

E: ENVIRONMENTAL MANAGEMENT SPECIFICATION

APPENDIX H



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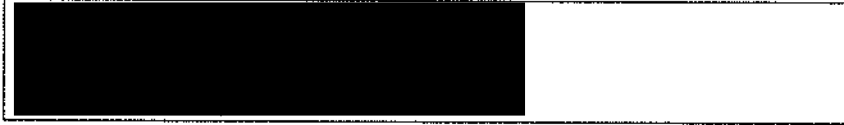


ENVIRONMENTAL MANAGEMENT PROGRAMME AND MAINTENANCE MANAGEMENT PLAN

THE CITY OF CAPE TOWN'S PROPOSED SIR LOWRY'S PASS
RIVER FLOOD ALLEVIATION UPGRADE, HELDERBERG
DISTRICT, WESTERN CAPE PROVINCE

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PREFACE

The City of Cape Town (CoCT) Directorate Transport for Cape Town (TCT) Planning and Infrastructure proposes to upgrade the Sir Lowry's Pass (SLP) River downstream from the built edge of the Sir Lowry's Pass Village to the points of discharge in False Bay. The main objectives of the proposed upgrades are to protect the properties in Gordon's Bay that is susceptible to flooding on an annual basis and to free up land for development next to the Sir Lowry's Pass River downstream of the Sir Lowry's Pass Village and in the Gordon's Bay (Firlands/ Broadlands) development areas. The project also seeks to address the possible impacts of climate change with regard to flooding risk in existing and future development areas.

The proposed SLP River upgrade is divided into six segments, namely:

- Segment 1: Southern edge of the Sir Lowry's Pass Village to T2 Trunk Road (current N2 National Highway);
- Segment 2: From T2 Trunk Road to the diversion channel at the edge of Gordon's Bay residential area;
- Segment 3: Re-alignment of the existing Diversion Canal (at Gordon's Bay built edge);
- Segment 4: Existing infrastructure upgrade along the natural channel of the Sir Lowry's Pass River;
- Segment 5: Phased bulk storm water drainage system implementation and upgrade to storm water drainage System at the Fairview Golf Course; and
- Segment 6: Raising of the existing culvert wall on the diversion channel upstream of the Fuschla road culvert.

Infilling or removal of material from the upgraded SLP River will be required during the operational phase of the project, as part of ongoing maintenance and management of the upgraded river. In terms of the Environmental Impact Assessment (EIA) Regulations Listing Notice 1 of 2014, Listed Activity 19, a Basic Assessment (BA) process should be undertaken and Environmental Authorisation obtained before undertaking activities that entail infilling or removal of more than 5m³ of material within a watercourse. Such infilling or removal is however allowed without further Environmental Authorisation if "for maintenance purposes undertaken in accordance with a maintenance management plan". This EMPr therefore includes a Maintenance Management Plan (MMP) for the operational phase maintenance and management of the river, specifically relating to sediment removal and infilling.

The Freshwater Ecosystem Assessment (Day, 2016) concluded, as part of the BA process for this proposed development, that, overall, implementation of the proposed activities would entail significant permanent changes to the Sir Lowry's Pass River throughout an extensive portion of its catchment. Day (2016). The specialist however recognised that the river in the study area is already compromised in terms of natural function, and is subject to poor water quality, abstraction, the effects of past channel and flow diversions, invasion by alien plants and a significant loss of floodplain wetlands and wetland function. Implementation of the proposed interventions would also carry with them some promise of rehabilitation of the river, with the creation of better quality floodplain depressional wetlands and riverine habitat in the proposed reconfigured section (Segment 2) than occur at present. Day (2016), however cautions that the risks that this vision may not in practice be accomplished are considered high, for various reasons.

In light of the above, complex and stringent mitigation measures have been proposed, with actual implementation of some considered prerequisites for implementation of the required development measures, and others emphasising the need for the development to include rehabilitation of the river along its natural course as far as the sea. Even with implementation of these mitigation measures, the overall impact of the development on freshwater ecosystems is considered of at least medium negative significance, with the proposed floodplain confinement considered an approach that would usually be considered by the Freshwater Consulting Group as highly undesirable from an environmental perspective.

However, in light of the existing development of the downstream floodplain, with the implementation of the diversion weir, berm and diversion canal already all in place, the practical options for achieving further development in an ecologically benign manner are limited, and opportunities to redress the current situation relating to the diversion weir and diversion berm to a significant extent are not feasible. Assuming that full mitigation measures as outlined in this EMPr are allowed for and implemented in good faith, it is likely that many of the risks implicit in the proposal can be addressed, and at least sections of the river channel will indeed have improved function and connectivity – e.g. the lower natural river channel, downstream of the existing diversion berm.

The development and implementation of environmental specifications is an on-going process that is iterative in nature.

The following documents were used as reference material in preparation of this EMP and MMP:

- City of Cape Town Detailed Environmental Specification, Version 6, Revision 2007;
- Freshwater Ecosystems Maintenance Management Plan prepared by [REDACTED] Consulting Services, 2016; and
- Specialist reports prepared as part of the BA process:
 - Freshwater Ecosystems [REDACTED]
 - Botanical Assessment, [REDACTED]
 - Social Impact Assessment [REDACTED]
 - Heritage Western Cape [REDACTED]

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ACRONYMS AND ABBREVIATIONS

BA	Basic Assessment
BAR	Basic Assessment Report
C	Contractor
CBA	Critical Biodiversity Area
CCA	Crowther Campbell & Associates
CE	Consulting Engineer
CEMPr	Construction Environmental Management Programme
CFA	Cape Flats Aquifer
CoCT	City of Cape Town
DEA	Department of Environmental Affairs
DEA&DP	Department of Environmental Affairs and Development Planning
DM	District Municipality
DWS	Department of Water Affairs and Sanitation
EA	Environmental Authorisation
EAP	Environmental Assessment Practitioner
ECO	Environmental Control Officer
EIA	Environmental Impact Assessment
EM	Environmental Manager
EMPr	Environmental Management Programme
EMC	Environmental Monitoring Committee
EO	Environmental Officer
ER	Engineer's Representative
ESA	Early Stone Age
ESO	Environmental Site Officer
E-WQI	Ecological Water Quality Index
FCG	Freshwater Consulting Group
FEPAs	Freshwater Ecosystem Priority Areas
FGE	Fairview Golf Estate
FRCMP	Floodplain and River Corridor Management Policy
GIS	Geographical Information Systems
GN	Government Notice
GPS	Geographic Positioning System
HD	Historically Disadvantaged
HDIs	Historically Disadvantaged Individuals
HDP	Helderberg District Plan (2012)
HPD	Helderberg Planning District
HSE	Health, Safety and Environmental Officer
HWC	Heritage Western Cape
IDP	Integrated Development Plan
I&AP's	Interested and Affected Parties
LED	Local Economic Development
LM	Local Municipality
NFEPA	Freshwater Ecosystem Priority Area
MAYCO	City's Mayoral Committee
MOSS	Metropolitan Open Space System
MS	Method Statement
m ³ /s	Cubic Meters Per Second
NPFA	Fire Protection Association of South Africa
NID	Notice of Intent to Develop

OEMP	Operational Environmental Management Programme
OHSA	Occupational Health and Safety Act, Act 85 of 1993
PES	Present Ecological State
PM	Project Manager
PSDF	Provincial Spatial Development Framework
RCP	River Corridor Plan
RE	Resident Engineer
RI	Return Interval
SABS	South African Bureau of Standards
SANRAL	South African National Roads Agency
SANS	South African National Standard
SAHRA	South African Heritage Resources Agency
SDF	Spatial Development Framework
SDP	Spatial Development Plan
SIA	Social Impact Assessment
SLP	Sir Lowry's Pass
TCT	Transport for Cape Town
TIS	Traffic Impact Statement
TMG	Table Mountain Group Aquifer
Tx	Transmission (lines)
WMA	Water Management Area
WCP	Western Cape Province
WSUDS	Water-sensitive Urban Design Strategy
WWTW	Waste Water Treatment Works

GLOSSARY OF TERMS

Alien Invasive Species:

Plants that do not naturally occur in an area. These plants may also be referred to as exotic plants, e.g. Port Jackson (*Acacia saligna*) and Rooikrans (*Acacia cyclops*).

Applicant:

The Developer is the Applicant – The City of Cape Town (CoCT).

Balustrade:

A low wall that is placed at the sides of bridges, etc., and that is made of a row of short posts topped by a long rail.

Berm:

A flat strip of land, raised bank, or terrace bordering a river or canal. An artificial ridge or embankment.

Canal:

An artificial waterway (concrete lined).

Channel:

An unlined watercourse.

Construction Activity:

A construction activity is any action taken by the Contractor, his subcontractors, suppliers or personnel during the construction phase and operational phase of the project.

Construction Camp:

Construction camp refers to all site offices, container sites, workshops and testing facilities.

Contaminated water:

Means any water contamination by the Contractor's activities, e.g. concrete water and run-off from plant / personnel wash areas.

Contractor:

Persons/organisations contracted by the Applicant to carry out parts of the work for the planned upgrade. The Contractor shall ensure compliance with the CEMPr, and shall request advice from the Environmental Control Officer where considered appropriate.

Construction Activities:

Activities associated with physical disturbance to the land, including the storage machinery, equipment and materials.

Construction Camp:

The area designated for all the Contractor's temporary offices, storage areas, plant parking areas, staff welfare facilities etc.

Construction Phase:

The Construction Phase is the period of commencement of physical disturbance to the land, excluding rehabilitation activities, such as re-vegetation and replacing of topsoil.

Construction Zone:

The demarcated and pegged area where construction activities shall be permitted.

Corrective (or remedial) action

Response required to address an environmental problem that is in conflict with the requirements of the CEMPr. The need for corrective action may be determined through monitoring, audits or management review.

Culvert:

A tunnel carrying a stream or open drain under a road or railway.

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Degradation:

The lowering of the quality of the environment through human activities, e.g. river degradation, soil degradation.

Developer:

The Developer is the Applicant – The City of Cape Town Metropolitan Municipality

Diversion Berm:

A berm is a level space, shelf, or raised barrier separating two areas. Berm to divert water.

Ecological Buffer:

A zone or an area that serves not for any anthropogenic use but as a conserved natural habitat where plants and animals can thrive.

Environment:

The surroundings within which humans live and that consist of:

- (i) the land, water and atmosphere of the earth;
- (ii) micro-organisms, plant and animal life
- (iii) any part or combination of (i) and (ii) and the interrelationships, among and between them; and the physical, chemical, aesthetic and cultural properties and conditions of the foregoing that influence human health and well-being.

Environmental Audit:

A systematic, documented verification process of objectively obtaining and evaluating evidence to determine whether specified environmental activities, events, conditions, management systems, or information about these matters conform with audit criteria, and communicating the results of this process to the client.

Environmental Management:

That part of the overall management process which seeks to ensure, as far as possible, that no avoidable impact is caused to the environment and that when this is unavoidable that the consequences are understood prior to the impact being caused and that the impact is then mitigated as far as possible.

Environmental Management Plan:

That part of the overall management process which includes organisational structure, planning activities, responsibilities, practices, procedures, processes and resources for developing, implementing, achieving, reviewing and maintaining the environmental policy.

Eradication Programme:

The clearing and rehabilitation of land infested by invasive alien plant species.

Groundwater:

All subsurface water that fills voids between highly permeable ground strata comprised of sand, gravel, broken rocks, porous rocks, etc. and move under the influence of gravitation.

Hazardous:

Contains an element of risk. Dangerous or toxic to life.

Hazardous waste:

Waste, even in small amounts, that can cause damage to plants, animals, their habitat and the well-being of human beings, e.g. waste from factories, detergents, pesticides, hydrocarbons, etc.

Invasive Species:

See 'Alien Invasive species'.

Impact:

A description of the potential effect or consequence of an aspect of the development on a specified component of the biophysical, social or economic environment within a defined time and space.

Infrastructure

The network of facilities and services that are needed for economic activities, e.g. roads, electricity, water, sewerage.

Integrated:

Mixing or combining all useful information and factors into a joint or unified whole. See Integrated Environmental Management.

Integrated Environmental Management (IEM):

A way of managing the environment by including environmental factors in all stages of development. This includes thinking about physical, social, cultural and economic factors and consulting with all the people affected by the proposed developments. Also called "IEM".

Interested and Affected Parties (I&AP's):

Those individuals or organizations that have an interest in the proposed development or will be directly affected by the activities of the development, as identified in the environmental impact assessment process.

Invert Level:

The base interior level of a pipe, trench or tunnel; it can be considered the "floor" level.

Local Authority:

City of Cape Town

Maintenance:

Actions performed to keep a structure or system functioning or in service on the same location, capacity and footprint.

Maintenance Management Plan:

A management plan for maintenance purposes defined or adopted by the competent authority.

Method statement:

Written statements that contain details about construction procedures required for work near sensitive environments in the site, including environmentally sensitive activities such as waste management, storage of hazardous substances, dust control, erosion and sediment control, etc.

A work method statement is predominately used in construction to describe a document that gives specific instructions on how to safely perform a work related task, or operate a piece of plant or equipment.

Mitigation:

Measures designed to avoid, reduce or remedy adverse impacts.

Natural environment:

Our physical surroundings, including plants and animals, when they are unspoiled by human activities.

No-go Area:

Areas where construction activities are prohibited area referred to as No-go Areas.

Ogee weirs:

A control weir that is ogee-shaped (S-shaped) in profile and allows water to safely flow over it. The downstream faces of overflow spillways are often made to this shape.

Pollutant:

A contaminant at a concentration high enough to endanger the environment or the public health.

Pollution:

- *National Water Act, 36 of 1998*: "Water pollution means the direct or indirect alteration of the physical, chemical or biological properties of a water resource so as to make it –
 - (a) less fit for any beneficial purpose for which it may reasonably be expected to be used; or
 - (b) harmful or potentially harmful –

- (aa) to the welfare, health or safety of human beings;
- (bb) to any aquatic or non-aquatic organisms;
- (cc) to the resource quality; or
- (dd) to property".

* *National Environmental Management Act, No. 107 of 1998*: "pollution means any change in the environment caused by –

- (i) substances;
- (ii) radioactive or other waves; or
- (iii) 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."

Rehabilitation:

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

Return Interval (RI):

A return period, also known as a recurrence interval (sometimes repeat interval) is an estimate of the likelihood of an event, such as an earthquake, flood or a river discharge flow to occur. It is a statistical measurement typically based on historic data denoting the average recurrence interval over an extended period of time, and is usually used for risk analysis (e.g. to decide whether a project should be allowed to go forward in a zone of a certain risk, or to design structures to withstand an event with a certain return period).

Rip-rap:

Rock or other material used to armour shorelines, streambeds, bridge abutments, pilings and other shoreline structures against scour and water or ice erosion.

Seepage:

Water that seeped or oozed through a porous soil.

Site:

The 'site' refers to the total area where the contract will take place awarded to the Contractor and any other area reasonably required by the Contractor to undertake the construction activities in order to fulfil the contract.

Waste Management:

Classifying, recycling, treatment and disposal of waste generated during construction and decommissioning activities.

Watercourse and Wetland:

All reference to wetlands and water courses in this document are based on the following definitions of wetlands and water courses, as contained in the National Water Act (NWA) (Act 36 of 1998) and the 2010 EIA regulations:

"watercourse" means –

- (a) a river or spring;
- (b) a natural channel in which water flows regularly or intermittently;
- (c) a wetland, lake or dam into which, or from which, water flows; and
- (d) any collection of water which the Minister may, by notice in the Gazette, declare to be a watercourse, and a reference to a watercourse includes, where relevant, its bed and banks;

"wetland" means –

land which is transitional between terrestrial and aquatic systems where the water table is usually at or near the surface, or the land is periodically covered with shallow water, and which land in normal circumstances supports or would support vegetation typically adapted to life in saturated soil.

Working Area:

Working area means any area within the boundaries of the Site where construction is taking place.

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1 INTRODUCTION

The City of Cape Town (CoCT) Directorate Transport for Cape Town (TCT) Planning and Infrastructure are proposing upgrades and maintenance to a portion of the Sir Lowry's Pass (SLP) River and associated storm water management infrastructure. The relevant portion of the river is downstream from the built edge of Sir Lowry's Pass Village to the point of discharge in False Bay. In addition, portions of the existing diversion canal within the Gordon's Bay built area are also proposed for upgrades.

A Basic Assessment (BA) Process is being undertaken for the proposed project in terms of the National Environmental Management Act, 1998 (Act No. 107 of 1998), as amended (NEMA) Environmental Impact Assessment (EIA) Regulations of 2014. This Environmental Management Programme (EMPr) was prepared in terms of the NEMA EIA Regulations of 2014, and compliance with the contents of this report is required during the planning and design, construction and operational phases of the proposed project. Mitigation measures prescribed by specialists as part of the BA process are also included in this EMPr.

Infilling or removal of material from the upgraded SLP River will be required during the operational phase of the project, as part of ongoing maintenance and management of the upgraded river. In terms of the EIA Regulations Listing Notice 1 of 2014, Listed Activity 18, a BA process should be undertaken and Environmental Authorisation obtained before undertaking activities that entail infilling or removal of more than 5m³ of material within a watercourse. Such infilling or removal is however allowed without further Environmental Authorisation if "for maintenance purposes undertaken in accordance with a maintenance management plan". This EMPr therefore includes a Maintenance Management Plan (MMP) for the operational phase maintenance and management of the river, specifically relating to sediment removal and infilling.

