be used for applying chemicals.

Injection

- Drill or punch downward slanting holes into the tree around the entire circumference of the stem.
- Inject the chemical directly into the plant.

Foliar spray

- Use a solid cone nozzle that ensures an even coverage on all leaves and stems to the point of runoff.
- Do not spray just before rain (a rainfall-free period of 6 hours is recommended) or before dew falls.
- Avoid spraying in windy weather as the spray may come into contact with non-target plants.
- Spraying dormant or drought stressed plants is not effective as they do not absorb enough of the herbicide.

Cut stump application

- This is a highly effective and appropriate control method for larger woody vegetation that has already been cut off close to the ground.
- The appropriate herbicide should be applied to the stump using a paintbrush within 30 min of being cut.
- Stems should be cut as low as possible. Herbicides are applied in water as recommended for the herbicide.

Stacking

- Stacking the cut material in heaps, or in windrows along mountain contours to reduce erosion, facilitates easy access for follow up.
- It also assists in containing the resulting fuel load and therefore the risk of uncontrolled fire.
- Keep stacks well apart to prevent fires from crossing easily, not less that fire meters apart, this is naturally dependant on the size of the stack & the resulting fire intensity when they burn.
- Stockpile removed material into piles of 2m high, 3m wide windrows/stacks.
- Stack light branches separately from heavy timber (75mm and more). Preferably remove heavy branches to reduce long burning fuel loads that can result in soil damage from intensely hot fire.
- Do not make stacks under trees, power and telephone lines, within 30 meters of a fire belt or near watercourses, houses and other infrastructure.

Disposal of plant material

- Plant material should be used beneficially wherever possible, as opposed to disposing it at a landfill site where it takes up valuable airspace.
- Woody and dry material, provided no seeds are present, can be chipped and used as mulch or made available to the local community for firewood.
- Wet material and aquatic weeds should be combined with other organic matter and composted. Alternatively, it may be possible to use it for basket making, animal feed or other uses.
- Material which cannot be used beneficially must be disposed of at a registered and approved disposal site.
- When removing material, take care to remove all debris, including shoots and seeds.

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Monitoring

- Follow-up inspections are required in order to establish whether follow-up operations are required.
- It is preferable to follow up on an area and remove all seedlings or treat resprouting plants, rather than treat a new area.

Table 4: List of alien plant are found at Johannesburg Water Sites and control method

Common name & CARA Category	Scientific name	Control Method	Photos
Black Wattle CARA 2	*Acacia mearnsii*	Seedlings/saplings can be pulled out by hand. Immature plants can be removed with hand tools. Intermediate sized plants should be cut at ground level, with the root being treated with herbicides. Mature plants can be cut/sawed. Herbicides should be applied to the stump as soon as possible thereafter (within 30 min). The suitability of the use of herbicide near water should be considered i.e., some herbicides may pollute the downstream environment. For seedlings a foliar spray of 150ml Mamba (Glyphosate) per 10l of water can be applied at a rate of 3 l/ha. A foliar spray of 25-75ml of Garlon 4/Viroaxe (Triclopyr Ester) can be mixed with 10l of water and applied at a rate of 0.5-1.5 l/ha. For young trees a foliar spray of 75ml of Garlon 4/Viroaxe (Triclopyr Ester) can be mixed with 10l of water and applied at a rate of 3 l/ha. Cut	

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		large/mature trees, the stump can be treated with 3 l of Timbrel 3A (Triclophyr Amine salt) mixed in 100 l of water applied at a rate of 1.5 l/ha. Application of herbicides is more successful in conjunction with mechanical means. Biological control is available, when cutting down the trees, the stump fungus should be applied to the cut stumps.	
Seringa CARA 3	*Melia azedarach*	Foliar Spray Confront 0.75% Solution. Cut Stump Confront 3% Solution. Frill Confront 3% Solution. Basal Stem Garson 2% Solution. Cut Stump Access 2% Solution.	

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Lantana camara Category 1b	*Verbenaceae*	To control lantana, one must resort to very thorough and persistent mechanical plus chemical treatment. Lantana biocontrol is nevertheless of value, because it reduces the rate of growth and reproduction of the weed, which reduces the frequency and cost of applying other control measures.	