What are maintenance activities?

Maintenance activities are activities performed to keep a structure or system functioning or in service on the same location, capacity and footprint. It is therefore activities that do not change the size of structures (thus "like for like" activities); such as:

- sediment management above and below weirs;
- restoring the width of weirs;
- preventing sediment from entering furrows;
- re-opening of secondary channels;
- protection of eroded river banks, where the activity has already being undertaken in the past;
- maintenance and protection of irrigation infrastructure such as pumps;
- clearing of alien invasive vegetation; and
- rehabilitation of disturbed areas.

This EMPr and MMP provides a set of guidelines for works to be executed by the Contractor and the City of Cape Town during the planning and design, construction and operational phases, so as to have a minimum impact on the environment. In this context, it should be regarded as a dynamic or 'living' document, which may require updating, or revision during the life-cycle of the upgrade to address new conditions as the need arises. It is essentially a written strategy of how the environment is to be managed in practical and achievable terms.

The efficiency of the EMPr and MMP is limited by the level of adherence to the conditions set forth in this report by the Developer and the Contractor. It is further assumed that compliance with the EMPr and MMP will be monitored on a regular basis as set out in the EMPr and contractual clauses.

2 BRIEF PROJECT DESCRIPTION

The project rationale is to protect the properties in Gordon's Bay that is susceptible to flooding on an annual basis on both the eastern and western flood plains and to free up land for development next to the Sir Lowry's Pass River downstream of the Sir Lowry's Pass Village and in the Gordon's Bay (Firlands/ Broadlands) development areas. The Firlands and Broadlands development areas represent two of the six new urban development areas identified in the Heideberg District Plan (HDP) (2012) to accommodate the City of Cape Town's medium to long term expansion needs. The project also seeks to address the possible impacts of

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climate change with regard to flooding risk in existing and future development areas. The existing SLP River channel has a limited flow capacity of 15 to 25m³/s.

At the same time, the natural river's flow regime has been compromised by infestation of alien plants, abstraction and erosion which has impacted negatively on the river's ecological functions (habitat and water quality). The majority of the portion between the Sir Lowry's Pass Village and Gordon's Bay is largely inaccessible to the public, and, as such, has not been integrated into the CoCT's open space system. Flood lines and setbacks for new development areas can only be determined once the river's channel had been upgraded to an optimal and appropriate functioning system.

In addition, the upgrades would restore ecological functions, provide for ecological buffers and linkages to the Metropolitan Open Space System (MOSS), and create an aesthetically pleasing environment for the benefit of the public and adjacent property owners and future developments. The bulk of the proposed activities are in line with the provisions of the Sir Lowry's Pass River Corridor Plan (RCP) (Neil *et al.*, 2013) which was compiled within the framework of the CoCT's Floodplain and River Corridor Management Plan (CoCT, 2009).

The proposed SLP River extension/upgrade is divided into six segments, as shown in Figure 1, namely:
 Segment 1: Southern edge of the Sir Lowry's Pass Village to T2 Trunk Road (current N2 National Highway);
 Segment 2: From T2 Trunk Road to the diversion channel at the edge of Gordon's Bay residential area;
 Segment 3: Re-alignment of the existing Diversion Canal (at Gordon's Bay built edge);
 Segment 4: Existing infrastructure upgrade along the natural channel of the Sir Lowry's Pass River;
 Segment 5: Phased bulk storm water drainage system implementation and upgrade to storm water drainage system at the Fairview Golf Course; and
 Segment 6: Raising of the existing culvert wall on the diversion channel upstream of the Fuschia road culvert.

The proposed activities/interventions at each of the six segments are summarised in the table below.

Table 1: Summary of the proposed development.

Segment and location	Activities/ Interventions proposed for each Segment
Segment 1: SLP River from the southern edge of the SLP Village to the T2 Trunk Road Bridge (current N2 National Highway).	- Construction of a rip-rap berm on the right hand side of the existing river channel to control the flow of water in the SLP River beneath the T2 Trunk Road; at the bridge. - An ecological buffer of 20 m wide on both sides of the river to protect the river corridor from Sir Lowry's Pass Village to the N2 Trunk Road. - The upstream parapet on the T2 bridge is also proposed to be raised to the height of the existing balustrade.
Segment 2: SLP River from the T2 Trunk Road to a point approximately 2.7km downstream, where its course intersects or enters the existing diversion canal.	River channel "upgrade" to create a system that will contain up to the 1:100 year Return Interval (RI) flood. - Excavation of the river to achieve an equilibrium diversion profile. The river will function as an unlined watercourse. - Proposed channel design details: <u>Lower floodplain:</u> An excavated trapezoidal channel is proposed, which will contain the 1:7 year return period flood (38.5m base, 1.1m height, 1:2.5 slopes; thus 44m wide). <u>Upper floodplain:</u> Floodplains are proposed to be developed on either side of the low flow floodplain. It is proposed to be protected by riprap berms with 1:2.5 side slopes and would contain the 1:100 year return period flood. - The upper and lower floodplains are proposed to be 85m wide in total. An additional 10m maintenance buffer area is proposed on either side of the upper floodplain. Total anticipated corridor: 105m. - West bank: The western berm of Segment 2 is proposed to be extended outside the buffer area by up to 65m to provide a means of disposing of excavated material, and for inclusion of this area in the developable

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Segment and location	Activities/ Interventions proposed for each Segment
	portions or footprint of future development plans. • The channel will have a vertical slope of 1:230. • Four weirs or "grade control structures" are proposed to be constructed: ◦ Ogee concrete weirs and bucket rollers are proposed to be constructed to prevent sedimentation, extending 20m downstream of each weir; with a median riprap of 0.8m in diameter. ◦ The ogee weirs and bucket rollers will be approximately 4.1m to 5.5m high and 17.5m to 38.5m in length in the flow direction. • Provision will be made for overland escape routes by means of overflow weirs and concrete lined channels at the drop structures for floods in excess of the 1:100 year return period events. The auxiliary spillways are proposed to be positioned on the western bank of the river. • Some of the existing dams situated alongside the proposed channel will be amended/upgraded. • The river will have to be bypassed or diverted during the construction phase. The bypass/diversion will take place within the 105m river corridor and/or the construction corridor. An option would be to construct on one side of the river with a temporary berm between the river and the construction area, and then on the other side after one side has been finished. Various other options to bypass or divert the river also exist. The exact method of bypassing or diverting the river will be agreed with the contractor before construction commences. • A 15m wide temporary construction corridor (running parallel to the channel) will furthermore be used for vehicle movement and construction access during the construction phase.
Segment 3: The existing diversion canal as far as the downstream of the existing balancing dam.	• A 10 m wide Armorflex type (or similar) lined trapezoidal channel, with a 5m wide parallel maintenance access corridor will be developed along the south-western boundary of Erf 5113 to drain about 23m³/s stormwater from the catchment east of the river, towards the river. • Repairing of the existing compromised berm will only be required if the river is not upgraded to contain the 1:100 year flood. Once construction of the flood alleviation project (which includes the channel along the south-western boundary of Erf 5113) is complete, the berm will no longer be required for flood protection, as the proposed channel will be sufficient to drain the catchment east of the river. Repairing the existing berm therefore does not form part of this proposal. • A weir is proposed to be constructed at the end of the re-configured river channel (Segment 2) to manage flow transition from the landscaped channel to the diversion canal. • The upper section of the existing diversion canal (from the Segment 2 transition) will be widened from about 50m to about 85m, towards the waste water treatment works (WWTW), to link in with the 85m wide Segment 2 channel. The evaporation dam and other facilities at the WWTW will therefore be reconfigured. • The existing lined section of the diversion canal along Segment 3 is proposed to be extended upstream to meet up with the re-configured channel (i.e. Segment 2). The entire diversion canal at Segment 3 is therefore proposed to be lined with concrete. • The existing diversion canal is proposed to be reconfigured to be re-aligned to a less acute angle and greater radius to reduce sedimentation and downstream flood risks. The width of the reconfigured diversion channel will gradually reduce from 85m (at the Segment 2 transition) to 50m. • The existing non-functioning Fulton Gate at the diversion point to the natural

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Segment and location	Activities/ Interventions proposed for each Segment
	channel of the Sir Lowry's Pass River is proposed to be removed. The Fulton Gate is supposed to divert water into the natural channel of the SLP River. - A new system will be constructed upstream of the existing waste water treatment work (WWTW) outlet, downstream of the diversion weir, to allow passage of water (natural flow) into the natural channel during winter and summer months. This system will be designed in order to ensure partial flow down Segment 4, and partial flow down Segment 3. The outlet of the WWTW will also be relocated during the construction work, but will be downstream of the diversion of water into the natural stream. - The existing balancing dam and throttle outlet structure at Fairview Golf Course is proposed to be removed. - The proposed reconfigured diversion canal section will join up with the existing diversion canal by means of a transition structure. - A wooden / steel pedestrian bridge is proposed to be constructed over the deviated portion of the diversion canal to allow passage across the canal for golfers. - The current abstraction point from the balancing dam (which is proposed to be removed) that is used for irrigation purposes by the Fairview Golf Course will be replaced by an abstraction point from the diversion canal. - Construction of a new green at the Fairview Golf Course, to replace the green and tee that will be lost as a result of reconfiguring and re-aligning of the diversion canal.
Segment 4: The natural channel of the SLP River from the existing diversion canal to its outflow into the sea.	- A number of the existing structures, such as channels, pipes, culverts and bridges, along the natural channel of the Sir Lowry's Pass River, from the diversion canal to the point where the river flows into the sea, are proposed to be upgraded. - The proposed upgrades will improve the ability of the channel to contain current and additional flow of 8m³/s.
Segment 5: The western catchment of the SLP River from downstream of the T2 Trunk Road Bridge to the diversion canal where it passes through the Fairview Golf course.	- The stormwater drainage system at the Fairview Golf Course is proposed to be upgraded. Sheet flow is proposed to be collected upstream of the Golf Course from the floodplain and conveyed in open channels across the Fairview Golf Course and discharged into the concrete lined diversion canal. The open channels are proposed to be lined with Armorflex™ (or similar) or riprap. - The existing channels are mainly <i>Typha capensis</i> lined earth channels.
Segment 6: The existing, lined diversion canal from the end of Segment 3 as far as the outlet of the canal onto False Bay.	The existing diversion canal walls upstream of the Fuchsia Road culvert is proposed to be raised by 1.25m to accommodate the anticipated 1:100 year flood of 234 m ³ /s. The concrete canal wall is proposed to be extended <i>in situ</i> .

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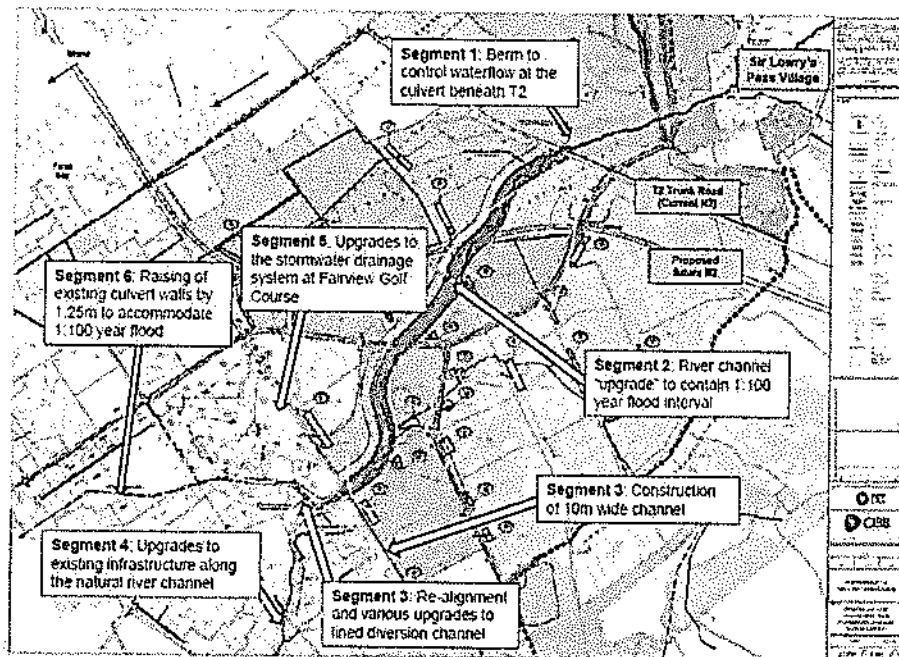


Figure 1: Locality of the six segments - read in conjunction with Table 1 (base figure supplied by GIBB (2013) with annotations provided by Liz Day (2016), and amended).

3 OBJECTIVES OF THE EMPr AND MMP

The objectives of the EMPr and MMP are to:

- To outline mitigation measures aimed at reducing and mitigating potential adverse impacts to minimal or insignificant levels.
- To provide a pro-active and practical working mechanism to enable the measurement, reporting and monitoring of environmental performance on site.

4 COMPLIANCE WITH APPLICABLE LAWS

The supreme law of South Africa is "The Constitution of the Republic of South Africa", which states: "Every person shall have the right to an environment which is not detrimental to his or her health or well-being".

Laws applicable to protection of the environment in terms of Environmental Management include, but are not restricted to:

- National Environmental Management Act, No. 107 of 1998, as amended (NEMA);
- National Environmental Management: Air Quality Act, No. 39 of 2004, as amended (NEM:AQA);
- National Environmental Management: Biodiversity Act, No. 10 of 2004, as amended (NEM:BA);
- National Environmental Management: Waste Act, No. 59 of 2008, as amended (NEM:WA);

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- National Heritage Resources Act, No. 25 of 1999, as amended (NHRA);
- National Water Act, No 36 of 1998, as amended (NWA);
- National Veld and Forest Fire Act, No 101 of 1998;
- Occupational Health and Safety Act, No 85 of 1993, as amended (OHSA);
- Conservation of Agricultural Resources Act, Act of 1983 (CARA);
- Sub-division of Agricultural Land Act Repeal Act 64 of 1998 (re: soil conservation) and all regulations framed there under and amendments thereto.

Of particular importance is Section 28(1) of the NEMA, which places an obligation on all individuals to take due care of the environment and to ensure remedial action is instituted to minimise and mitigate environmental impact. In terms of the NEMA, an individual responsible for environmental damage must pay costs both to environment and human health and the preventative measures to reduce or prevent additional pollution and/or environmental damage from occurring. This is referred to as the Polluter Pays Principle, please refer to the Schedule of Fines in Chapter 11 below.

The Construction EMPr should form part of the Contract Documentation for construction contractors and is thus a legally binding document.

4.1 NEMA, as Relevant to the MMP

The MMP component of this document, i.e. the Operational Phase EMPr, specifically relates to Activity 19 as listed in the NEMA EIA Regulations Listing Notice 1 of 2014 (GN R. 983), which relates to *"the infilling or depositing of any material of more than 5 cubic metres into, or the dredging, excavation, removal or moving of soil, sand, shells, shell grit, pebbles, or rock of more than 5 cubic metres from a watercourse"*.

In terms of Listed Activity 19, a BA process should be undertaken and Environmental Authorisation obtained before undertaking activities that entail infilling or removal of more than 5m³ material within a watercourse. In terms of this Listed Activity, such an infilling or removal activity is however allowed if *"for maintenance purposes undertaken in accordance with a maintenance management plan"*. This MMP is therefore aimed to protect the City of Cape Town from being fined or legally prosecuted for routine maintenance of their infrastructure in the upgraded river or on river banks that involves the removal or infilling of more than 5m³ of material from a watercourse.

The NEMA EIA Regulations Listing Notice 1 of 2014 defines "maintenance" and "maintenance management plan" as follows:

- "maintenance" means *"actions performed to keep a structure or system functioning or in service on the same location, capacity and footprint"*;
- "maintenance management plan" means *"a management plan for maintenance purposes defined or adopted by the competent authority"*.

The MMP is submitted to the DEA&DP as part of the EMPr for adoption in terms of the NEMA, EIA Regulations of 2014. It is of the utmost importance that the City of Cape Town adhere to the MMP in order to prevent the triggering of listed activities that may need to be authorised. If in doubt, the DEA&DP should be contacted before commencement of any other activities not specified in the MMP.

Maintenance work in watercourses is not necessarily restricted only to infilling or removal of more than 5m³ material within a watercourse. Other activities might include expansion and construction activities that require a Basic Assessment to be undertaken.

It should be noted that approval/acceptance of this EMPr and MMP by the DEA&DP does not absolve the City of Cape Town from his/her general "duty of care" set out in Section 28(1) of the NEMA which states that *"Every person who causes, has caused or may cause significant pollution or degradation of the environment must take reasonable measures to prevent such pollution or degradation from occurring, continuing or recurring, or, in so far as such harm to the environment is authorised by law or cannot reasonably be avoided"*

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or stopped, to minimise and rectify such pollution or degradation of the environment." When interpreting this "duty of care" responsibility, cognisance must be taken of the principles of sustainability as contained in Section 2 of the NEMA.