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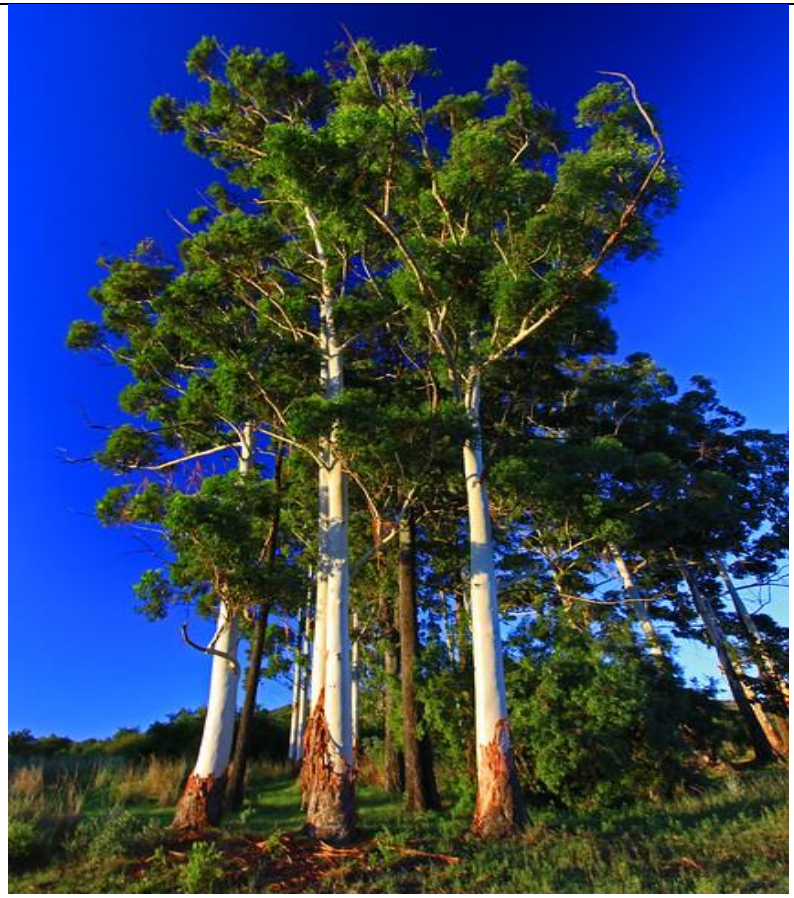
Blue Gums tree CARA 1 & 2	*Eucalyptus spp.*	Can be pulled cut by hand or head. Intermediate sized plants should be cut at ground level with the root treated with herbicides immediately. Mature blue gum can be cut/sawed. Mature Eucalyptus can be cut/sawed. Herbicides should be applied to the stump as soon as possible thereafter (within 30mins). The suitability of using herbicide near water should be considered i.e. some herbicides may pollute the downstream environment. Seedlings can be sprayed using 200g/ha Brush Off (Mersulphfuron Methyl) plus 3l/ha Mamba (glyphosphate). Frill the trunk of mature plants, apply a mix of 1250ml Chopper (Imazapyr) & 10l of water at a rate of 6 l/ha. With a cut stump, apply a mix of 1250ml Chopper (Imazapyr) & 10l of water at a rate of 6 l/ha. If the species is known, check the rate on the label. For spot spraying coppice, apply 16l water, 16gms Brush off, 1% Mamba and 0,5% Actipron. Application of herbicides is more successful in conjunction with mechanical means.	

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		Disposal: Cut material can either be stockpiled for removal or used as erosion barriers. Smaller stemmed material can be stacked for burning or chipping. Seed bearing slash that has been chipped must be left to compost (or to allow seeds to germinate) before being used. Stockpiling should be avoided within a flood plain as this could pose a flood risk. It should always be known that stacked material poses a fire hazard and burns easily.	

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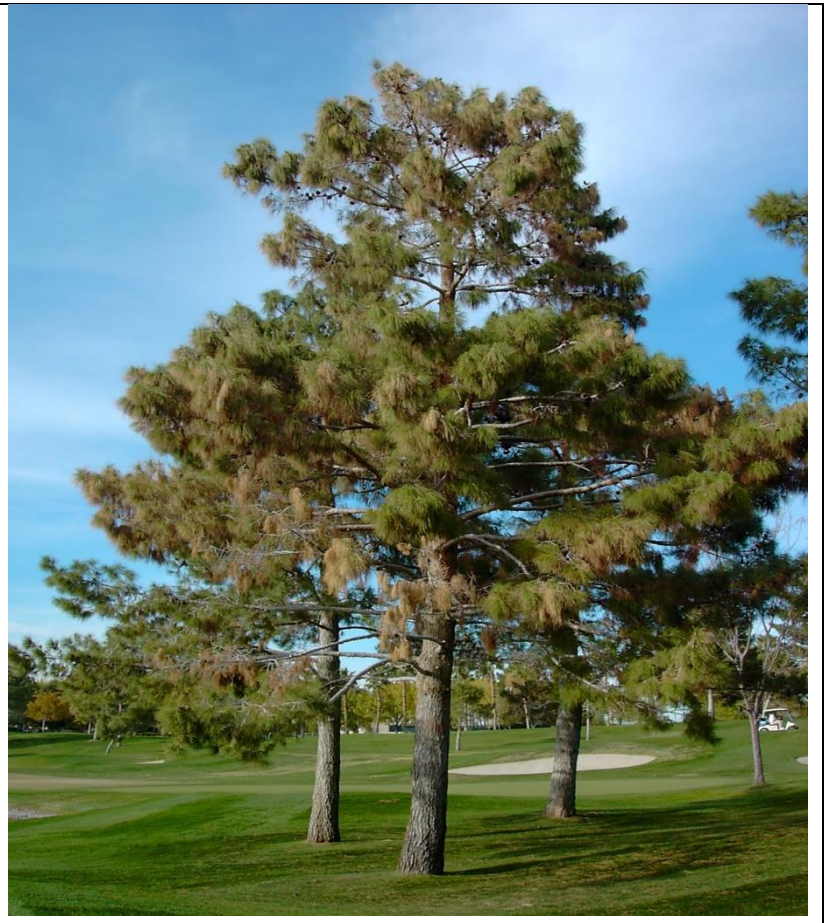
Pine CARA 2	*Pinus pinaster*	Can be pulled out by hand or hoed. Intermediate sized plants should be cut at ground level, with the root being left behind. Mature pine trees can be cut/sawed. Ring barking or filling can also be used. **Disposal:** Cut material can either be stockpiled for removal or used as erosion barriers. Smaller stemmed material can be stacked for burning or chipping. Seed bearing slash that has been chipped must be left to compost (or to allow seeds to germinate) before being used. Stockpiling should be avoided within a flood plain as this could pose a flood risk. It should always be known that stacked material poses a fire hazard and burns easily.	