5 ADMINISTRATION AND REGULATION OF THE EMPr/MMP

The Developer (City of Cape Town) is responsible for the implementation of the EMPr/MMP and for compliance monitoring of the EMPr/MMP. The EMPr/MMP will be made binding on all contractors and sub-contractors operating on the site and will be included with the Contract between the Developer, the Consulting Engineer and the Contractor. Non-Compliance with, or any deviation from, the conditions set out in this document constitutes a failure in compliance.

5.1 Implementation and Compliance with the EMPr (Planning and Design, and Construction Phases)

5.1.1 Conditions of Contract / Roles and Responsibilities

Refer to the Management Structure shown in Figure 2.

5.1.1.1 Authority (DEA&DP)

The Western Cape Provincial Department of Environmental Affairs and Development Planning (DEA&DP) is the designated authority responsible for authorising this EMPr. The DEA&DP shall also be responsible for approving any amendments to the EMPr (if required), and may also perform random site inspections to check compliance with the EMPr.

5.1.1.2 Developer (City of Cape Town)

The Developer (City of Cape Town) has overall responsibility for compliance with the EMPr as it is a fundamental component of the authorisation requirements for the project.

This means that the Developer must:

- Ensure that the professional team and the Contractors are appropriately briefed and that their appointment includes environmental requirements as relevant;
- Ensure that he/she is kept fully informed of the performance of the project against the requirements of the EMPr;
- Ensure that appropriate action is taken where consistent incidents of non-compliance are taking place; and
- Ensure that any corrective action required by the authorities is implemented.

5.1.1.3 Consulting Engineer (CE)

The Consulting Engineer (CE) is contracted by the City of Cape Town to design and specify the project engineering aspects. Generally the engineer runs the works contract. The CE may also fulfil the role of Project Manager on the proponent's behalf (See PM).

This Consulting Engineer must:

- Assume overall responsibility for the effective implementation and administration of the EMPr during the construction phase;
- Ensure that the EMPr is included in the Contractors' contract (including all subcontractors);
- Ensure that the EMPr and any other relevant documentation is provided to the Contractor and subcontractors;
- Undertake regular inspections of the Contractor's site to check for compliance with the EMPr in terms of the specifications outlined in this document;

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- Keep a register of major incidents (spills, injuries, complaints, legal transgressions, etc.) and any other relevant issues related to the EMP;
- Report any problems (or complaints) concerning the environment arising out of the construction phase to the appointed Environmental Control Officer (ECO);
- Ensure Contractor staff are trained in accordance with the EMP;
- Implement recommendations of possible audits; and
- Inform the ECO of the date of construction at least 2 months in advance.

5.1.1.4 Project Manager (PM)

The Project Manager (PM) has over-all responsibility for managing the project, contractors, and consultants and to ensure that the environmental management requirements are met. The CE may also act as the PM. All decisions regarding environmental procedures must be approved by the PM. The PM has the authority to stop any construction activity in contravention of the EMP in accordance with an agreed warning procedure.

5.1.1.5 Engineer's Representative (ER)

The Engineer's Representative (ER) is the Consulting Engineer's representative on site. The ER has the power/mandate to issue site instructions and in some instances, variation orders to the contractor, following request by the EO or ECO. The RE oversees site works, liaison with Contractor and ECO

5.1.1.6 Environmental Officer/ Environmental Manager (EO/EM)

The Environmental Officer/Environmental Manager (EO/EM) is appointed by the Consulting Engineers as their environmental representative on site. The EO is not independent but must rather act on behalf of the consulting engineers with the mandate to enforce compliance under the project contract, which must include the EMP.

The EO has the directive to issue non-conformance and hazard certificates. Further, in terms of accepted industry practice the EO could issue the equivalent of a "cease works" instruction only in exceptional circumstances where serious environmental harm has been or is about to be caused i.e. in cases of extreme urgency and then only when the ER is absent.

The EO must form part of the project team and be involved in all aspects of project planning that can influence environmental conditions on the site. On certain types of projects, such as linear developments (fences, pipelines, etc.), the EO must also be the liaison between the contractor and landowners.

The EO must attend relevant project meetings, conduct daily inspections to monitor compliance with the EMP, and be responsible for providing reports and feedback on potential environmental problems associated with the development to the project team and ECO.

The EO must convey the contents of this EMP to the Contractor site team and discuss the contents in detail with the Contractor as well as undertake to conduct an induction and an environmental awareness training session prior to site handover to all contractors and their workforce.

The EO must be suitably experienced with the relevant qualifications and preferably competent in construction related methods and practices.

5.1.1.7 Environmental Control Officer (ECO)

The Environmental Control Officer (ECO) is an independent appointment to objectively monitor implementation of relevant environmental legislation, conditions of Environmental Authorisations (EA's), and

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the EMPr for the project. The ECO must be on site prior to any site establishment and must endeavour to form an integral part of the project team.

The ECO must be suitably experienced with the relevant environmental management qualifications and preferably competent in construction related methods and practices. He/she must be proactive and have access to specialist expertise as and when required; these include botanist's ecologists etc. Further, the ECO must also have access to expertise such as game capture, snake catching, etc.

The ECO's duties shall include, *inter alia*, the following:

- Must be the liaison between the relevant authorities and the project team.
- Must communicate and inform the developer and consulting engineers of any changes to environmental conditions as required by relevant authoritative bodies.
- Must ensure that the registration and updating of all relevant EMP documentation is carried out.
- Must handle information received from whistle blowers as confidential and must address and report these incidences to the relevant Authority as soon as possible.
- Must check whether the necessary environmental authorisations and permits, as relevant, has been obtained.
- Must undertake site audits once a week for the first three months and thereafter once every two weeks during the Construction and Post-Construction Phase to ensure compliance with the EMPr.
- Must monitor and report on compliance with the EMPr by all parties on site on a monthly basis.
- Must complete the EMPr Audit Checklist at each site audit, and keep *ad hoc* record of any and all incidents or events on site with significant environmental impact.
- Significant impacts must be recorded photographically with enough supporting information to locate the image on the site, preferably with an accurate GPS coordinate (within 10m).
- All records must be dated and accurately catalogued.
- Must submit an environmental compliance report on a regular basis as required by the conditions of the EA, in writing, to the DEA&DP.
- Must immediately communicate any contraventions of this EMPr, or undesirable environmental impacts to the CE. If the CE cannot be contacted and urgent action is required to prevent environmental damage, and/or if in the opinion of the ECO the response of the CE is not adequate, the ECO must also communicate contraventions of this EMPr to the DEA&DP and the District: Environmental and Heritage Management Branch of the City of Cape Town.
- The ECO and the CE has the authority to stop works or any portion of construction related activity, if in his/her opinion:
 - any activity is in contravention of the requirements of this EMPr/MMP;
 - any activity is in contravention of relevant environmental legislation/permits/authorisations applicable to the site and/or activity/ies, or;
 - the activity has caused or will imminently cause significant damage and/or harm to the environment.
 - If urgent action is required to prevent environmental damage as a result of contravention of the requirements of this EMPr, the ECO and the Developer has the authority to issue a written instruction to the Site Manager, or any person on site to stop works or any portion of construction related activity required to prevent such damage.
- The ECO and the CE may demand that any Contractor, Contractor's representative, or any employee/s not adhering to the requirements of this EMPr and/or the instructions of the ECO be removed from the site. Alternatively, the ECO and the CE may suspend all work on site until the matter is remedied.
- Report back on any environmental issues/incidents to the DEA&DP as reported to by the Contractor.
- Must remain employed until the completion of the construction phase.
- Prepare an environmental audit close-out report at the conclusion of the construction phase.

5.1.1.8 Contractor (C)

The principle contractor, hereafter known as the 'Contractor' (C), is responsible for implementation and compliance with the requirements of the EMPr and conditions of the EA, contract and relevant environmental

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legislation. The Contractor must ensure that all sub-contractors have a copy of and are fully aware of the content and requirements of this EMPr.

The contractor is required, where specified, to provide Method Statements setting out in detail how the management actions contained in the EMPr will be implemented.

The Contractor shall:

- Ensure that the environmental specifications of this document are effectively implemented. This includes the on-site implementation of steps to mitigate environmental impacts;
- Monitor environmental performance and conformance with the specifications contained in this document during site inspections;
- Discuss implementation of and compliance with this document with staff at routine site meetings;
- Report non-compliances with the EMPr and EA to the ECO immediately (on discovery), within 24 hours of the event discovered or occurred;
- Report progress towards implementation of and non-conformances with this document at site meetings with the Developer;
- Ensure that suitable records are kept and appropriate documentation is available to the Developer; and
- Ensure that construction employees are trained in accordance with the requirements of the EMPr.

The Contractor will conduct all activities in a manner that minimises disturbances to and impacts on the environment. The Contractor is deemed not to have complied with this EMPr if:

- There is evidence of contravention of clauses within the boundaries of the property and adjacent areas during the Construction Phase;
- If environmental damage ensues due to negligence;
- The Contractor fails to comply with corrective or other instructions issued by the Local Authority, ECO, or the Developer within a specified time;
- Failure to take any reasonable measure to protect the environment if there is a perceived or identified environmental risk associated with an activity that has not been defined in the EMPr; and/or
- The Contractor fails to respond adequately to complaints from the public.

Application of a penalty clause will apply for incidents of non-compliance as per Chapter 11 below. Such fines will be paid by the Contractor to the Developer and will be used to rehabilitate and/or landscape the site.

5.1.1.9 Environmental Site Officer (ESO)

The ESO is employed by the Contractor as his/her environmental representative to monitor, review and verify compliance with the EMPr by the contractor. This is not an independent appointment; rather the ESO must be a respected member of the contractor's management team.

The ESO must ensure that he/she is involved at all phases of the construction (from site clearance to rehabilitation).

5.2 Environmental Monitoring Committee (EMC)

An Environmental Monitoring Committee (EMC) has to be established at the onset of the construction phase and should remain involved in this project during the operational phase.

The key functions of an EMC (DEAT, 2005):

- *To regularly monitor and review the progress towards adhering to the specific conditions of the EMPr and meet the requirements contained in the record of decision;*
- *to consider any modification or additions to the original version of the EMPr that was approved by the government authority;*
- *to inform decision-making authorities when there is non-compliance with conditions of approval; and*

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- *to promote the participation of key stakeholders in a structured forum, that provides exchanges of information and insights."*

The EMC should be structured as follows, as a minimum:

- Independent Chairperson;
- Secretary;
- Independent ECO;
- Freshwater ecologist;
- Developer:
 - City of Cape Town Environmental Officer;
 - City of Cape Town Project Manager; and
 - City of Cape Town Project Engineer;
- Consulting engineer(s);
- Regulatory Authorities:
 - DEA&DP; and
 - DWS;
- NGOs as may be relevant; and
- Community:
 - Ward Councillor;
 - Other community representative(s) as relevant.

Functioning of the EMC:

- The EMC has to be guided by a robust Terms of Reference, which has to set out the following, as a minimum:
 - The function and purpose of the EMC;
 - EMC composition and membership criteria;
 - responsibilities of members;
 - decision-making procedure;
 - format of meetings; and
 - selection of duties of the Chairperson and ECO;
- Quarterly meetings (bi-annual site visits);
- Review reports (audits, environmental monitoring);
- Open, inclusive and participatory discussions; and
- Provide guidance on environmental management.

The EMC should also comply with the guidelines provided in the following document:

DEAT (2005) Environmental Monitoring Committees (EMCs), Integrated Environmental Management Information Series 21, Department of Environmental Affairs and Tourism (DEAT), Pretoria

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5.3 Management Structure

Details of the management structure for this EMPr, as applicable to the planning and design, and construction phases, showing official communication and reporting lines, are presented in Figure 2 below.

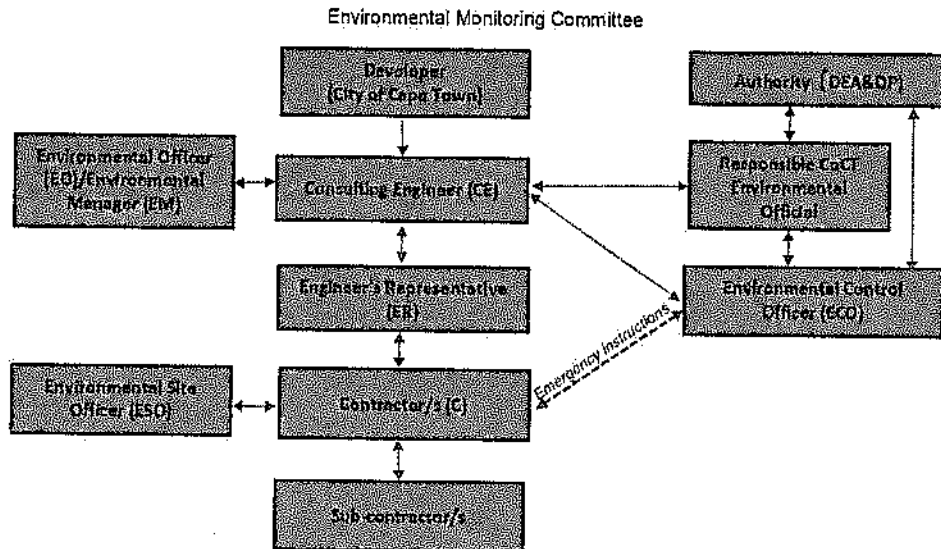


Figure 2: Management Structure (figure adapted from CoCT Detailed Environmental Specification, Version 6, Revision 2007).

5.3 On-Site EMPr Training and Awareness and Construction Phase Rules

The purpose of the environmental training is to communicate potential environmental impacts relating to construction activities to contractors to ensure that precautionary measures are undertaken to avoid and/or mitigate the potential impacts. Environmental awareness training sessions should be undertaken prior to any construction work commencing by any contractor or sub-contractor on site as well as throughout the construction phase. The EO or the ECO shall give initial EMPr training to all senior staff prior to any work starting on site. The training record must be kept on the project file for each training.

The main Contractor must provide the EO or ECO with (a) a list of all sub-contractors and their scope of work for the contract and (b) a time schedule of works before the initial environmental training awareness session is scheduled. This will assist the ECO to schedule subsequent EMPr awareness training sessions as and when required. The Developer shall inform the EO or ECO one month prior to starting construction, so that training can be given.

The Contractor shall ensure that the construction team and all sub-contractor/s are familiar with the EMPr requirements and have a basic level of environmental awareness training.

Topics to be covered by the training should include:

- What is meant by "environment"?

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- Why the environment needs to be protected and conserved.
- How construction activities can impact on the environment.
- What measures can be taken to mitigate against these impacts.
- Prevention of pollution and litter control and the minimisation of disturbance to sensitive areas.
- The need for a "clean site" policy also needs to be conveyed to construction workers.
- Worker conduct on site which encompasses a general regard for the social and ecological well-being of the site and adjacent areas. Workers need to be made aware of the following general rules of behaviour:
 - No alcohol/drugs to be present on site.
 - No firearms permitted on site or in vehicles transporting staff to / from site, (unless used by security personnel).
 - Bringing pets on site is forbidden.
 - No harvesting of firewood from the site or from areas adjacent to it.
 - Workers are to make use of facilities provided for them, as opposed to *ad-hoc* alternatives (e.g. the use of surrounding bush as a toilet facility is forbidden).
 - Driving under the influence of alcohol is prohibited.
 - Leaving the designated work and recreation area is forbidden.
 - No workers shall be permitted to live on site.
 - No plant or animal is to be harmed or disturbed in any way.
 - Should any bones be unearthed, the CE and ECO is to be contacted immediately. The bones are to be undisturbed until the go-ahead is given from Heritage Western Cape.

5.3.1 EMPr Awareness Training Throughout the Construction Phase

- EMPr awareness training must be given to new contractors and sub-contractors that start to work on site throughout the construction phase at various stages.
- All contractor and sub-contractor teams involved in work on site must be briefed on their obligations towards environmental controls and methodologies in terms of this EMPr prior to commencement of any construction and construction related activities on an on-going basis throughout the construction phase.
- In the case of new workers coming on site throughout the construction programme, the Site Contractor is responsible to ensure all new labour arriving on site is made aware of the contents of the EMPr and is briefed on the Environmental Awareness Training session.
- A register must be kept of all training given to contractors and sub-contractors, indicating the date, time, venue, attendees, name of trainer, name of contractor, signatures and unique numbers / identity numbers of attendees.
- If the construction is phased, a training session must be conducted before the commencement of each phase. The environmental issues, construction impacts and mitigation measures for each phase must be discussed in detail at this training session.

5.4 On-Site Communication Procedure (Construction Phase)

5.4.1 On Site Start-up/ Kick-off Meeting

- A mandatory on-site start-up meeting shall be convened preferably 14 days but not less than five working days prior to commencement of any site/camp establishment, earthworks and/or construction activities and will relate to additional discussed information that must be complied with during the entire construction phase.
- Information pertaining to specific site construction agreements that was discussed at the kick-off meeting on site by all the relevant parties and agreed on and must be recorded and included as part of the EMPr.
- Any changes made to the EMPr as per the agreements between all parties on site must still fall within the conditions of the EA.
- At the site start-up meeting, the following issues must be discussed:
 - The Construction EMPr and other relevant site documents;
 - Project to be discussed and all uncertainties are cleared;

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- Method statement/s;
- Access routes;
- Road and construction area to be demarcated;
- Materials stockpile and lay down areas to be demarcated;
- Method of stockpiling to be discussed;
- Firefighting procedures;
- Mandatory firefighting equipment and fire preventative measures;
- Mandatory site equipment and facilities;
- Solid waste facilities and removal intentions;
- Placement, type and service of toilets to be agreed on;
- Placement and type of rubbish bins and removal of rubbish to be agreed on;
- Environmental Education and awareness training session to all contractors and onsite staff/labour;
- Location and establishment of concrete batching plant facility if required; and
- Frequency of site audits (once a week for the first three months and thereafter once every two weeks).