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Kikuyu CARA 2	*Pennisetum clandestinum*	A herbicide with the active ingredient glyphosate should be used. Plants should be sprayed during their active growing season (summer or autumn dependant on rainfall region). The suitability of using herbicide near water should be considered i.e., some herbicides may pollute the downstream environment. Application of herbicides is more successful in conjunction with mechanical means.	

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Sisal	*Agave sisalana*	**Chemical:** Herbicides containing picloram are affective against seedlings. Direct injection of concentrated MSMA into the hole. Plants can be removed once they have died and dried out. **Mechanical:** Physical removal of plants prior to seeding. Removal of seed heads prior to seeding. Light tillage can destroy seedlings. Physical removal is only possible with bulldozers, which then have impacts on the indigenous vegetation, which is not recommended.	

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Triffid Weed	*Chromoleana odorata*	**Chemical control** C. odorata is most susceptible to chemical control when it is growing vigorously, such as at the beginning of the rainy season. Best control is usually obtained when herbicides are applied to young shoots after slashing. For control of germinating C. odorata, pre-emergence herbicides may be used, such as diuron or metribuzin in yams and cassava, oxyfluoren in cassava, cyanazine+atrazube or atrazine+terbutryn in maize, and dipropetrin in groundnuts and cotton. **Mechanical control** Seedlings and young plants can be removed by hand-pulling, but follow-up clearance every 2-3 months is necessary because of rapid regrowth.	

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Jimson weed	*Datura stramonium*	**Chemical:** Datura stramonium is susceptible to a range of soil and foliar herbicides available for agricultural markets. **Mechanical:** Physical hand-pulling removal of the plants. This should be done when not seeding. If seeding, then the seed heads should be carefully removed and burnt. Tillage will work to some extent with seedlings.	

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Long spined thorn apple	*Datura ferox*	**Chemical:** Datura ferox is susceptible to a range of soil and foliar herbicides available for agricultural markets. **Mechanical**: Physical hand-pulling removal of the plants. This should be done when not seeding. If seeding, then the seed heads should be carefully removed and burnt. Tillage will work to some extent with seedlings.	

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Smelter's-bush	*Flaveria bidentis*	**Mechanical:** Physical hand-pulling removal of the plants. This should be done when not seeding. If seeding, then the seed heads should be carefully removed and burnt.	

		Chemical control: Anecdotal reports suggest a basal stem application of Garlon4 at 2.5% in diesel may be effective. As a foliar application try Garlon4 at 0.5% in diesel. **Mechanical:** No herbicides registered therefore control is usually manual, cutting down the plant and ensuring roots are dug out.	

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Persian Lilac/Syringa	*Melia azedarach*	**Chemical control:** Foliar sprays: Garlon 480 EC or Viroaxe (25-50 ml/10l water) at 0.5 to 2 l/ha. Trees up to 1.5 m: Foliar sprays with Garlon 480 EC or Viroaxe (75 ml/10l water) at 3 l/ha. For mature trees: Cut stump and apply Timbrel 360 SL (300 ml/10l water) at 1.5 l/ha or Mamba 360 SL (200 ml/10l water) at 6 l/ha to freshly cut areas. Frill and apply Mamba 360 SL (2 l/10l water) at 6 l/ha. **Biological control:** Acacia seed weevils **Mechanical** Seedlings & Saplings must be hand pulled or use a hand hoe.	

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Wild tobacco	*Nicotiana glauca*	**Chemical control** Foliar spray with Springbok at 3% with 0.1% wetter. **Manual control** Cut Stump. No herbicide registered for cut stump.	
Sweet prickly pear	*Opuntia ficus-indica*	**Chemical control** Inject MSMA 720 grammes per litre into pre-made holes in the stems of the cactus. **Biocontrol** Biocontrol organisms are available for long-term control of some Cactus species. **Manual control** Manual control should be confined to single plants or very small groups of plants because felling large plants, digging out the roots	

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		and collecting up all the fruits and "cladodes" (pieces of stem) that break off while moving the cactus not only creates disturbance but increases risk of further invasions. Pieces of stem that are left on the soil surface will take root and lead to re-invasion of the site	
Pale persicaria	*Persicaria lapathifolia*	**Manual control** Easy. Seedlings and saplings may be removed by hand	

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Honey mesquite	*Prosopis glandulosa*	**Chemical** Cut Stump and spray with Confront at 4% mix. add 0.5% wetter. Foliar spray with Confront at 1.5% mix, add 0.5% wetter. **Mechanical**: Cut Stump.	

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Yellow firethorn	*Pyracantha angustifolia*	**Mechanical** Cut Stump. No registered herbicide.	

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Caster-oil plant	*Ricinus communis*	**Chemical** Cut Stump and spray with Hatchet at 3%. No need for wetter or dye, already included. **Mechanical:** All mature plants must be cut close to the ground and seedlings & saplings must be hand pulled.	

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Peanut butter cassia	*Senna didymobotrya*	**Mechanical:** All mature plants must be cut close to the ground and seedlings & saplings must be hand pulled.	

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Bugweed	*Solanum mauritianum*	**Chemical** Cut Stump and spray with Lumberjack at 3% mix, with 0.5% wetter. **Biocontrol** Only two insect agents: a leaf-feeding lace bug, *Gargaphia decoris*, and a flower-bud feeding snoutbeetle, Anthonomus *santacruzi*. **Mechanical** Small plants can be uprooted manually, and large plants may be ringbarked at ground level, or cut down close to the ground and the stumps treated with recommended herbicides. The seeds of inaccessible plants will, however, always cause re-invasion of cleared areas, and biocontrol is therefore deemed the most sustainable control option.	

Yellow bells	*Tecoma stans*	**Biological control** Three biological control agents have been developed successfully in South Africa, viz. a rust fungus, *Prospodium* transformans; a leaf feeding lady beetle, Mada polluta, and a leafmining fly, *Pseudonapomyza sp.* **Mechanical:** All mature plants must be cut close to the ground and seedlings & saplings must be hand pulled.	

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Large Cocklebur	*Xanthium strumarium*	**Chemical:** Susceptible to a range of soil and foliar herbicides available for agricultural markets. **Mechanical:** Hand pull. Remove underground parts preferably when not seeding. Remove seed heads carefully and dispose of.	

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	Cirsium vulgare		

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	Crotalaria agatiflora		

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	Solanum sisymbriifolium		

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	Eupatorium macrocephalum		

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Patula pine	*Pinus patula*	**Manual control** Cut Stump. No herbicide necessary Ringbark where needed.	

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7.5 Aliens invasive and weeds control plan

Who is responsible for alien invasive and weeds control?

In terms of national environmental management: biodiversity act, 2004 (Act no. 10 of 2004) alien and invasive species regulations general obligations, any landowner, occupier of land, person in control of land or any person in control of a listed category 1a, 1b and 3 invasive species must prevent the escape and spread of the species, including its growth, or spread of propagules, and must control any specimen that escapes or spreads.

The control methods of alien invasive plants can be broadly classified into three categories:

- **Mechanical** - Mechanical control methods involve the physical destruction or total removal of plants (e.g., felling, strip-barking; ringbarking, hand-pulling and mowing);
- **Chemical** – involves the foliar spraying of herbicides to kill targeted plants.
- **Biological** - involves the release of natural enemies that will reduce plant health and reduce population vigour to a level comparable to that of the natural vegetation.

It is often necessary to use a combination of at least two of these methods to control or remove invasive alien plants (State of the World Plants, 2017). With repeated follow-up, mechanical and chemical control methods tend to be short-term activities suitable for smaller plant invasions that can result in the complete removal of the target species. After the implementation of the method, it is important to evaluate the effectiveness of the method and to monitor the cleared areas on a regular basis to identify emergent seedlings and to remove those immediately. Overall, the management of invasive alien plants in South Africa is of utmost importance as it can increase runoff, improve water quality, minimize fire risk and prevent the extinction of our indigenous vegetation.

Invasive alien vegetation must be removed from environmentally sensitive areas with the least amount of damage to indigenous vegetation, to ensure compliance with the Conservation of Agricultural Resources Act (CARA) regulations. Before any clearing of alien vegetation is initiated, it must be understood that when the programme starts, it must be implemented until completion.

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Table 5: Invasive Species Monitoring, Control and Eradication Plan at JW CAPEX sites

Task	Responsible party	Frequency
1. Clearing of alien species and weeds must be organized an approved by the Site Agent/JW EO	JW/Contractor	As and when required
2. All manual cleared alien plants must be disposed of carefully and must not be dumped in areas of indigenous vegetables	JW/Contractor	As and when required
3. Any exposed construction areas that have been invaded can be sprayed with environmentally friendly herbicides (Only that break down on contact with the soil)	JW/Contractor	As when required
4. Any soil stockpiles that have become invaded should be cleared through manual control methods (weeding)	JW/Contractor	Throughout construction
5 Areas that will be vegetated through rehabilitation must be done through rehabilitation plan; no organic matter from outside the site should be used to encourage regrowth of vegetation.	JW/Contractor	Post Construction Phase
6. Introduction of alien plant species and weeds to the site should be prevented as far as practicable, vehicles entering should be inspected, outside sources of soil and sand should be inspected, and outside sources of soil and sand should be clear weeds and invasive species.	JW/Contractor	Throughout construction phase
7. Alien invasive species must be controlled throughout the entire site during the construction process.	JW/Contractor	Monitored Monthly
8. Any no-go areas such as watercourses such as wetlands should be demarcated, and workers should be informed that no activities should occur in these areas.	JW/Contractor	Monitored Daily
9. To prevent increased invasion in areas cleared for construction but not needed for operation, rehabilitation of the natural vegetation should be done.	JW/Contractor	Post construction phase

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10. Weeds establishment in construction areas should be monitored and controlled as per the act.	JW/Contractor	Throughout construction phase
11. For the management of vegetation on site, grass cutter will be utilised.	JW/Contractor	Throughout project
12. No removal of trees will take place without a **wayleave or permit**	JW/Contractor	Throughout project

8. Fire Management

Fire in the ecosystem is an ecological process and part of our environment. It has a fundamental role in sustaining biodiversity. However, if fire is mistimed, occurs too frequently or too seldom, or is too severe, it may result in ecosystem degradation e.g.

- Bush encroachment
- Invasions by alien plants
- Decrease in forage palatability and productivity and
- Reduction in water yield
- Burning too seldom is as damaging as burning too often.
- A build-up in fuel load increases both the risk of damage to life and property as well as the possibility severe burns that lead to soil erosion or the death of otherwise resilient organisms.
- The regions of high and extreme veldfire risk are all especially prone to these environmental consequences of inappropriate veldfire regime.