5.4.2 Monthly Construction Progress Meetings

- Environmental matters pertaining to the construction phase must be included as an agenda item on the monthly project construction progress meeting.
- The ECO must be invited to monthly construction progress meetings to discuss findings of site audits, mitigation measures and other issues arising pertaining to the implementation of the EMP conditions.

5.4.3 Minutes of Meetings

- Environmental issues, action items, complaints, incidents and mitigation measures must be recorded in minutes of monthly construction project meetings.
- The ECO must be included in the circulation of minutes of meetings in order to stay informed of construction progress and construction issues as they relate to the receiving environment.

5.4.4 Complaints Register

- A complaints register must be made available for any complaints to be recorded related to the construction phase.

5.5 Implementation and Compliance with the MMP (Operational Phase)

Refer to the "Skills and Expertise" and "Compliance and Monitoring" columns in the tables in Chapter 10 for the people/positions responsible for implementation of and compliance with the MMP during the operational phase.

6 METHOD STATEMENTS

The Contractor shall submit written Method Statements to the CE and ECO for all environmentally sensitive activities, as per the Method Statement proforma to be provided by the City of Cape Town.

The following Method Statements shall be provided by the Contractor 14 days after receipt of the Letter of Acceptance:

MS 1: Access routes

- Upgrading and construction of access routes.
- Rehabilitation of temporary access routes.
- Location of proposed access routes.
- Traffic safety measures with regard to entry and exit on public roads and the control of construction traffic.

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MS 2: Alien plant clearing

- Method of control to be used for the eradication or control of alien vegetation.

MS 3: Bunding and Chemical Storage

- Method of bunding for static plant.
- Method of chemical storage.

MS 4: Camp establishment

- Layout and preparation of the construction camp.
- Method of installing fences required for "no go" areas, working areas and construction camp areas.
- Preparation of the working area.

MS 5: Cement /concrete batching

- Location, layout and preparation of cement/ concrete batching facilities including the methods employed for the mixing of concrete including the management of runoff water from such areas.

MS 6: Contaminated water

- Contaminated water management plan, including the containment of runoff and polluted water.

MS 7: Demolition

- Proposed method(s) of demolition.

MS 8: Drilling and jack hammering

- Method of drill coring with water or coolant lubricants.
- Methods to prevent pollution during drilling operations.

MS 9: Dust

- Dust control.

MS 10: Earthworks and Spoil Management

- Method for the control of erosion during bulk earthwork operations.
- Method for undertaking earthworks, including hand excavation and spoil management (including topsoil and excess spoil management/disposal).

MS 11: Emergency

- Emergency construction method statements.

MS 12: Environmental awareness training

- Logistics for the environmental awareness course for all the Contractors' employees.
- Logistics for the environmental awareness course for the Contractors' management staff.

MS 13: Erosion control

- Method of erosion control, including erosion of spoil material.

MS 14: Exposed aggregate finishes

- The method of control, treatment and disposal with respect to exposed aggregate finishes.

MS 15: Fire, hazardous and poisonous substances

- Handling and storage of hazardous wastes.
- Emergency spillage procedures and compounds to be used.
- Emergency procedures for fire.
- Use of herbicides, pesticides and other poisonous substances.

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- Methods for the disposal of hazardous building materials including asbestos, fibre claddings, refrigerants and coolants.

MS 16: Fuels and fuel spills

- Methods of refuelling vehicles.
- Details of methods for fuel spills and clean up operations.
- Refuelling of construction vehicles in high flow areas [or in the 1 in 50 year floodplain].

MS 17: Piling, jacking and thrust boring

- The method of piling operation (e.g. driven or bored) or *in situ* casting or pre-cast pile structures.

MS 18: Rehabilitation

- Rehabilitation of disturbed areas and revegetation after construction is complete.

MS 19: Riverine corridors / River Diversion

- Details on how stormwater will be managed during construction.
- Method of diverting the river during construction.
- Details of methods to control downstream sedimentation (refer to the relevant series of guidelines, detailed by reach, available from Stormwater Management).
- Details of methods to control instream and floodplain erosion.
- Details of methods to cross rivers or streams during construction activities.
- Details of the release of any construction related effluent water into any natural stream of river.

MS 20: Rock breaking

- Details of chemical applications to be used for rock breaking.

MS 21: Sensitive environments

- Proposed construction methods within any sensitive environments including wetlands.

MS 22: Settlement ponds and sumps

- Layout and preparation of settlement ponds and sumps.

MS 23: Solid waste management

- Solid waste control and removal of waste from site.
- Methods for the disposal of vegetation cuttings, tree trunks and or building materials.

MS 24: Sources of materials

- Details of materials imported to the site (where applicable).

MS 25: Traffic Control

- Traffic safety measure for entry/ exit onto/ off public roads.

MS 26: Vegetation clearing

- Method of vegetation clearing during site establishment.

MS 27: Wash areas

- Location, layout, preparation and operation of all wash areas, including vehicle wash, workshop washing and paint washing and clearing.

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7. PLANNING AND DESIGN PHASE

The mitigation measures to be implemented during the planning and design phase are described below.

7.1 Detailed Design and Landscaping Plans

- The detailed planning and design team should include, as a minimum, a civil engineer, freshwater ecologist and landscape architect.
- A Project Steering Committee should be established during the detailed design phase to ensure that all relevant City of Cape Town Departments' issues are considered in the detailed designs.
- Detailed landscape plans must be circulated to the following Departments for comment once they have been prepared:
 - City of Cape Town: Spatial Planning and Urban Design Department
 - City of Cape Town: Community Services, City Parks Department
- The cited restriction on trees and plant height by the Freshwater Ecology specialist, comes from the hydraulic modelling for the project (report by Prof Basson). These restrictions are based on controlling hydraulic roughness to prevent overtopping of the berms and in the case of trees, protecting the integrity of the structures. Prof Basson noted, however (e-mailed comments to Liz Day – August 2016) that some of the vegetation could be higher (up to 2m) provided that average hydraulic roughness remains in line with that of the model. The proposed final spatial layout of the shrubs/plants that will be established in the river corridor should be evaluated in a 2D numerical hydrodynamic model during the detailed design phase.

7.2 Freshwater Ecosystem Aspects

The planning and design phase conditions and mitigation measures below were sourced from the Freshwater Ecosystems Impact Assessment Report prepared by Dr Liz Day, 2016 (Appendix G2 to the BA Report).

7.2.1 Segment 1

Table 2: Segment 1 planning and design phase Freshwater Ecosystem mitigation measures.

Activity	Impact	Mitigation Measures
Implementation of river buffer / ecological setback	Improved river function, connectivity and rehabilitation potential	This would be a positive impact. Its likelihood of achieving success would be increased by: 1. Including allowance for the reshaping of steep, eroded river banks in order to improve bank stability through planting. 2. Shaping should be carried out with input from a river ecologist and should aim to achieve banks that are no steeper than 1:4 in most reaches. Shaping should allow for dense planting of the river bed and adjacent banks with appropriate, locally indigenous plant species, including the establishment of Palmiet (<i>Prionium serratum</i>) in the wetted channel (see Annexure B for list of recommended plant species).

7.2.2 Segment 2

Table 3: Segment 2 planning and design phase Freshwater Ecosystem mitigation measures.

Activity	Impact	Mitigation Measures
River channel "upgrade" to create a system that will contain up	Changes in natural river function	1. The details of the River Corridor Plan (2013) (Annexure C to this EMP/MMP) for this segment of the river [Section 6.2 of the RCP between the T2 Trunk Road and the Diversion Canal in Nell et al (2013)] must be implemented as stated in the document. The following practical exceptions/deviation from the

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Activity	Impact	Mitigation Measures
to the 1:100 year Return Interval (RI) flood, with the planned approach comprising pre-excavation of the river channel, and establishment of stable channel slopes of 1:230 by the installation of four weirs that will act as grade control structures.		RCP will apply: - Page 31, second last bullet: Trees and houses will indeed be allowed on the 65m wide berm. - Page 32, second bullet: The flattening of the side slopes will only be possible where the longitudinal profile allows for it. 2. Issues of longitudinal fragmentation along the upper and lower floodplains must be addressed by: - Flattening of the slopes (where the longitudinal profile allows for it) between the 1:7 year flood channel and the upper flood channel – slopes of 1:5 or flatter are recommended, to allow a better transition between habitat types; to improve the stability of the edge of the upper floodplain, to reduce erosion scour and to lessen the erosive impact of smaller floods (e.g. 1:7 to 1: 10 year RI) on the lower floodplain. - Flattening of the proposed 1:2.5 side slopes of the main low flow river channel, to an average slope of 1:4, but with allowance for variation in slope to a gradient as flat as 1:6 or 1:7 in places, to provide a less symmetrical initial shaping, bearing in mind that Basson's (2012) model output showed that the channel slopes would be dynamic, even at 1:2 RI floods. - Attention to the establishment of locally indigenous vegetation appropriate to the provision of low level shelter to riverine fauna within a band preferably 10m in width, abutting at least one side of each of the arrestor weirs. Effectively, this means that the 10m ecological and maintenance buffer along at least one side of the river in these areas (i.e. abutting the arrestor weirs) would need to be vegetated with a more complex diversity of plant species than the "rough grass" envisaged as a minimum requirement in the RCP (2013). This detail will have to be planned in conjunction with the detail design team to accommodate this in the design. The objective of these vegetated spaces is that they would allow a transition from the vegetated floodplain upstream or downstream of the weirs, up into the buffer areas, and back down (downstream or upstream) onto the floodplain, thus bypassing the significant interruption created by the weirs at these points. 3. Issues of lateral fragmentation would be addressed by implementation of recommendations in the RCP (2013) for open space areas in adjacent developments to link directly with the River Corridor, rather than existing as isolated entities – this would need to be a condition of development in adjacent areas. This will only be addressed when the developers apply for their development plans for each township. 4. Sterilisation of long (up to 20m) reaches of the river with riprap downstream of each weir would be addressed by interfilling large riprap with smaller sized stones and sediment aimed at providing substrate in which vegetation can establish. It is recognised that such material would be eroded from the channel during high velocity periods – nevertheless, the establishment of vegetation in these reaches is considered important from a habitat improvement perspective, and the successful establishment of plants such as Palmiet (<i>Prionium serratum</i>) in permanently wetted sections of these reaches should be encouraged, as this species plays a role in flood flow

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Activity	Impact	Mitigation Measures
		attenuation and associated erosion control. This detail will have to be designed in conjunction with the detail design team. 5. The effects of floodplain shrinkage and resultant channel down cutting would be addressed through effective indigenous planting and alien clearing maintenance activities in the floodplains and lowflow channel. 6. The proposed design measures, as described in Table 1 of this report, and as are based on Basson (2012) should be implemented.
	Encroachment onto remnant floodplains	1. Encroachment of the flood channel onto the remnant <i>Eleocharis limosa</i> wetlands on the western side of the channel cannot be mitigated against; this impact could however be offset by the creation of high quality, seasonally inundated, perched wetlands within the overall reconfigured river channel – provided that the operational phase maintenance measures regarding periodic replacement/rehabilitation of such habitat following flood damage are adhered to; the design and locations of these wetland depressions should be determined on site in consultation with a wetland/ river ecologist.
	Creation of deep, standing water habitat in ogee weir roller buckets	Safety issues must be addressed as follows: 1. The roller buckets should be fitted with litter traps. Best practice should be followed during the design process. 2. Litter traps must be maintained on a regular basis, if the function of the roller buckets is to be maintained. 3. This has been incorporated, along with others, into an Operational Phase Environmental Management Plan (OEMP) for the river corridor, forming part of the EMP. No mitigation measures are recommended for ecological issues such as nuisance species development:
	Further fragmentation as a result of bridges	1. Attention to the design and location of bridges across the river: a) The number of vehicle and pedestrian bridge crossings over the river should be minimised. Bridges other than those already approved as part of the N2 and Bloubaas Road upgrades should preferably cross at the point of the ogee weir drop structures only, and should not further fragment the river corridor. Basson (2012:112-113), identified and investigated four possible sites for future bridges. The four sites investigated are: the preferred future N2 bridge, and three site alternatives for the Bloubaas Road bridge. Flood levels and velocity vectors were measured in the physical model that was run (Basson, 2012). Table 8.3.6 in Basson (2012) gives the recorded maximum water levels, and Appendix D in Basson (2012) shows the simulated flow directions at the bridge sites. This information should be used to orientate the bridge piers. b) Where bridges cross the channel, their design must ensure that it does not negate the longitudinal connectivity allowed by the previous mitigation measure. c) Provision must be made in the design of the ogee weirs for the incorporation of sleeves, conduits or other devices that will allow for their immediate or future use to convey electrical cables, water pipelines and sewers across the channel at existing points of obstruction, rather than allowing for multiple crossings for such services in the future.

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Activity	Impact	Mitigation Measures
		d) In the case of the approved Bloubaos Road crossing, the following measures must be implemented: - The bridge should span the full width of the cross-sectional area of the channel (up to 86 m), with the location of piers placed within this area subject to approval by a fluvial geomorphologist; and - The placement of piers within the low flow portion of the channel (i.e. the section below the 1:10 year floodline) should be subject to approval by a fluvial geomorphologist, using the recommendations of Basson (2012). 2. In addition, the bridge should allow for piers that extend across the full buffer area, and maintain longitudinal connectivity. It should also allow for pedestrian (non-motorised transport) movement under the bridge. 3. Any additional river crossings to address access, must be catered for and addressed during the detail design process.
Planning and design of the river bypass or diversion	Sedimentation, erosion and flood damage	- The river will have to be bypassed or diverted during the construction phase. An option would be to construct on one side of the river with a temporary berm between the river and the construction area; and then on the other side after one side has been finished. Various other options to bypass or divert the river also exist. - The bypass/diversion shall take place within the 105m river corridor and/or the construction corridor. - The exact method of bypassing or diverting the river will be agreed with the contractor before construction commences. The ECO and Freshwater Ecologist should provide input into this method before it is agreed between the contractor and the City of Cape Town. - The ECO, with assistance from the Freshwater Ecologist, should furthermore also update the Construction Phase EMPr by including measures to mitigate any potential impacts associated with the identified river bypass/diversion method.

7.3 Segment 3

Table 4: Segment 3 planning and design phase Freshwater Ecosystem mitigation measures.

Activity	Impact	Mitigation Measures
Including activities: • Extension of the lined Diversion Canal to the existing diversion berm upstream of the Gordon's Bay WWTW • Removal of the balancing dam at the	Loss of and disturbance to artificial wetlands Sedimentation and pollution of / disturbance to downstream canal	No mitigation measures are proposed – rehabilitation of the natural channel is considered to be a more ecologically important objective. - The throttle structure should ideally be left in place until removal of all organic debris in the reaches upstream has taken place. Alternatively, another mechanism for effective sediment collection during construction must be found. The detail design phase will identify the best way to reconstruct the canal. - Removal of sediment and vegetation from upstream of the throttle structure as far as the current diversion berm must take place in summer when only the WWTW effluent is likely to require diversion past the construction works. This effluent must not be diverted into the natural channel during construction but should be piped or otherwise conveyed in a controlled manner

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Activity	Impact	Mitigation Measures
Fairview Golf Course and its "throttle" outlet - Construction of a transition structure between the diversion berm and the extended Diversion Canal - Construction of a 10m wide channel along the south-western boundary of Erf 5113 - Construction of a pedestrian bridge - Use of water from the Diversion Canal for irrigation		past the canal construction works.
Interventions associated with the natural channel, comprising: - Construction of a weir at the end of the re-configured river channel - Replacement of the Fulton Gate with a new weir / structure to allow the passage of up to 8m³/s during major flows into the natural Sir Lowry's Pass Channel - Conveyance	Effects on rehabilitation potential of the natural channel	- The weir or other structure at the downstream end of the reconfigured channel must be designed so as to allow natural low flows from the SLP River to pass into the natural channel (Segment 4) downstream. These mitigation measures are considered crucial to mitigating the cumulative impacts associated with the project as a whole, and to meeting the Desired State for the river in these reaches, as stipulated in Nell <i>et al.</i> (2013). - The structure must be located upstream of the point at which effluent from the Gordon's Bay WWTW enters the diversion canal. - Flows up to 1 m³/s from the upstream river channel must be passed into the natural river channel. - Flood flows in excess of 1 m³/s from the Sir Lowry's Pass River upstream of the structure, should be diverted into the canal. - Effluent flows from the Gordon's Bay WWTW should be diverted into the Diversion Canal downstream of the diversion structure. - During storm events, runoff from the eastern catchment up to volumes of 7 m³/s should be passed into the natural channel, where it will play a role in flushing of debris and sediment from the channel, improving water quality and stimulating river aquatic ecosystem function - these flows should comprise, in theory, a better quality of runoff than those from the Sir Lowry's Pass catchment, although water quality data indicated that

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Activity	Impact	Mitigation Measures
of flood flows from the eastern catchment to enter at the diversion weir, and its passage into the natural channel via the new weir at the Fulton Gate or where required. Position of the weir to be determined during the detail design phase.		(presumably) current agricultural activities along Channel 1 result in elevated concentrations of nutrients in low flows from this part of the catchment, under current land use. f) The structure replacing the Fulton Gate structure should be designed so as to feed the required flow volumes into the natural channel, allowing for upstream collection and treatment of sediment and litter, and ensuring through design that the passage of natural river low flows are allowed to pass into the natural river channel downstream. g) The structure should be designed such that the passage of base flows into the natural channel is a default scenario, and does not require active management. h) Both structures must be designed to address physical terrestrial connectivity along the river corridor – although the structures will provide unmitigable barriers to longitudinal instream movement, they should at least include terrestrial corridors, preferably 10m in width, on at least one side of the structure, vegetated with indigenous vegetation that provides vertical cover and habitat quality to a river ecologist's specifications 2) The design of the above structures should be finalised with input from a river ecologist, and should be formally signed off by the latter as meeting the stipulated requirements of the above mitigation measures.
Passage of water (natural flow) from upstream of the WWTW outlet into the natural channel (Segment 4).	If all flow is diverted to Segment 4: Loss of the current dilution of the WWTW effluent.	1) This system has to be designed in order to ensure partial flow down Segment 4, and partial flow down Segment 3.

7.4 Segment 4

Table 5: Segment 4 planning and design phase Freshwater Ecosystem mitigation measures.

Activity	Impact	Mitigation Measures
Existing infrastructure upgrades to the natural river channel, including various changes downstream of the diversion berm along the natural river channel and at points where roads cross the channel, to accommodate the required flows of 8m ³ /s received from the Sir Lowry's Pass River System.		
River lining: Lancaster Road to Faure Marine Drive:	Loss of lateral connectivity; poor instream habitat; increasing sterilisation of channel	1. The stepped gabion mattresses should be designed so that the lowest step is no higher than 30cm above the assumed summer baseflow level of the channel, depending on land availability. 2. A wide "sill" should be created at this level (0.5m in width) on which wetland/riverine vegetation can establish, in order to provide a less ecologically sterile habitat than that afforded by steep gabions, which would be elevated too high to allow the establishment of vegetation. This "sill" would run the length of the channel on both sides, and would improve longitudinal connectivity and create a vegetated zone above the permanently inundated water level. 3. Suggestions for plant species to establish in this zone

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Activity	Impact	Mitigation Measures
		include Palmiet <i>Prionium serratum</i> as well as hardy sedges (e.g. <i>Isolepis prolifer</i> and <i>Carex</i> spp.). The exposed gabion shelf should include a bidem lining and interfilling with top soil, to encourage establishment of plants. 4. Hardy indigenous creepers/other low maintenance plants should be established on the gabion higher up – this is less to create habitat and rather to promote shading and reduce the need for mowing and cutting of plant cover.
Creation of an unlined trapezoidal channel between Dennehof and Lancaster Roads and downstream of Admiral's Drive:	Channel simplification; lost rehabilitation opportunity; perpetuation of present undesirable situation	1. The proposed channel design for these reaches should be amended so as to create a wide, vegetated river corridor, with gently graded banks (no steeper than 1:4 and preferably as gentle as 1:7 in places. These banks should be planted with locally indigenous vegetation – establishment of a nursery has been recommended (Neil et al, 2013) to make such measures more affordable. The channel should be allowed to meander within the open space, rather than being conveyed as a straight line, and a fluvial hydraulics specialist should be consulted with regard to the right level of sinuosity to strive for. 2. If setting of channel depth is required to guide long-term maintenance measures, then it is suggested that the channel could be lined with Armortex (or similar) on the base, with reno on the sides, and naturally vegetated banks, provided that the reno are lined with a bidem or other geotextile to prevent undermining and the erosion of fine sediments. 3. The need for removal of alien trees and/or other vegetation along this zone should be established on site prior to construction, with input from a river ecologist and the project engineer, noting that bank rehabilitation possibilities should not be limited by the presence of alien trees.
Changes in pipeline outlet levels (Clipper Road, Faure Marine Drive):	Possible bank destabilisation, erosion as a result of concentrated flows, bank disturbance	1. Energy dissipation measures must be included at each outlet. Ideally, these should take the form of re-grading the bank and vegetating it so that energy dissipation is achieved by vegetation. In the case of larger outlet pipes, this would not be adequate and measures such as riprap or reno mattresses must be used to address erosion. In such cases, these devices must be set into the river bed and/or banks in a manner that allows them to blend over time into the natural vegetated bed and banks of the river. 2. Rehabilitation measures for the river in this segment require the river bank to be graded to slopes no steeper than 1:4, where space permits. Changes in pipeline outlets should actively seek to address this, by re-grading the bank along a length of 10m in the area of the intervention and setting the pipeline back accordingly. Allowance must be made for planting of the banks that are thus disturbed, using locally indigenous plants. Note that this measure may not always be practical – in the case of the Faure Marine Drive outlet, other services and stormwater outlets and the availability of space along the river bank mean that the existing bank profile would

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Activity	Impact	Mitigation Measures
		probably need to be kept, and attention to dissipation measures would be required. The use of Palmiet along the wetted bank of the river as a flow dissipation measure should also be considered as this would contribute positively to river habitat improvement.
Installation of larger / additional pipes, culverts at road crossings (Admiral's Drive, Lancaster Road, Faure Marine Drive)	Improved flood conveyance and reduced erosion, destruction of banks and infrastructure in floods	No mitigation measures required, assuming pipes and culverts are sized appropriately
Alteration in existing pedestrian bridge height or width:	- Loss of opportunities for future bank rehabilitation, if new bridges are designed and placed according to existing steep-sided banks; - Localised scour and bed or bank erosion as a result of the placement of structures in the main channel; - Erosion as a result of debris dams caused against extruding structures (handrails etc.) during floods.	- The width of any new pedestrian bridge should take cognisance of recommendations for river bank re-grading and rehabilitation through planting. Bridge structures should thus be widened in design, to allow for gently sloped banks (1:5). Ideally such activities should form part of general rehabilitation activities, and bank widening and planting should precede bridge replacement. Note that in the case of the Faure Marine Drive bridge, the planned gabion lining for the already-confined channel will limit the extent of bank widening that is possible. - As a general principle, pedestrian bridges should span the whole river, but where supports/piers are required, these should be located outside of the low-flow channel. Pedestrian bridges located within the 1:50 year floodline (this would probably apply to most of them) should be designed, so that handrailings/other structures above the bridge base that are likely to snag debris during floods, so as to snap off rather than become the cause of a major debris dam. - The use of new culverts across the channel to create pedestrian crossings should not take place, as these would further fragment flows and river habitats within the river corridor.

7.5 Segment 5

Table 6: Segment 5 planning and design phase Freshwater Ecosystem mitigation measures.

Activity	Impact	Mitigation Measures
Upgrading of the stormwater drainage system at the Fairview Golf Course, to allow for the passage of flows anticipated to be generated in	Reduced water quality amelioration and loss of poor quality reedbed habitat	Devices that address poor water quality from the golf course and adjacent developments should be included in the management of runoff from the golf course and adjacent residential development and parking areas. Any appropriate device that will allow for the collection of sediment (mainly) and removal of litter, as well as (ideally) the reduction of nutrients (mainly phosphorus) should be included, with the Georgia Manual for Stormwater Treatment (Georgia, 2001) being recommended as a starting point for ideas for appropriate approaches.

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Activity	Impact	Mitigation Measures
this part of the catchment		Possible options could include extended (dry) swales, forebays, detention ponds or simple sediment and litter traps at channel outlets. Although removal of phosphorus from stormwater would usually be accorded high priority in such recommendations (e.g. CoCT, 2009), the golf course discharges into sewage effluent in a canal just upstream from its marine outlet, such approaches are therefore not considered reasonable. 2. The above sediment and litter traps would need to be included in operational maintenance and management approaches for this area of the catchment. 3. The establishment of hardy, low-growing wetland vegetation such as <i>Isotria medeoloides</i> should also be considered for the lower-lying, wetter channels, where this plant will assist with trapping of sediment without posing a threat in terms of channel capacity.

7.6 Segment 6

Table 7: Segment 6 planning and design phase mitigation measures.

Activity	Impact	Mitigation Measures
Detailed design of the proposed raised culvert wall	Impeded maintenance and access for emergencies due to higher culvert walls.	1. Maintenance and access for emergencies should be addressed during the detailed design phase of the raised culvert wall. 2. Input from the City of Cape Town: Spatial Planning and Urban Design Department should be obtained during the detailed planning and design of the raised culvert walls.

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8 CONSTRUCTION PHASE ENVIRONMENTAL MANAGEMENT PROGRAMME (CEMPr)

During the construction phase, the activities/interventions proposed for the six segments of the Sir Lowry's Pass River will be implemented, as summarised in Figure 1.

The need for Method Statements (MS) to be prepared and submitted by the Contractor(s) are indicated below where relevant.

8.1 Community Relations

- The Contractor shall erect an information board containing background information for the construction activities and listing the relevant contact details for complaint. The number and location of information boards for this project will be determined when drawing up the tender document.

8.2 Environmental Awareness Training

- All the Contractors' employees and Sub-Contractors' employees and any suppliers' employees that spend more than one day a week or four days in a month on site, must attend an Environmental Awareness Training course presented by the EO or the ECO, the first of which shall be held within one week of the commencement date. Subsequent courses shall be held as and when required.
 - The ECO/EO or suitably qualified representative will present the environmental awareness training course to the Contractors employees on the site, to any new employees coming onto site and to the Contractors subcontractors and suppliers.
 - No more than 20 people shall attend each course and the cost, venue and logistics for this/these course/s shall be for the Contractor's responsibility.
- Within seven days from the commencement date the contractor shall ensure that the first course/s is/are held for as many of the employees that are available at this time.
- The Contractor shall supply the ECO/EO with a monthly report indicating the number of employees that will be present on site during the following month and any changes in this number that may occur during the month.

Also refer to Section 5.2.1 of this EMPr.

Method Statement (MS) 12: Environmental Awareness Training

8.2.1 Construction Personnel Information Posters

- An A3 construction personnel information poster must be laminated and erected in the eating area. The specifications for the posters will be included in the Contractors' tender document.
- The Contractor shall ensure that the construction personnel information poster is not damaged in any way, and shall replace it if any part of it becomes illegible.

8.3 Construction Camp Establishment

- The location for the establishment of a construction camp for the storage of materials, site office, containers, ablution facilities etc. shall be identified by the Contractor in consultation with the ECO and remain in the same location for the duration of the development activities.
- The construction camp shall not be located in an area of environmental sensitivity and shall contain an adequate wastewater management system for ablution facilities as well as other waste water generating activities.
- No construction camp shall be established within 32 metres of any watercourse (wetland, river, drainage channels or flood plains) or in an area with sensitive archaeological resources.

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- The construction camp shall be fenced off and the suitable signage shall be placed on the entrance and perimeter fence.
- The construction camps shall be kept neat and tidy at all times. Materials and equipment must be kept in designated areas and storing/stockpiling shall be kept orderly.
- The Contractor shall submit a Method Statement indicating the location, preparation and layout of the construction camp.

MS 4: Construction camp establishment

8.4 Landscaping and Nursery Establishment and Maintenance

- A nursery should be established and maintained for the propagation of plants from local Helderberg basin (Sir Lowry's Pass or Lourens Rivers) or Eerste River catchment material.
- Propagation will require at least a 12-month lead-in time for seed collecting, germination and rooting of cuttings in the appropriate seasons, and growing in preparation for planting out in the field in autumn.
- Only plants propagated from local material may be used for landscaping/rehabilitation. No material may be brought in from other nurseries, since this could negatively impact the genetics of local populations.

8.5 Maintenance of the Construction Site and Waste Management

- The Contractor shall ensure that all litter is collected daily from the work area. Similarly, all bins shall be emptied daily and the waste disposed of at a permitted landfill site.
- Wastewater from construction activities (e.g. mixing cement) is to be captured and disposed of at a licensed hazardous landfill site with proof of safe disposal.
- Waste bins and skips must be used for all waste and litter.
- Waste bins must have lids to prevent content from blowing away or accumulating rain water.
- All waste material shall be stored in a way to avoid stormwater run-off or ground contamination due to rain.
- The Contractor shall ensure that the construction site, working and eating areas are maintained in a clean, hygienic and orderly state.
- Separate bins should be provided for various materials to facilitate recycling. The bins should have liner bags for easy control and safe disposal of waste.
- The excavation and use of rubbish pits on site is forbidden.
- The burning of waste is forbidden.
- Contaminated soil (resulting from oil spills, etc.), unwanted cement bags and water used for washing concrete equipment are regarded as hazardous waste and should be disposed at a permitted hazardous waste landfill site.
- All hydrocarbons, including fuel, oil, tar or bitumen and its associated contaminated soil or wastewater, shall be disposed of at a licensed hazardous waste site and disposal certificates obtained.
- No hydrocarbons shall be disposed of by burning or burial and unused material to be returned to the supplier or disposed of in the manner described above.
- Hydrocarbons from vehicle and machinery maintenance may be stored in appropriate containers in a bunded area with impermeable surfacing for up to 30 days before disposal at a licensed hazardous waste disposal site.

MS 23: Solid waste management

8.6 Staff Management, Ablution and Eating Facilities

- Workers are to make use of the chemical toilet to be provided. Under no circumstances may neighbouring open areas or the surrounding bush be used as a toilet facility.

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- The Contractor shall provide one (1) toilet for every 15 workers on site or as stipulated by pertinent legislation.
- To prevent toilets from blowing over, they must properly be secured, containing a functioning door and lock.
- Chemical toilets shall not be located within 32m of a watercourse and emptied on a regular basis. Care shall be taken that spillage of toilet contents does not occur during content removals.
- Chemical toilets that will be utilised during the construction phase must be located such that it does not pose a risk of water pollution and its contents must be disposed of at an appropriate facility.
- No toilet shall be located in sensitive environments (i.e. in or near watercourses or wetlands).
- No food may be left outside unattended. No food may be disposed of in the surrounding areas.
- Washing facilities for construction teams shall be provided with flow reduction devices and adequate catchment to contain wash water. Only biodegradable soap shall be allowed (as provided by the Contractor).
- Water from wash basins shall be re-used wherever possible.
- The Contractor in association with the Developer shall monitor the performance of workers to ensure compliance with good environmental practices and general conduct as per their environmental awareness induction training.
- Burning of any sort by construction workers are forbidden on site.
- The construction site shall stay clean and orderly at all times.

8.7 Site Demarcation

- The boundaries of working areas shall be fenced off/demarcated [Consulting Engineer (CE) to specify type of fencing to be used].
- The Contractor shall maintain in good order all demarcation fencing and barriers for the duration of construction activities, or as otherwise instructed.

8.7.1 Special and No-go Environments

- All trees, which are to be retained, are to be clearly indicated on a site plan and demarcated.
- Trees to be demarcated shall be clearly marked under the supervision of the CE/ECO/EO. Marking techniques include danger tape, paint (be aware of long term aesthetics), strapping or pegs. Tagging by exclusion shall be considered, i.e. where the number of trees to be cleared is fewer than those to be retained then mark trees for felling and all other trees shall automatically be retained.
- Demarcation shall remain in place for the duration of works on site. If damaged, demarcation shall be repaired or replaced immediately.
- Special features shall be marked on a site layout plan prior to any works commencing on site. These areas may be designated "No go" areas.
- Identified No-Go/sensitive areas shall be fenced off [Consulting Engineer (CE) to specify type of fencing to be used].
- No unauthorised entry, stockpiling, dumping or storage of equipment or materials shall be allowed within the demarcated "no go" areas.
- Outcrops, rock faces, trees and natural vegetation or any other natural or special features inside and outside the site, shall not be defaced, painted for benchmarks for survey or any other purposes or otherwise damaged in any way without the prior approval of the Engineer/ECO/EO. These features shall be demarcated as "no go" areas and shall be fenced or similarly protected, as determined by the Engineer/ECO/EO.
- Wetlands:
 - Damage to wetland areas shall be minimised. The ECO/EO shall approve demarcation of work area extent. All wetland areas shall be marked clearly on the plan and the Contractor shall submit a Method Statement for review at least 14 days prior to commencing construction in a wetland.

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- o The Contractor shall remove all wetland vegetation, as indicated by the ECO/EO, with their root ball intact. This vegetation shall be kept moist at all times and shall be placed in the shade and covered with moistened hessian cloth until replanting within a specified time period.
- o No construction materials shall be stockpiled in any wetland areas.