8.1 Elements of Fire Prevention Planning

- Implementation of Fire danger index
- List all major fire hazards.
- Proper control of hazardous materials including flammable and combustible liquids.
- Control potential ignition sources.
- List fire protection equipment.
- Regular inspection and maintenance.

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8.2 Combustibles Materials

- Ordinary combustible materials, like paper, cardboard, wood, and products made from these materials can present a fire hazard when they are allowed to accumulate or are stored improperly.
- Foam or plastic cups, utensils, materials close to heat sources burn rapidly and give off dense, toxic, black smoke
- Oily rags or other materials soaked in oil can spontaneously combust if placed in areas where the air does not circulate.

8.3 Flammable Materials

- The unsafe use, storage, dispensing, or disposal of flammable materials can be a prime source of fires and explosions.
- Read labels of all spray cans to identify those with flammable gas-propellants.
- Any operation involving heated materials or open flames can present a fire hazard.
- Hot work procedures have been developed and are part of this program.
- Any operation involving heated materials or open flames can present a fire hazard.
- Hot work procedures have been developed and are part of this program.

8.4 Electrical, Machines and Housekeeping issues

- Small portable fans can pose a fire hazard if they are placed near combustible materials, or where the blades of the fan can easily catch items.
- Damaged wiring on portable fans and mounting portable fans in walls also increase your fire risk.
- Extension cords and multiple plug adapters may only be used for temporary operations.
- Damaged wiring, and defective switches and outlets can all lead to electrical fires.
- Small portable fans can pose a fire hazard if they are placed near combustible materials, or where the blades of the fan can easily catch items.
- Damaged wiring on portable fans and mounting portable fans in walls also increase your fire risk.
- Extension cords and multiple plug adapters may only be used for temporary operations.
- Overloaded circuits, damaged wiring, and defective switches and outlets can all lead to electrical fires.

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8.5 Fire Break

- A firebreak is a gap in vegetation or other combustible material that acts as a barrier to slow or stop the progress of a bushfire or wildfire. A firebreak may occur naturally where there is a lack of vegetation or "fuel", such as a river, dam or canyon.
- Firebreaks may also be man-made, and many of these also serve as roads, such as a logging road, four-wheel drive trail, secondary road, or a highway.
- The purpose of a firebreak is to provide an area of reduced fuel load which will reduce the intensity of a fire and therefore allow for more effectively combating and to also serve as a line from which a back burn can be started.
- In the construction of a firebreak, the primary goal is to remove deadwood and undergrowth down to mineral soil
- Although fire- breaks cannot completely protect sites against large veld fires, they play an important role in controlling and containing smaller fires on site – and are compulsory by law.
- Firebreaks are often backed up with other firefighting efforts. Even then, it is still sometimes possible for fire to spread across a seemingly impenetrable divide.

Figure 4: Creation of firebreak underway

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8.5.1 How to create Firebreaks

- Prepare firebreaks on the side of the boundary. Owners of adjoining land may agree to position a common firebreak away from the boundary.
- Discuss fire breaks with neighbours and plan together – it should be in the right place, cost-effective and be practical to implement. Document your agreed fire breaks.
- External firebreaks can be provided in various ways, including the regular burning of grassland or other bordering vegetation, adding prescribed burned stands, ploughing of firebreaks, scraping of firebreaks or hand-clearing fire breaks.
- It should be wide enough and long enough to have a reasonable chance of preventing a fire from spreading to or from neighbouring land, and so that
    - It does not cause soil erosion;
    - It is reasonably free of a flammable material capable of carrying a fire across it; and
    - It is maintained.

Some natural (or human-made) veld conditions, e.g. recently burned veld (younger than four years), a natural vlei, a dam or river, old farmlands and floodplains can be regarded as a natural firebreak.

The width of firebreaks depends on where it is to be made:

- Firebreaks in crop residue /fallow land – at least 2,5 m wide.
- Fynbos/Natural veld on agricultural land – 2,5 m x the height of vegetation (minimum of 5 m).
- Road verge (provincial and district roads)– 3 m on either side to be maintained annually.
- Labour housing, farm infrastructure and homesteads – 10 m.
- Wildland interface – 20 m, depending on the adjacent land type such as Protected Areas, Formal Forestry Plantations etc.

General rule is that a firebreak in the grasslands of the interior of South Africa should comprise two **5m** wide strips of veld that have been mown short to manicured lawn length and cleared of the cuttings, separated by a 5m wide strip in which all the combustible material has been removed.

The full 15m width can be shared between neighbours, i.e, they can cut the one 5m strip alongside the fence while you plough or burn 5m immediately the other side of the fence and cut the second 5m strip on your property, or you can each clear a 2,5m strip on each side of the fence, and each cut 5m alongside

Check with your local municipality, fire brigade or Fire Protection Association to confirm the rules and regulations for your area.