8.8 Access and Traffic Control

- The Contractor shall ensure that access to the site and associated infrastructure and equipment is off-limits to the public at all times during construction. Additional areas restricted to the public and suggested detours shall be clearly marked on the information boards to the satisfaction of the ECO/EO.
- The existing access roads shall be utilised where possible.
- Property owners' access to their properties must remain clear at all times.
- Existing private access roads utilised by vehicles for construction purposes must be maintained at all times. Maintenance includes adequate drainage and side drains, dust control and restriction of edge use.
- Damage to existing access roads as a result of construction activities shall be repaired to the satisfaction of the ECO/EO, using material similar to that originally used. The cost of the repairs shall be borne by the Contractor.
- The movement of any vehicles and/ or personnel outside of the designated working areas shall not be permitted without the written authorisation of the Engineer/ECO/EO.
- Existing private access roads damaged during the construction phase must be rehabilitated to the state in which they were before construction. Rehabilitation is to occur within an agreed period with the landowner from the date of identification.
- All Contractors, subcontractors and staff shall be identified by clothing with company logos and be in possession of valid SA identity documents.
- Deliveries, removals etc. to be completed during gate open times only.
- All personnel shall be off site by gate closing time unless permission to stay on site provided as part of the construction contract.
- Parking of construction and related vehicles, and off-loading of materials shall be on site and in demarcated construction areas only.
- Construction staff is not to enter any properties at/near the construction site, other than the property on which work is commencing.
- The Contractor shall, at his cost, document with photographs the existing condition of all access roads prior to the commencement of construction.
- Should any damage occur to the access road as a result of the upgrade activities, the road will be rehabilitated to its original state with all costs borne by the contractor. All unused materials must be removed from the site at the end of construction.
- On public roads adjacent to the site, vehicles will adhere to municipal and provincial traffic regulations.
- Should an additional access route be required, the access must be agreed upon with the relevant property owner in conjunction with the contractor. A written agreement must be in place, prior to any construction of the said access route.
- Upgrading of the access roads shall be undertaken within the existing confines of the road, unless otherwise agreed with the Engineer/ECO/EO.
- All public roads shall be kept clear of mud and sand. Mud and sand that has been deposited through construction activities shall be cleared regularly.
- All temporary access routes shall be rehabilitated at the end of the contract to the satisfaction of the Engineer/ECO/EO.
- All users of haul roads shall not exceed 45 km/h (cars)/ 15 km/h (trucks).

MS 1: Access routes

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8.8.1 Traffic Control

- All vehicles will be legally compliant.
- All drivers will be competent and in possession of an appropriate valid driver's license.
- The Contractor must control the movement of all vehicles (construction and private) including that of his suppliers so that they remain on designated routes.
- Temporary road signs and traffic warning signs must be erected and maintained during the construction phase.
- Traffic safety measures, to the satisfaction of the Engineer/ECO/EO, shall be considered in determining entry / exit onto public roads.
- Attention shall be paid to minimising disruption of the flow of traffic and reducing the danger to other road users and pedestrians.
- Trained and equipped flagmen shall be used where the access road intersects with any public roads.
- Single directional traffic shall be controlled through a stop-go system or any other appropriate traffic control method.
- All traffic accommodation measures are to conform to the latest edition of the South African Road Signs Manual.
- No member will be permitted to drive a vehicle under the influence of alcohol or narcotic substances.

MS 25: Traffic control

8.9 Dust Control

- Generation of dust shall be minimized and dust nuisance for the surrounding areas shall be kept to a minimum wherever possible.
- Dust from exposed soil surfaces shall be minimized at all times, using water spraying during extremely windy conditions or during the compaction process of the berms and river construction. Dustex can also be used for dust control.
- Reasonable measures must be implemented by the contractor to ensure that any exposed areas and material stockpiles are adequately protected against the wind.
- Dust suppression measures must be implemented for heavy vehicles such as the wetting of gravel roads on a regular basis and ensuring that vehicles used to move soil etc. are fitted with tarpaulin or covers.

MS 9: Dust Control

8.10 Fire Control

- The Contractor shall take all reasonable and active steps to avoid increasing the risk of fire through their activities on Site.
- No fires may be lit except at places approved by the Engineer/ECO/EO.
- The Contractor shall supply all site offices, kitchen areas, workshop areas, materials, stores and any other areas identified by the Engineer/ECO/EO with tested and approved fire-fighting equipment, to the satisfaction of the Municipal Fire Chief.
- Fire and "hot work" shall be restricted to a site approved by the Engineer/ECO/EO.
- Spark quenching will be minimised by wetting down.
- A braai facility may be considered at the discretion of the Engineer/ECO/EO. The area shall be away from flammable stores. All events shall be under management supervision and a fire extinguisher shall be immediately available. "Low smoke" fuels shall be used. Smoke free zoning regulations shall be considered.
- Fires within Nature Reserves and natural areas are prohibited. Cooking shall be restricted to bottled gas facilities under strict control and supervision.

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- The sensitivity of the surrounding land uses and occurrence of natural indigenous vegetation must be considered when assessing the risk of fires.
- The Contractor shall take precautions when working with welding or grinding equipment near potential sources of combustion. Such precautions include having a suitable, tested and approved fire extinguisher immediately at hand and the use of welding curtains.
- The Municipal Fire Chief must be informed and consulted in terms of the relevant Fire Regulations.
- All fire requirements shall be carried out as contained in the National Building Regulations SABS 0400 and the safety code of the National Fire Protection Association of the South Africa (NFPA).
- The disposal of any matter by burning is prohibited.
- No smoking will be allowed on site, except in designated smoking points.

MS 15: Fire, hazardous and poisonous substances

8.11 Safety and Emergency Procedures, Risk Management and Training

- The application of all Occupational Health and Safety Regulations must be ensured. This includes the distribution and use of protective clothing and equipment to at least include safety shoes, overalls, gloves, dust masks, and where appropriate ear muffs and eye/face protection shields.
- Hand out and use of safety and protective equipment must be recorded. Staff who fail to use the protective equipment provided by site staff must not be allowed to work at the facility.
- Emergency procedures for fire, adverse conditions due to inclement weather, spillages, stoppage of operations due to refusal to work by employees, etc. must be included in the emergency procedures.
- All staff working on site shall be trained in all relevant aspects of the Occupational Health and Safety Act No. 85 of 1993 and relevant regulations promulgated under this act.

MS 11: Emergency

MS 15: Fire, hazardous and poisonous substances

8.12 Leaks, Spills and Chemical Storage

- Any accidental spills shall be cleaned up and the area re-instated to the approval of the ECO.
- The site shall have a supply of absorbent material readily available to absorb any emergency hydrocarbon spills, and where possible is designed to encapsulate minor hydrocarbon spillage. The quantity of such materials shall be able to absorb / deal with a minimum of 200 l of hydrocarbon liquid spill.
- There are a number of products on the market, which are designed and suitable to absorbents and encapsulate. The following are examples of those products used to contain incidental spillage:
 - Spill-Sorb – oil and chemical absorbent and encapsulating products
 - Drizzat Pads (021 531 5335)
 - Enretech Powder – Absorbent and encapsulation (021 683 1858)
 - Oil spill kits are also available from Pinelands Environmental Technology (021 531 3749)
- Treatment and remediation of spill areas shall be undertaken to the satisfaction of the Engineer/ECO/EO.
- The source of the spillage shall be isolated.
- The contractor shall contain the spillage using sand berms, sandbags, pre-made booms, sawdust or absorbent materials.
- Notify the Engineer/ECO/EO and the City of Cape Town Pollution Control Inspectorate.
- Oil containment facilities should be provided for any oil filled equipment onsite.
- Care should be taken to prevent any potential oil spillage during construction activities.
- Sufficient measures should be put in place to ensure that any potential oil spills are mitigated.
- In the event of an oil spill, please refer to the City of Cape Town's Standard for Oil Spill Clean-up and Rehabilitation.

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- Should an oil spill occur during construction activities, the oil spilled should be contained as soon as possible and the procedure as set out in the Standard for Oil Spill Clean-up and rehabilitation be followed.
- Re-fuelling of vehicles shall be done in a designated area within the construction camp.
- Drip trays shall be used at all times when re-fuelling vehicles on-site or for any motor-driven equipment (e.g. generators, pumps etc.).
- All vehicles to remain within the designated vehicle tracks and parking areas on the site when not in use.
- Refuelling or maintenance involving the use of hydrocarbons shall not occur within 32m of a watercourse.
- Regular maintenance should be undertaken on construction vehicles to avoid possible spills and leaks.
- If accidental spillage of hydrocarbons occurs, the area shall be demarcated and isolated before clean-up commences.
- Any contaminated soil shall be excavated and disposed of at a licensed hazardous landfill site with proof of safe disposal.
- The Contractor shall ensure that any run-off from re-fuelling area(s), stockpiles or hazardous materials site is contained. No run-off shall enter the ground or watercourses.
- Construction materials shall only be stored on demarcated construction sites.
- The Contractor shall ensure that all materials to be moved between locations are properly secured and/or covered up during transport.
- The Contractor shall ensure that the pick-up and/or drop-off of materials is handled in a safe and environmentally acceptable manner as prescribed in this EMPr.
- The Contractor shall ensure that the suppliers are aware of the conditions of this EMPr when moving materials to/from the construction site.
- Storage of any materials shall not take place within 32m of any watercourses or sensitive environments.
- Fuel, oil and any other hazardous substances and harmful materials shall be stored in suitable containers within adequately bunded areas (with 110% of the capacity of the volume of the container) in a dry, secure environment, with concrete or sealed flooring.
- Material Safety Data Sheets must be kept for all hazardous materials and substances and a copy of the Material Safety Data sheets made available to all workers to ensure that the required safe handling and necessary precautions are taken when using the materials.
- The Contractor will ensure that materials storage facilities are cleaned/maintained on a regular basis, and that leaking containers are disposed of in a manner that allows no spillage onto the bare soil or surface water.
- The management of such storage facilities and means of securing them shall be agreed to by the Contractor with the Developer.
- All hazardous substances on site have to be locked away at all times and directly after use of the substance in designated area.
- The Contractor will only provide selected individuals with keys to specified locks securing hazardous substances.

MS 3: Bunding and Chemical Storage
MS 15: Fire, hazardous and poisonous substances

8.13 Cultural Heritage

- If any human remains or archaeological remains (e.g. fossils, bones, artefacts etc.) be exposed or uncovered during excavations, the Contractor shall stop work immediately and inform the ECO who must contact Heritage Western Cape (HWC) for information on the appropriate course of action to be taken. HWC contact detail: 021 483 5959.
- Should any findings be made, the Contractor shall not recommence working in that area until he has received written permission from the ECO.

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- Note that the Contractor may not, without a permit issued by HWC; destroy, damage, excavate, alter, deface or otherwise disturb any archaeological site or archaeological material. The latter is a criminal offence under the Heritage Resources Act.

8.14 Work Hours

- Normal working hours will apply as laid out by building legislation and as prescribed by local noise by-laws. Working hours will be limited between 08:00 and 17:00 on weekdays (Mon- Fri), as well as on certain Saturdays.
- No work is permitted on Sundays.

8.15 Noise

- The Contractor shall adhere to the local by-laws and regulations regarding the noise and associated hours of operations.
- The Contractor shall limit noise levels (e.g. install and maintain silencers on machinery). The provisions of SANS 1200A Sub-clause 4.1 regarding "built-up" area shall apply to all areas within audible distance of residents whether in urban, peri-urban or rural areas.
- Construction and demolition activities generating output of 85dB or more, shall be limited to normal working hours and not allowed during weekends to limit the impact of noise of neighbours.
- Should the contractor need to work outside normal working hours (including Sundays from 07h00 to 17h00), any affected individuals shall be informed prior to the work taking place.
- No amplified music shall be allowed on site.

8.16 Temporary Site Closure

- If the Site is closed for a period exceeding one week, the Contractor in consultation with the CE and ECO shall carry out the checklist procedure required by the Project Specification. In the event of temporary site closure, the Contractor's Safety Officers (as defined by the Occupational Health and Safety Act) shall check the site, ensure that the conditions contained in the Detailed Specification.

8.17 Soil Erosion and Sedimentation Control

- During construction, the Contractor shall protect areas susceptible to erosion by installing necessary temporary and permanent drainage works as soon as possible and by taking other measures necessary to prevent the surface water from being concentrated in streams and from scouring the slopes, banks or other areas.
- A Method statement shall be developed (in consultation with a specialist if necessary) and submitted to the Engineer/ECO/EO to deal with erosion issues prior to bulk earthworks operations commencing.
- Any runnels or erosion channels developed during the construction period or during the vegetation establishment period shall be backfilled and compacted, and the areas restored to a proper condition.
- Stabilisation of cleared areas to prevent and control erosion shall be actively managed. The method of stabilisation shall determined in consultation with the Engineer/ECO/EO and a specialist if necessary. Consideration and provision shall be made for the following methods (or combination): (choose appropriate method)
 - o Brushcut packing
 - o Mulch or chip cover
 - o Straw stabilising (at the rate of one bale/m² and rotated into the top 100mm of the completed earthworks)
 - o Watering
 - o Planting / sodding
 - o Hand seeding/sowing
 - o Hydroseeding
 - o Soil binders and anti erosion compounds

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- o Mechanical cover or packing structures:
 - Gabions & mattresses
 - Geofabric
 - Hessian cover
 - Armorflex (or similar)
 - Log / pole fencing
 - Retaining walls
- Traffic and movement over stabilised areas shall be restricted and controlled, and damage to stabilised areas shall be repaired and maintained to the satisfaction of the Engineer/ECO/EO.
- Anti-erosion compounds shall consist of an organic or inorganic material to bind soil particles together and shall be a proven product able to suppress dust and erosion. The application rate shall conform to the manufacturer's recommendations. The material used shall be of such a quality that grass and fynbos seeds may germinate and not prohibit growth.
- All vehicles to remain within the designated vehicle tracks.
- Existing access tracks must be utilised insofar possible.
- Stabilised areas where through-fare is necessary for vehicles and excavation equipment shall be monitored carefully and traffic kept to a minimum.
- Minimum/no movement in areas already eroded.
- Erosion control should form part of the on-going construction site management.
- After excavation, the affected area shall be stabilized accordingly to prevent any erosion or sediment runoff. Stabilized areas shall be demarcated accordingly.

MS 13: Erosion control

8.18 Stormwater Controls

- The Contractor shall take reasonable measures to control the erosive effects of stormwater runoff.
- The Contractor shall use silt screens to prevent overland flowing water from causing erosion.
- The use of straw bales as filters, which are placed across the flow of overland stormwater flows, shall be used as an erosion protection measure.
- The ploughing-in of straw offers limited protection against stormwater runoff-induced erosion and shall be used as an erosion protection measure.
- The Contractor shall be liable for any damage to downstream property caused by the diversion of overland stormwater flows.
- Contaminated water by silt, cement or any other construction materials shall be diverted into a temporary settlement pond or suitable containers to settle out materials before the water can be decanted into the ground and/or watercourse. The settled material shall be disposed of in an environmentally acceptable manner.

8.19 Cement and Concrete Batching

Location:

- Concrete shall not be mixed directly on the ground.
- The concrete batching activity shall be located in an area of low environmental sensitivity to be identified and approved by the Engineer/ECO/EO.
- The permitted location of the batching plant (including the location of cement stores and sand and aggregate stockpiles) shall be indicated on the site layout plan and approved by the Engineer/ECO/EO. A Method Statement indicating the layout and preparation of this facility is required in this regard.
- Mixing activities must take place on an impermeable surface and the mixing area should be bunded to contain any liquids to prevent contamination of soil and storm water.

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Maintenance:

- All wastewater resulting from batching of concrete shall be disposed of via the wastewater management system.
- The cement/concrete batching works shall be kept neat and clean at all times. No batching activities shall occur on unprotected substratum of any kind.
- All runoff from batching areas shall be strictly controlled, and cement-contaminated water shall be collected, stored and disposed of at a site approved by the Engineer/ECO/EO. Daggas, boards, mixing trays and impermeable sumps shall be used at all mixing and supply points. Contaminated water shall be disposed at a waste disposal site approved by the Engineer/ECO/EO.
- Contaminated water storage facilities shall not be allowed to overflow and appropriate protection from rain and flooding shall be implemented.
- Contaminated water treatment on site shall require a method statement approved by Engineer/ECO/EO.
- Unused cement bags are to be stored so as not to be effected by rain or runoff events.
- Used bags shall be stored in weatherproof containers to prevent wind blown cement dust and water contamination. Used bags shall be disposed of on a regular basis via the solid waste management system, and shall not be used for any other purpose.
- The re-use of discarded cement bags on site is forbidden.
- Concrete transportation shall not result in spillage.
- Cleaning of equipment and flushing of mixers shall not result in pollution of the surrounding environment. Care shall be taken to collect contaminated wash water from cleaning activities and dispose of it in a manner approved by the Engineer/ECO/EO. To prevent spillage onto roads, ready mix trucks shall rinse off the delivery shoot into a suitable sump prior to leaving Site.
- Suitable screening and containment shall be in place to prevent wind-blown contamination associated with bulk cement silos, loading and batching.
- With respect to exposed aggregate finishes, the Contractor shall collect all contaminated water & fines and store it in sumps for disposal at an approved waste site.
- All visible remains of excess concrete shall be physically removed on completion of the plaster or concrete pour section and disposed off. Washing the remains into the ground is not acceptable. All excess aggregate shall also be removed.
- Concrete and cement shall preferably be ordered from the supplier; otherwise only sufficient quantities shall be mixed at any one time.
- The Contractor shall be responsible to implement collection facilities for cement/concrete water and matter.
- The visible remains of the batch and concrete, either solid, or from washings, shall be physically removed immediately and disposed of as hazardous waste.
- Excess concrete shall be disposed of in a safe manner at a licensed landfill site.