8.5.2 The Law and Responsibility to prepare and maintain Firebreaks

The National Veld and Forest Fire Act 101 of 1998 prescribes the following statutory landowner requirements:

Duty to prepare and maintain firebreaks (Section 12)

- Every owner on whose land a veld-fire may start or burn or from whose land it may spread must prepare and maintain a firebreak on his or her side of the boundary between his or her land and any adjoining land.
- If an owner referred to in subsection (1) intends to prepare and maintain a firebreak by burning, he or she must determine a mutually agreeable date or dates with the owners of adjoining land for doing so, and inform the fire protection association for the area, if any.
- If agreement cannot be reached, such owner must give to the owners of adjoining land and the fire protection association for the area, if any, at least 14 days written a notice of the day or days during which he or she intends burning firebreaks, fire danger permitting.
- An owner of adjoining land who has agreed on a day in terms of subsection (2)(a) or who receives a notice in terms of subsection (2)(b) must- burn his or her firebreak on the boundary concerned on the same day or days; or be present at such burning or have his or her agent attend; and ensure that a sufficient number of persons are present on his or her side of the boundary to prevent any spread of fire when the firebreak is burned.
- An owner may not burn a firebreak, despite having complied with subsection (2), if the fire protection association objects to the proposed burning; or a warning has been published in terms of subsection 10(1)(b) because the fire danger is high in the region, or the conditions are not conducive to the burning of firebreaks.
- The owner must inform the owners of adjoining land and the fire protection association if any if burning cannot be done on the agreed day or days referred to in subsection (2)(a) or any of the days referred to in subsection (2)(b); and of the additional days on which he or she intends to burn because

of the failure to do so on the day or days set in terms of subsection (2)(a) or (b). It is not necessary for the owner to give 14 days' notice of the additional days.

- Owners of adjoining land may agree to position a common firebreak away from the boundary.
- Should an owner intend to be absent for a period longer than 14 days during the period or part of any period in which burning normally takes place, he or she must give all owners of adjoining land an address and telephone number, if any, at which he or she may be contacted.
- If an owner of adjoining land is not present on the agreed or notified day or days; or has not given an address and telephone number, if any, as required in subsection (8), the owner may proceed with the burning in his or her absence.
- A fire protection association may make rules different from subsections (2) to (6) if the new rules are approved by the Minister, in which event members are bound by the new rules and exempt from subsections (2) to (6).

8.6 Fire Danger Index

The national Fire Danger Rating System is designed to apply in 41 district regions each with different fire conditions. Within each region data relating to flammable fuel structure and condition (fuel models) must be specified, together with daily forecast weather data, for inputting to the fire danger model. This model is used to calculate daily forecast Fire Danger Index values. The forecast indices of fire danger are then entered into a Fire Danger Rating Table. The table classifies fire danger rating into five categories

Table 6: Fire danger index Rating System

FIRE ALERT STAGES	BLUE	GREEN	YELLOW	ORANGE	RED
FIRE DANGER INDEX	0 – 20	21 – 45	46 – 60	61 – 75	78-100
FIRE BEHAVIOUR FLAME LENGTHS (m)	SAFE 0-1m	MODERATE 1 –1,2m	DANGEROUS 1,2 – 1,8m	VERY DANGEROUS 1,8 – 2,4m	EXTREMELY DANGEROUS 2,4m +
FIRE CONTROL GUIDE	Fires are not likely to start. If started, they spread very slowly or may go out without aid from suppression forces. There is little flaming combustion and intensity is low under all conditions. Control is readily achieved and little or no mopping up is required.	Ignition may take place near prolonged heat sources (camp fires, etc.), spread is slow in forests, moderate in open areas. These are light surface fires , with low flames. Control is readily achieved by direct manual attack and with minimum forces, difficulty may be experienced on exposed dry slopes and some light mopping up will be necessary.	Extreme caution should be taken when controlled burning is carried out. Aircraft should be called in at the early stages of a fire.	Ignition can occur readily, spread may be fast in the forests though not for sustained periods. Grass fires could outstrip forces with a spread of approximately 7km/h. Fires may be very hot with local crowning and “short to medium range” spotting. Control will be very difficult, requiring indirect attack methods with major assistance necessary. Mopping up may require and extended effort.	Ignition can occur from sparks. Rate of spread will be extremely fast for extended periods. Fires will be extremely hot with a dangerous heat effect on people within 10m of the fire and there may be extensive crowning, fire whirls and “long range” spotting. Control may not be possible by frontal attack during the day and fire fighters should limit their actions to containing lateral spread, until the weather changes. Damage potential total and mopping up operations mat be very extensive and difficult. Full assistance necessary throughout.

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8.7 Weather Systems and Fire Danger

The ignition of fires, fire behaviour and flame lengths are influenced in a major way by weather. In terms of the Mc-Arthur fire danger model used in South Africa, relative humidity, air temperature and wind speed are the main factors that are used to calculate the Fire Danger Index (F.D.I.) for a specific day (refer to the FDI page in table 6). Corrections are also applied for fuel moisture.

South Africa has both summer and winter rainfall areas. The northern interior experiences fire weather during the winter months of April to September. During these winter months, the subcontinent experiences frontal weather systems associated with pre-frontal Berg wind conditions. During these hot, dry and windy conditions, plant material becomes very dry, and ignition of fuel is aided. Fanned by the high winds, fires spread rapidly and are extremely difficult to control. The windy conditions also ventilate fires and with the high availability of oxygen, hot fires with long flame lengths occur.

8.7 How can the Fire Danger Index be implemented at Johannesburg Water Sites

- JW wastewater treatment works are recommended to install the Fire Danger Index board at their sites, which must be maintained during dry season between May and August.
- The manager shall select the individual who will assist the site by updating the index on the site.
- The person must have access to the internet to check the daily weather forecast on the South Africa Weather Services website on the following website: https://www.weathersa.co.za/home/fireindex.
- All workers must be sensitized to the importance of the fire danger index and how it works. **See below example of the Fire Danger Index board.**

Figure 5: Fire Danger Index Board

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9. Rehabilitation Implementation programme

9.1 General Rehabilitation Measures

- All areas compacted by construction machines shall be ripped after construction activities.
- Appropriate area specific plant species, seeding methods and replanting shall be used to achieve the re-vegetation of the construction area.
- All waste rock shall be removed from the area and no rocky debris with sharp edges should be left behind in the stream channel.