MS 5: Cement / concrete batching

8.20 Demolition

- Hazardous and non-hazardous materials shall be separated at site and disposed of in a manner approved by the Engineer/ECO/EO.
- All buildings older than 60 years require a permit from South African Heritage Resources Agency in terms of the National Heritage Resources Act (no. 25 of 1999).
- A demolition permit is also required from the local authority in terms of the National Building Regulations (this applies to the demolition all buildings, irrespective age).
- Municipal and other services shall be isolated prior to any demolition occurring.
- Hazardous building materials (e.g. asbestos, fibre claddings, refrigerants, coolants, substation cooling oils) shall be identified prior to demolition of the building and dealt with in accordance with the safety and health legislation. A Method Statement, outlining the proposed approach to the disposal of these materials, must be supplied for approval by the Engineer/ECO/EO.

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- Safety legislation shall be strictly adhered to in demolishing buildings and structures.
- A Safety officer shall be appointed to oversee the safe demolition of buildings and structures.
- Demolition sites shall be kept in a neat, tidy and safe condition.
- Hazardous and non-hazardous materials shall be separated on site and disposed off at appropriate licensed disposal sites. The Contractor shall supply the Engineer/ECO/EO with a certificate of disposal.
- Prior to demolition taking place, the Contractor shall ensure that suitable anti-rodent measures are implemented at any building requiring demolition.

MS 7: Demolition

8.21 Drilling and Jackhammering

- The Contractor shall submit a Method Statement detailing his proposals to prevent pollution during drilling operations. This shall be approved by the Engineer/ECO/EO prior to the onset of any drilling operations.
- The Contractor shall take all reasonable measures to limit dust generation as a result of drilling operations.
- Noise and dust nuisances shall comply with the applicable standards.
- The Contractor shall ensure that no pollution results from drilling operations, either as a result of oil and fuel drips, or from drilling fluid.
- All affected parties shall be informed at least one week prior to the onset of the proposed drilling/jackhammering operations, and their concerns addressed.
- Any areas or structures damaged by the drilling and associated activities shall be rehabilitated by the Contractor to the satisfaction of the Engineer/ECO/EO.

MS 8: Drilling and Jackhammering

8.22 Earthworks

- The excavation of any material on site shall be done in accordance with SABS 1200 D or DB and PSD or PSDB, as applicable.
- Prior to earthworks (including site clearance) starting on site, a search and rescue operation for bulbs and other indigenous plants of value, as detailed in the Revegetation Specification shall be undertaken.
- All earthworks shall be undertaken in such a manner so as to minimise the extent of any impacts caused by such activities.
- Defined access routes to and from the area of operation as well as around the area of operation shall be detailed in a Method Statement for approval by the Engineer/ECO/EO.
- No equipment associated with the activity shall be allowed outside of these areas unless expressly permitted by the Engineer/ECO/EO. All vehicles to therefore remain within the designated vehicle tracks.
- Care shall be taken to preserve all vegetation in the immediate area of these temporary stockpiles.
- Stockpiles should ideally be located to create the least visual impact and must be maintained to avoid erosion of the material and contamination of surrounding environment.
- Stockpile areas shall be re-instated to its original state after the removal of material.
- Excavated material shall be reused and temporarily stockpiled in areas approved by the Developer; shall be subject to the same condition as other stockpiled materials.
- Top soil shall be removed separately and stockpiled separately from other soil base layers.
- Topsoil areas must be demarcated in order to ensure the safekeeping of topsoil.
- Any topsoil removed during the planting process must be backfilled or levelled on site; and ensure that the topsoil is replaced on the surface and not below the ground.
- Topsoil storage areas must be convex and should not exceed 2m in height.

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- Topsoil must be treated with care, must not be buried or in any other way be rendered unsuitable for further use (e.g. by mixing with spoil) and precautions must be taken to prevent unnecessary handling and compaction.
- In particular, topsoil must not be subject to compaction greater than 1 500 kg/m² and must not be pushed by a bulldozer for more than 50 metres. Trucks may not be driven over the stockpiles.
- The Contractor must ensure that the material does not blow or wash away.
- Specific attention should be given to the areas that may house rare and threatened species.

MS 10: Earthworks and Spoil Management

8.23 Piling, Jacking and Thrust Boring

- Piling operations require a Method Statement, which shall detail the type of piling operation as well as *in situ* casting or pre-cast pile structures. *In situ* piles shall take cognisance of possible groundwater impacts.
- The Contractor shall take preventative measures, such as screening, muffling, dust control, timing. Pre-notification of affected parties shall be implemented to minimise complaints regarding dust, noise and vibration nuisances.
- The area shall be adequately fenced and warning signs erected.

MS 17: Piling, jacking and thrust boring

8.24 Power Tools

- The Contractor shall take preventative measures, such as screening, muffling, dust control, timing and pre-notification of affected parties shall be implemented to minimise complaints regarding dust, noise and vibration nuisances.

8.25 Pumping and Sumping

- Pumps shall be placed over a drip tray in order to prevent fuel spills and leaks from contaminating the water in the pumped area.
- Contaminated water may not be discharged into existing watercourses or streams and a Method Statement for discharge of this contaminated water shall be required.
- Silt-laden water shall be cleaned by using a perforated 200l drum containing sand and stone separated by geotextile fabric with a central delivery water pipe
- Silt-laden water shall be cleaned by ensuring that the overland flow of water disperses widely through vegetation.
- Silt-laden water shall be cleaned by tying a geotextile sock on the delivery pipe of the pump. Other filtration methods may be used and shall be approved by the Engineer/ECO/EO.

MS 6: Contaminated water

8.26 Settlement Ponds

- The Contractor shall submit a Method Statement proposal in connection with settlement ponds prior to the construction of any such ponds. The Contractor shall size settlement ponds in accordance with the envisaged scale of operation.
- Suspended solids and contaminants including oils shall be removed and disposed of by the Contractor at frequent intervals at a site approved by the Engineer/ECO/EO.

MS 22: Settlement ponds and sumps

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8.27 Rock Breaking

- Mechanical methods of rock breaking, including Montabert type breakers, jackhammers and "boulder busting", have noise and dust impacts that shall be addressed. Boulder buster use requires that blasting protocols shall be followed.
- Residents shall be notified at least one week prior to these activities commencing, and their concerns addressed.
- Chemical breaking shall require a Method Statement approved by the Engineer/ECO/EO.

MS 20: Rock breaking

8.28 Stream Crossing

- Temporary bridges shall be built in order for the Contractor to cross rivers and, where appropriate, the structure of the bridge shall be such that there is nothing placed in the water (i.e. the bridge shall be "bank-to-bank" in a single span).
- The fording of rivers by machinery and vehicles shall be undertaken at slow speed and with clean vehicles (i.e. no oil leaks, etc) and along a single track. The methodology of vehicle crossings via fording shall be detailed in a Method Statement.

8.29 Temporary Site Closure

In the event of temporary site closure the Contractor's Safety Officers (as defined by the Occupational Health and Safety Act) shall check the site, ensure that the following conditions pertain and report on compliance with this clause:

Fuels / flammables / hazardous materials stores:

Fuel stores are as low in volume as practicable.

- There are no leaks.
- The outlet is secure and locked.
- The bund is empty.
- Fire extinguishers are serviced and accessible.
- The area is secure from accidental damage through vehicle collision and the like.
- Emergency and contact numbers are available and displayed.
- There are no stores or containers within the 1:50 year flood line.

Safety:

- Site safety officer checks have been carried out in accordance with the Occupational Health and Safety Act (No. 85 of 1993) prior to site closure.
- That there is an inspection schedule and log for use by security or contracts staff.
- All trenches and manholes are secured.
- Fencing and barriers in place in accordance with the Occupational Health and Safety Act (No. 85 of 1993).
- Applicable notice boards are in place and secured.
- Emergency and Management contact details are prominently displayed.
- Security personnel have been briefed and have the facilities to contact or be contacted by relevant management and emergency personnel.
- Night hazards such as reflectors, lighting, traffic signage etc have been checked.
- Fire hazards identified and the local authority notified of any potential threats e.g. large brush stockpiles, fuels etc.
- Pipe stockpiles are wedged / secured.
- Scaffolds are secure.
- Structures vulnerable to high winds secure.

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Erosion:

- Wind and dust mitigation measures such as straw, brush packs, irrigation etc are in place.
- Excavated and filled slopes and stockpiles are at a stable angle and capable of accommodating normal expected water flows.
- Re-vegetated areas have a water schedule and the supply to such areas is secured.
- There are sufficient detention ponds or channels in place.

Water contamination and pollution:

- Hazardous fuel stores are secure.
- Cement and materials stores are secured
- Toilets are empty and secured
- Refuse bins are empty and secured
- Bunding is clean and treated e.g. Spill Sorb or Enretech #1 powder or similar approved product
- Drip trays empty and secure.

8.30 Visual Aspects

- No high mast, spot-light or up-lighting security lighting should be allowed. Down-lighting to be used.
- The construction camps shall be kept neat and tidy at all times. Materials and equipment must be kept in designated areas and storing/stockpiling shall be kept orderly.
- The location for the establishment of a construction site for the storage of materials, site office, containers and ablution facilities must clearly be indicated on site and remain with in a constant location for the duration of the development activities.

8.31 Freshwater Ecosystem Aspects

The information below was sourced from the conditions and mitigation measures of the Freshwater Ecosystems Impact Assessment undertaken by Dr Liz Day, Freshwater Consulting Services, 2016 (Appendix G2 to the BA Report).

8.31.1 Segment 1

Table 7: Segment 1 construction phase freshwater ecosystem mitigation measures.

Activity	Potential Impact	Mitigation Measure
Construction of a 105m long riprap berm	Wetland disturbance and downstream pollution/ sedimentation	1. The river should be regarded as a no-go area during the construction of the berm, from at least 3m from the top of the river bank, and preferably 10m where space permits. The <i>Pennisetum macrourum</i> wetland should also be regarded as no-go areas during the construction and the, from at least 10m from the wetland edge. 2. The above no-go areas should be clearly fenced off for the duration of the berm construction period. 3. Access to the berm working area should avoid both the river and the wetland – this means that a construction phase access route for vehicles must be created off the T2 if possible, north-west of the existing bridge and south of the wetland. 4. The construction of the berm in Segment 1, involving excavation and earthworks, should be limited to the dry where possible, to limit the chances of wash-off from disturbed areas or construction zones. 5. The CEMPr (included in the EMPr) must be implemented. It details practical measures that should be employed during construction to prevent the passage of construction-associated

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Activity	Potential Impact	Mitigation Measure
		contaminants (e.g. sediment, spoil, fuel, litter) into the river or the wetland, and to manage construction camps, stockpiles, vehicle and fuel storage and the passage of personnel and vehicles, so as to prevent contamination and/or disturbance of aquatic ecosystems. 6. The CEMPr must be implemented under the supervision of an experienced Environmental Control Officer (ECO) or person of similar designation. 7. Where the removal of woody alien plants is required or desired, this should be carried out with input from experienced alien vegetation removal specialists, and including measures to prevent the re-sprouting of cut material. Bulldozing or other earth-disturbing measures used in tree removal should not take place, unless required from an ecological perspective (e.g. to prevent root masses forming erosion knick-points on the river bank). 8. If the river bank or bed, or the <i>Pennisetum macrourum</i> wetland is damaged or disturbed during construction as a result of accidental or other activities associated with the project, rehabilitation of such damage must take place to the satisfaction of a freshwater ecologist, and in ecologically appropriate time frames. 9. The disturbance footprint associated with the berm in Segment 1 must be minimised. 10. The riprap berm should be packed with soil excavated from the buried portion of the berm, and (provided that this measure will not impinge on the wetland or river bank, within the setback areas outlined above) excess soil should be used to landscape the berm such that it is gently shaped into the surrounding landscape. Thus treated, the berm should be planted with locally indigenous, low-growing shrubs, grasses, restios and other plant types, selected in consultation with a botanist, and excluding trees that might threaten berm infrastructure, so as to facilitate movement across this berm by wetland-associated and other fauna that would normally utilise such corridors. 11. The above landscape and planting phase should include allowance for short-term maintenance (weeding, irrigation and plant replacement) over at least two summers. 12. The 20m ecological setback should be implemented along the river in these reaches, after the construction phase, to improve ecological connectivity and condition.
Raising the T2 parapet	River disturbance and downstream pollution and sedimentation	1. The EMPr should be implemented. It details practical measures that will be employed during construction to prevent the passage of construction-associated contaminants (e.g. sediment, spoil, fuel, litter) into the river or (albeit less likely in any case) the wetland, and to manage construction camps, vehicle and fuel storage and the passage of personnel and vehicles, so as to prevent contamination and/or disturbance of aquatic ecosystems. 2. The CEMPr must be implemented under the supervision of an experienced Environmental Control Officer (ECO) or person of similar designation. 3. Allowance must be made for the adequate rehabilitation of any areas of the river channel or wetlands that are damaged during construction.

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Activity	Potential Impact	Mitigation Measure
Implementation of river buffer / ecological setback	Bed and bank disturbance	1. The short-term disturbance associated with construction phase activities are assumed to be outweighed by the long term operational phase benefits to the river ecosystem that would accrue as a result of establishment of a stable river corridor that tended towards a more natural condition than that currently in place, and at least moving towards the Desired State for the river in this reach. 2. The CEMP (included in the EMPr) details practical measures that will be employed during construction to prevent the passage of construction-associated contaminants (e.g. sediment, spoil, fuel, litter) into the river, and to manage construction camps, vehicle and fuel storage and the passage of personnel and vehicles, so as to prevent contamination and/or disturbance of aquatic ecosystems. 3. River rehabilitation measures involving bank reshaping and disturbance at the berm in Segment 1 should be limited to the dry season where possible, allowing adequate time for the re-establishment of indigenous plant cover on the bank and, in particular, the wetted channel edge / bottom of the banks.

8.31.2 Segment 2

Table 8: Segment 2 construction phase freshwater ecosystem mitigation measures.

Activity	Potential Impact	Mitigation Measure
River channel "upgrade" to create a system that will contain up to the 1:100 year Return Interval (RI) flood, with the planned approach comprising pre-excavation of the river channel, and establishment of stable channel slopes of 1:230 by the installation of four weirs that will act as grade control structures.	Large-scale disturbance of the existing river channel and floodplain	1. Careful attention must be paid to the phasing of works between the Diversion Canal and the T2, so that the final ecological and hydrological outcomes of the project are not compromised by issues such as flooding and erosion of landscaped areas. 2. A detailed construction works programme must be compiled during the detailed design phase, with input from the river ecologist, the landscaper, the project engineers and the contractors, to ensure that the implementation plan follows a logical course, that will allow its approved ecological and other objectives to be met in practice, and to ensure that the whole project team shares a common vision for the new river channel. The detailed construction works programme should be compiled before appointment of contractors, and the programme should be included in the call for tender documents. This will enable contractors to evaluate their risk at tender stage, which should mitigate the risk of increased costs. 3. The CEMP (included in the EMPr) should be implemented, it outlines standard Best Practice and other measures that must be included in the approach to project implementation. In order to minimise impacts to freshwater ecosystems and allow for the re-dress of such impacts where they inadvertently or accidentally occur. 4. The natural sinuosity of the lowflow river channel must be allowed for in a pre-excavated low-flow channel, as recommended in Basson (2012) as well as in Nell et al (2013). Implementation of this measure should reduce initial erosion damage during smaller floods, and allow for

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Activity	Potential Impact	Mitigation Measure
		planting of a relatively stable low flow channel, further assisting to reduce erosion. 5. Allowance must be made for an initial intense planting phase, with adequate availability of plant material, personnel and finances for this to take place as follows: - Only locally indigenous plant material should be used in the lowflow channel and lower floodplain, - Ideally, locally indigenous vegetation should be used in the upper floodplain as well, although it is recognised that financial constraints may limit the extent to which this can occur. This portion of the channel could instead be grassed, provided that the grass species is hardy, drought-tolerant, erosion resistant, preferably indigenous (e.g. <i>Cynodon dactylon</i>) is not kikuyu grass (<i>Pennisetum clandestinum</i>) and is able to survive. - Planting of the low flow channel should focus on the channel margins, which should be shaped initially as gently shelving banks, with gradient less steep than 1:4 (up to 1:7 in places), and shaped so as to merge gently into the lower floodplain. The full extent of the channel margins should however be planted along this segment of the river, using species included in Annexure B), or others as approved by the project botanical specialist and the wetland ecologist. - Planting of the lower floodplain and the side slopes leading to the upper floodplain should be carried out at a similar intensity to the lowflow channel. A planting objective of 80% (if practically possible), cover of appropriate, ecologically desirable vegetation should be the target to be achieved by the end of one year from planting. Project costing must allow for this – planting should begin with immediate effect when shaping of the channel (or sections of the channel) has been completed. - The side slopes leading from the lower floodplain to the upper floodplain should be flattened, to slopes of 1:4 and preferably less, and planted with locally indigenous plant species that are known to be erosion-resistant and drought tolerant. Recommendations in Nell <i>et al</i> (2013) for blinding of riprap by topsoil and smaller rocks along the upland slopes of the upper and lower floodplain should also be implemented, to provide an adequate quality of planting areas. - Planting of the buffer area(s) should be as outlined in Nell <i>et al</i> (2013). - Allowance must be made for irrigation of the lower and upper floodplain as well as of the buffer areas, through at least two summers following implementation. - Allowance must also be made in the construction budget for the large-scale replacement of vegetation and possible reshaping of the channel as a result of

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Activity	Potential Impact	Mitigation Measure
		erosion damage before plants have adequately been established in the channel (measure to be implemented by the relevant contractor). i. An intensive period of weed and alien removal must be allowed for in the first two years following implementation, across the whole new channel and its allocated buffer areas, to ensure that such material is not allowed to overshadow or take over indigenous plantings. This measure should form part of the landscaping contract.
	Receipt of sediment-rich runoff into the river channel as a result of wind or water borne sediment from stockpiled areas on the adjacent floodplain	Standard Best Practice measures are included in the CEMPr (as part of the EMPr), and should be implemented to minimise uncontrolled sediment runoff into the channel.
	Contamination of downstream areas including newly created floodplain depressions with construction material	1. Standard Best Practice measures are included in the CEMPr and should be implemented to minimise uncontrolled sediment runoff, as well as (and particularly) the passage of cement or other construction-associated materials into the channel. 2. Monitoring of basic river water quality should take place during construction, and the resultant data used to determine the efficacy and allow educated manipulation of, the approaches to pollution management during construction. 3. Regular and frequent (at least weekly) clearing of litter from the entire excavated channel should be allowed for throughout the construction phase of the programme, noting that some of this activity would entail collection of litter washed in from upstream, until the RCP's recommendations for the reduction of litter in the upstream river reaches find effect.