9.2 Soil Preparation

- The entire scarred area must be levelled and shaped to the level of the surrounding topography so as not to hinder water drainage and cause channelling which may in time lead to erosion.
- All gullies shall be filled in and compacted so that the final level of the gully is level with the surrounding soil surface and packed in overflow channels/berm offshoots, this would include those dislodged in any soil preparation works.
- The construction area must be adequately reinstated, and concurrent or progressive rehabilitation of affected areas must be conducted.

9.3 Site Clearance

- All construction/building related rubble left on site is to be collected and removed from site and disposed of at a licensed waste disposal site.
- The EO/ECO must be provided proof of disposal in the form of an invoice from the Contractor, or a weighbridge notice from the relevant disposal site.
- Rubble to a depth of 100mm in the soil must all be removed.

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9.4 Excavation

- With any excavation, all soils must be replaced in the same order as they were removed ending with topsoil as the final layer. The sequence of replacing the soil layers plays a vital role regarding re-instating the sub-surface layering of the soil profile.
- All dangerous excavations must be made safe by backfilling and grading, as required.

9.5 Topsoil

- Topsoil will be stockpiled in heaps of a maximum of 2 metres and protected from erosion and loss of any form of contamination.
- Execute top soiling activity prior to the rainy season or any expected wet weather conditions.
- Execute topsoil placement only after all construction work has ceased.
- Topsoil removed on site must be saved and stored. It is imperative that this soil be collected and stored to ensure that valuable seeds in the soil are not lost to the process of eventual rehabilitation of the site.
- Topsoil stockpiles must be covered during windy and rainy months in order to limit soil erosion.
- It must be ensured that topsoil used is clear of any alien and invasive species before being reinstated on re-profiled areas.
- No topsoil, which has been stripped, shall be buried or in any other way be rendered unsuitable for further use.
- Ensure that excavated and stockpiled soil material is stored and bermed on the higher lying areas of the site and not in any storm water run-off channels or any other areas where it is likely to cause erosion or where water would naturally accumulate.
- Place topsoil in the same area from where it was stripped. If there is insufficient topsoil available from a particular soil zone to produce the minimum specified depth, topsoil of similar quality may be brought from other areas of similar quality.
- Stockpiled topsoil must be replaced and redistributed together with herbaceous vegetation, overlying grass and other fine organic matter in all disturbed areas of the construction site, including temporary access routes and roads. Topsoil is to be replaced to its original depth.

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- After topsoil placement is complete, spread available stripped vegetation randomly by hand over the top-soiled area.
- Do not use topsoil suspected to be contaminated with the seed of alien vegetation (e.g. black wattle, poplar,). Alternatively, the soil is to be sprayed with specified herbicides.
- Topsoil may not be mixed with spoil material before or during replacement.

9.6 Final shaping

- Programme the backfill of excavations so that subsoil is deposited first, followed by the topsoil. Compact in layers for best results.
- Monitor backfilled areas for subsidence (as the backfill settles) and fill depressions using available material.
- The entire scarred area is to be levelled off as close as possible to the surrounding topography so as not to hinder water drainage and cause channelling which may in time lead to erosion.
- All disturbed areas should be shaped to blend in with the surrounding landscape, where possible.
- Ensure that no excavated material or stockpiles are left on site and that all material remaining after backfilling is landscaped to blend in with the surrounding landscape.

9.7 Ripping and scarifying

- Rip and/or scarify all areas following the application of topsoil to facilitate mixing of the upper most layers. Whether ripping and/or scarifying is necessary will be based on the site conditions immediately before these works begin.
- Rip and/or scarify all disturbed (and other specified) areas of the construction site, including temporary access routes and roads, compacted during the execution of the works.
- Rip and/or scarify along the contour to prevent the creation of down-slope channels.
- Do not rip and/or scarify areas under wet conditions, as the soil will not break up.

9.8 Rehabilitation Species

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The rehabilitation "seed cocktails" generally consist of grasses as they rapidly establish and provide excellent protection against surface erosion. Seed stocks for rehabilitation can be sourced commercially. The following grass seed mix is recommended for rehabilitation re-vegetation:

- *Brachiaria serrata*
- *Cynodon dactylon*
- *Cenchrus ciliaris*
- *Chloris gayana*
- *Digitaria eriantha*
- *Diheteropogon amplectens*
- *Elionurus muticus*
- *Eragrostis curvula*
- *Eragrostis tef*
- *Eragrostis racemosa*
- *Heteropogon contortus*
- *Melinis nerviglumis*
- *Setaria sphacelata*
- *Sporobolus africanus*
- *Sporobolus pyramidalis*
- *Themeda triandra*
- *Trachypogon spicatus*
- *Tristachya leucothrix*

A suitable mixture of indigenous annual and/or pioneer grasses may be added to boost initial cover. Consult landowner(s) where applicable to determine nature of vegetative cover. For open municipal areas not part of private land, following species can be used in the hydroseeding mixture:

- *Choris gayana*
- *Cynodon dactylon*
- *Digitaria eriantha*
- *Eragrostis curvula*

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- *Setaria sphacelata*
- *Sporobolus africanus*

9.9 Grassing

- All planting work is to be supervised by suitably experienced EO/ECO, making use of the appropriate equipment.
- Only locally indigenous grass species can be used for rehabilitation. The grass seed mix can be established through consultation with an Ecological Specialist and EO/ECO.
- Sodding may be done at any time of the year, but seeding must be done during the summer when the germination rate is better.
- Re-vegetation shall take place at the start of the rainy season to maximise water availability and minimise the need for watering.
- Hydroseeding with a winter mix will only be specified where re-grassing is urgent and cannot wait for the summer.
- Only locally indigenous vegetation must be used for landscaping and rehabilitation.
- Vetriver or Kikuyu grass must not be used on site as it will invade and outcompete indigenous grass species.

9.10 Erosion prevention measures

Rehabilitation areas on steep slopes must be suitably stabilised to prevent erosion. Any erosion taking place must be remediated and measures put in place to further retard erosion.

9.11 Maintenance and monitoring

- All rehabilitation efforts including erosion control as well as re-vegetation must be monitored as per the JW EMP rev 05 stipulated timelines.

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- Access to rehabilitated areas must be restricted.
- The re-growth of invasive vegetative material must be monitored, and alien invasive species removed regularly from the rehabilitated areas.
- Areas that are under rehabilitation should be cordoned off as no-go areas.
- Re-vegetation must match the existing vegetation, unless otherwise indicated by the Engineer/EO.
- Invasive plant species and noxious weeds must be controlled by means of extraction, cutting or other approved methods.
- For planted areas that have failed to establish, plants should be replaced with the same species as originally specified, unless otherwise specified by the EO/ECO.

9.12 Rehabilitation of the Wetland Areas

Soil erosion is an aspect that has the potential to result in the most significant and long-term impacts of all habitat units, with impact features that could potentially be on a regional scale. Special attention must be paid to active and ongoing avoidance and management of soil erosion throughout all phases. This is an aspect that is easily managed, but, if allowed to develop unabated, will have profound impacts on the respective systems. Therefore, temporary and permanent erosion control methods should be utilised, such as silt fences, silt curtains, berms, retention basins, detention ponds, interceptor ditches, seeding and sodding, riprap of exposed embankments, erosion mats, and mulching.

The impacted wetland areas must after being levelled and the topsoil being returned, be re-grassed again with wetland vegetation associated with the surrounding wetland areas or with the vegetation. This can be done either by procuring the relevant seeds from a suitable supplier or by taking grass pockets from surrounding wetlands and replanting them in the disturbed wetland areas.

Reinstatement of vegetation near watercourses should be supplemented with bands of grass plugs, 1m wide distributed along the slope following the contour. These bands of grass act as energy breakers for water flow across the site which reduces soil erosion. The frequency of

plugged bands should increase with the increase of slope. The bands of grass should be aligned and used in conjunction with rock pitching and berms placement to enhance the effect of slowing down water and breaking up the energy.

The Contactor shall reinstate the original watercourse geometry and topography in both cross-sectional and longitudinal profile. Follow-up surveys should be conducted to determine the extent of the effectiveness and functionality of the mitigation measures provided for the construction phase of the project. Should the effectiveness and functionality of mitigation measures be found to be inefficient, amendments must be made to improve on the mitigation measures.

10. Conclusion

The management of vegetation is an important and complex matter that may have an impact on the activities of Johannesburg Water. The life cycle of JW activities has an impact on vegetation, and this procedure will assist in managing the impact that may have on the vegetation within JW sites.

11. References

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DISCLAIMER

1. This procedure does not exempt the JW and Suppliers from complying with other relevant legislations related to the vegetation management within the City of Johannesburg.

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DISCLAIMER

1. This procedure does not exempt the JW and Suppliers from complying with other relevant legislations related to the vegetation management within the City of Johannesburg.

South African Weather Services: https://www.weathersa.co.za/home/fireindex

DISCLAIMER

1. This procedure does not exempt the JW and Suppliers from complying with other relevant legislations related to the vegetation management within the City of Johannesburg.

	OCCUPATIONAL HEALTH & SAFETY (OHS) SPECIFICATION	
Johannesburg Water	PROJECT NUMBER:	JW 14302
	PROJECT LOCATION:	Carlswald
	PROJECT DESCR:	Construction of 20ML Carlswald Reservoir

ANNEXURE 5:

JW 6.4 (RETURNABLE ANNEXURE A)

	OCCUPATIONAL HEALTH & SAFETY (OHS) SPECIFICATION	
Johannesburg Water	TENDER NUMBER:	JW 14302
	PROJECT LOCATION:	Carlswald
	PROJECT DESCRIPTION:	Construction of 20ML Carlswald Reservoir

Returnable Annexure A: Acknowledgement of SHE Specification & Annexures

DECLARATION BY CONTRACTOR

I, the undersigned, and representing the tenderer as indicated hereby acknowledge that I have obtained copies of the following listed documentation and confirm that I fully understand the contents thereof and confirm compliance thereto in the event of being successful:

- OHS Specification (Volume 2)
- Annexure 1: Baseline Risk Assessment
- Annexure 2: Medical Screening Policy
- Annexure 3: Sign off form
- Annexure 4: Environmental Management Plan

We furthermore commit to:

- Comply with all applicable SHE related legal and other requirements.
- Inform all staff of their role in managing environmental impacts and safety hazards on site.

Signed at …… on this …….. Day of …… 20……..

Name of tenderer	
Name of Authorized person	
Authorized Signature*	

Signature must be as per form JW 3.3 as applicable