8.31.3 Segment 3

Table 9: Segment 3 construction phase freshwater ecosystem mitigation measures.

Activity	Potential Impact	Mitigation Measure
Removal of the balancing dam at Segment 3.	Loss of fish population in the balancing dam.	1. Before construction commences, undertake a once-off assessment of the balancing dam (which will be removed), for identification of the fish species. In the unlikely event that a species of conservation concern is identified, its relocation has to be undertaken to the specifications of CapeNature
Including activities: • Extension of the lined Diversion Canal to the existing diversion	Sedimentation and pollution of / disturbance to downstream canal	1. The throttle structure should ideally be left in place until removal of all organic debris in the reaches upstream has taken place. Alternatively, another mechanism for effective sediment collection during construction must be found. The detail design phase will identify the best way to

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Activity	Potential Impact	Mitigation Measure
- berm upstream of the Gordon's Bay WWTW - Removal of the balancing dam at the Fairview Golf Course and its "throttle" outlet - Construction of a transition structure between the diversion berm and the extended Diversion Canal - Construction of a 10m wide channel along the south-western boundary of Erf 5113 - Construction of a pedestrian bridge - Use of water from the Diversion Canal for irrigation		- reconstruct the canal. 2. Removal of sediment and vegetation from upstream of the throttle structure as far as the current diversion berm must take place in summer when only the WWTW effluent is likely to require diversion past the construction works. This effluent must not be diverted into the natural channel during construction but should be piped or otherwise conveyed in a controlled manner past the canal construction works.
Interventions associated with the natural channel, comprising: - Construction of a weir at the end of the re-configured river channel - Replacement of the Fulton Gate with a new weir / structure to allow the passage of up to 8m³/s during major flows into the natural Sir Lowry's Pass Channel - Conveyance of flood flows from the eastern catchment to enter at the	Sedimentation, compaction, disturbance to the channel, its vegetation and adjacent wetlands	- The design phase mitigation measures outlined above should reduce the likelihood of concrete contamination by impact avoidance. In addition: - Wetlands along the alignment of any stormwater conveyance system must be identified (by a freshwater ecologist) and fenced off as no-go areas during construction, with the fence-line set back 10m from the wetland edge; - Most of the construction and shaping of the channel should be undertaken during the dry season as far as possible. - Allowance must be made for the planting of the channel and its buffer area, so as to create a quality habitat, albeit highly modified, through a developing urban environment adequate levels; and, - When the existing Fulton Gate is removed, concrete and other waste material associated with the dismantled structure should also be removed entirely from the river channel and its floodplain. - The CEMPr outlines the standard Best Practice and other measures that must be included in the approach to project implementation, to minimise impacts to freshwater ecosystems and allow re-dress of such impacts where they inadvertently or accidentally occur.

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Activity	Potential Impact	Mitigation Measure
diversion weir, and its passage into the natural channel via the new weir at the Fulton Gate or where required. Position of the weir to be determined during the detail design phase.		

8.31.4 Segment 4

Table 10: Segment 4 construction phase freshwater ecosystem mitigation measures.

Activity	Impact	Mitigation Measures
All activities	- Short term disturbance to downstream systems, entailing the passage of sediment, plant material and other debris resulting from excavation of upstream areas; - localised disturbance to the beds and banks of the natural stream and its tributary; - possible diversion of flows.	- River lining mitigation: - Construction activities should take place outside of the wet season, when channel flows are lowest, if possible. Measures to reduce runoff of sediment from construction stockpile and spoil areas are included in the CEMPr for these activities. - The channel would still provide habitat for mosquito larvae during summer and possibly other seasons as well. However, allowing low flows through means that there will tend to be more flows than at present at least in summer, and thus (potentially) a reduction in the stagnant water that mosquitoes thrive in. It is however stressed that management of the system to avoid quite natural wetland faunal elements such as mosquitoes is not recommended from an ecological perspective. Not only would creation of a more complex functional system allow for colonisation by a more diverse faunal community, thus reducing the chances that particular nuisance groups will dominate, but it is noted that there are numerous other areas of standing water in the area, all likely to give rise to mosquitoes. - Mitigation against impacts from river regrading as a trapezoidal channel. - Construction activities should preferably take place outside of the wet season, when channel flows are lowest. Measures to reduce runoff of sediment from construction stockpile and spoil areas are included in the CEMPr for these activities. - Management of the system to avoid quite natural wetland faunal elements such as mosquitoes is not recommended. - Mitigation against impacts from installation of additional pipes or culverts at road crossings: - The disturbance zone during construction must be limited to 10m up- and downstream of the affected structure. The need for the removal of alien trees and/or other

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Activity	Impact	Mitigation Measures
		vegetation along this zone should be established on site prior to construction, with input from a river ecologist and the project engineer, noting that bank rehabilitation possibilities should not be limited by the presence of alien trees. b) The CEMPr specifies practical measures that will be employed during construction to prevent the passage of construction-associated waste (e.g. sediment, spoil, fuel, litter) into the channel during construction. c) Old pipes, rubble, sediment and other waste must be removed with immediate effect. Areas that are disturbed during construction should be rehabilitated by regrading, shaping and planting as considered necessary by a river ecologist. d) Construction should preferably take place during the low flow period. 4. Mitigation against impacts resulting from the lowering of the Steenbras pipeline: a) The disturbance zone during construction must be limited to 10m up- and downstream of the pipeline, if possible. b) The CEMPr specifies practical measures that will be employed during construction to prevent the passage of construction-associated waste (e.g. cement, sediment, spoil, fuel, litter) into the channel during construction. c) Old pipes, rubble, sediment and other waste must be removed with immediate effect, and areas that are disturbed during construction should be rehabilitated by regrading, shaping and planting, as considered necessary by a river ecologist. d) Construction should preferably take place during the low flow period. 5. Mitigation against impacts resulting from changing the pipe inflow levels into the river: a) The disturbance zone during construction must be limited to 10m of bank, and a construction zone along the pipeline itself of no wider than 10m. All excess spoil must be removed. Its disposal by spreading in grassed terrestrial areas in the open space areas of the broader river/open space corridors would be acceptable provided that this was undertaken such that it did not negatively affect river, wetland or sensitive/important terrestrial habitats. b) The CEMPr specifies practical measures that will be employed during construction to prevent the passage of construction-associated contaminants (e.g. cement, sediment, spoil, fuel, litter) into the channel during construction. c) Old pipes, rubble, sediment and other waste must be removed and areas that are disturbed during construction should be rehabilitated by regrading, shaping and planting as recommended by a river ecologist; and, d) Construction should take place during the low flow period as far as possible. 6. Mitigation against impacts resulting from the alteration in

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Activity	Impact	Mitigation Measures
		existing pedestrian bridge height or width: - The CEMPr specifies practical measures that will be employed during construction to prevent the passage of construction-associated contaminants (e.g. cement, sediment, spoil, fuel, litter) into the channel during construction. - Old pipes, rubble, sediment and other waste that does fall into the channel during construction should be removed with immediate effect and areas that are disturbed should be rehabilitated by regrading, shaping and planting as considered necessary by a river ecologist. - Construction should take place during the low flow period as far as possible. 7. Mitigation against impacts resulting from the raising of headwalls: - The disturbance zone during construction must be limited to 10m of bank length in the vicinity of the affected structure. - The CEMPr specifies practical measures that will be employed during construction to prevent the passage of construction-associated contaminants (e.g. cement, sediment, spoil, fuel, litter) into the channel during construction. - Old pipes, rubble, sediment and other waste that does fall into the channel during construction should be removed with immediate effect and areas that are disturbed should be rehabilitated by regrading, shaping and planting as considered necessary by a river ecologist. - Construction should take place during the low flow period as far as possible. 8. River lining mitigation: Construction activities should take place outside of the wet season, if possible, when channel flows are lowest. Measures to reduce runoff of sediment from construction stockpile and spoil areas are included in the CEMPr for these activities. 9. Rehabilitation should take place in the areas of the natural channel where shaping and other construction activities took place. This should not comprise of grass, but suitable indigenous vegetation as detailed in the RCP for Segment 2. Input should be obtained from the Freshwater Ecologist.

8.31.5 Segment 5

Table 11: Segment 5 construction phase freshwater ecosystem mitigation measures.

Activity	Potential Impact	Mitigation Measure
Upgrading of the stormwater drainage system at the Fairview Golf Course, to allow for the passage of flows anticipated to be	Release of sediment into downstream canal	- Excavation/ dredging of channels and laying of Armoxflex™ (or similar) should be carried out during dry periods only when there is no flow or standing water in the channels, if possible. Alternatively, methods should be implemented to prevent the release of sediment downstream. - Excavated material should be disposed of responsibly.

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Activity	Potential Impact	Mitigation Measure
generated in this part of the catchment		such that it will not result in damage to wetlands, watercourses, or other sensitive ecological areas; 3. The above measures are included in a CEMPr, which addresses all construction related activities, and outlines practical measures to reduce impacts to sensitive systems during construction. Implementation of these measures must be overseen by a competent ECO or similar.

8.31.6 Segment 6

Table 12: Segment 6 construction phase freshwater ecosystem mitigation measures.

Activity	Potential Impact	Mitigation Measure
Raising of the existing culvert walls on the Diversion Canal upstream of the Fuchsia Road culvert by 1.25m to accommodate the anticipated 1:100 year flood of 234m³/s.	Contamination of canal water and bed of canal with sediments, construction waste and/or cement-laden water	1. The CEMPr specifies practical measures that should be employed during construction to prevent the passage of construction-associated contaminants (e.g. sediment, spoil, fuel, litter) into the canal during raising of the canal wall. 2. Rubble, sediment and other waste that does fall into the canal during construction should be removed with immediate effect; 3. Construction should take place during the low flow period, if possible, when there is relatively easy access to the canal floor.

8.32 Biodiversity / Biological Aspects

The Contractor is referred to the conditions and mitigation measures of the Botanical Impact Assessment undertaken by Dr David McDonald and Mr Paul Emms from Bergwind Botanical Surveys & Tours CC, attached as Appendix G3 to the BA Report.

8.32.1 Segment 1

Table 13: Segment 1 construction phase botanical/biological mitigation measures.

Activity	Potential Impact	Mitigation Measure
Vegetation clearing	Loss of vegetation and ecological processes at Segment 1 (Wild olive grove)	1. Where it is not feasible from an engineering perspective to protect the wild olive grove, the loss of the habitat could be mitigated through the re-establishment of the species within the Sir Lowry's Pass RCP (2013) and/or nearby to the original habitat as prescribed by the RCP.

8.32.2 Segment 2

Table 14: Segment 2 construction phase botanical/biological mitigation measures.

Activity	Potential Impact	Mitigation Measure
River channel "upgrade" to create a system that will contain up to the 1:100 year Return Interval (RI) flood, with the planned approach comprising	Creation of seasonally inundated floodplain depressional wetlands Short-term loss of instream river	Requirements of the RCP (2013) for the planting of these wetlands with locally indigenous plants are included to improve biodiversity, and their maintenance over time by alien clearing and replanting as required, must be implemented. Mitigation measures are not recommended for this impact. It is argued that the creation of a better quality habitat in as short a

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Activity	Potential Impact	Mitigation Measure
pre-excavation of the river channel, and establishment of stable channel slopes of 1:230 by the installation of four weirs that will act as grade control structures.	habitat	time frame as possible should rather be the objective of construction phase mitigation.
	Sedimentation of downstream aquatic ecosystems as a result of upstream disturbance and erosion.	Proposed mitigation: 1. The (desired) hydrological connection between the new channel in Segment 2 and the natural river channel downstream (Segment 4) should, if practically possible, not be established until landscaping of Segment 2 has resulted in a system that is deemed relatively stable and unlikely to discharge large volumes of sediment into the rehabilitated sections of the natural channel downstream of the Fullon Gate. 2. Allowance must be made for frequent removal of sediment from the downstream reaches of the diversion canal during the construction and establishment phases of this project. It should be noted that the more effort that is put into rapid establishment of plant cover in the new channel, the less likely sediment is to wash into downstream reaches.
	Disturbance to adjacent aquatic ecosystems of high importance	Wetlands identified in this study as of conservation importance, and any natural wetlands outside of the excavated channel, but within the direct vicinity of the project area, should be treated as no-go areas during the course of the construction phase, and fenced off with substantial (orange safety netting or preferably wire) temporary fencing throughout the construction period, to ensure that neither vehicles nor personnel access these areas. Note that such fencing should be in place before the start of any construction in this segment.
	Loss of vegetation and ecological processes (especially at the CBA1b site) along Segment 2	1. Implement the RCP (2013) and include the species recommended by Boucher since these would re-create, in part the original habitat and associated ecological processes. 2. Planting must be carried out as soon as possible after construction, but preferably in autumn to prevent drought stress and to capitalize on the peak growing season. 3. Prior to any construction that important geophytes must be removed, housed in a nursery and translocated after construction along the rehabilitated area in the RCP (2013). 4. The population of <i>Ornithogalum thyrsoides</i> between waypoints 063 (34° 8'28.54"S; 18°52'41.46"E) and 065 (34° 8'37.48"S; 18°52'32.22"E) on the eastern side of the river should be removed and replanted if the habitat is impacted. 5. If the bulbs cannot be replanted in the same locality for some reason then these (and any additional geophytes found subsequent to this survey) should be planted elsewhere in the RCP (2013) along Segment 2. 6. Any threatened species found subsequent to this survey should be similarly translocated. 7. The CBAs along Section 2 on the western side of the river must not be fragmented.

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8.32.3 Segment 6

Table 15: Segment 6 construction phase botanical/biological mitigation measures.

Activity	Potential Impact	Mitigation Measure
Raising of existing diversion canal walls.	Loss of vegetation and ecological processes (CBA 1b site) along Segment 6	Proposed mitigation: 1. The CBA 1b sites must be rehabilitated if disturbed. 2. Rehabilitation should include propagation and re-introduction of local species such as those listed in Annexure B. 3. Planting must be carried out as soon as possible after construction, and preferably in autumn, to prevent drought stress and to capitalize on the peak growing season. 4. Existing ecological links must be maintained between adjoining CBAs and ESAs. 5. If any important remnant species are found subsequent to this report, these should be translocated and incorporated in the RCP (2013) rehabilitation. 6. Appropriate plant species as described by Boucher (Annexure B) must be propagated at least two years in advance of implementation of the RCP (2013). Species must be locally sourced as far as practically possible.

8.32.4 Segment 1 to 6 (Overall impacts)

Table 16: Segments 1 to 6 (overall impacts) construction phase botanical/biological mitigation measures.

Activity	Potential Impact	Mitigation Measure
Implementation of the proposed activities in Segments 1, 2 and 6.	Loss of vegetation and ecological processes Segments 1, 2 and 6 (Overall Impacts)	Proposed mitigation: The following mitigation measures should be applied for Segments 1, 2 and 6: 1. An early spring survey has to be done to identify and mark individual bulbs that fall within the proposed development zone. Marked bulbs should be translocated out of the construction area before construction commences and planted at no-go areas or used for revegetation after construction. 2. An Environmental Control Officer (ECO) must be appointed to ensure that all mitigation measures are implemented during the construction and operational phases of the project. 3. It is imperative that all invasive alien plants are regularly cleared since this is likely to be an ongoing problem requiring regular clearing. In-stream clearing of invasive species must also be carried out. 4. Vegetation cover must be monitored along all rehabilitated areas, with specific attention to the RCP (2013). Vegetation cover should be measured using subjectively positioned 4m x 4m vegetation plots whereby species cover abundance is measured, along with fixed-point photography, to compare cover change over time. Monitoring should take place every 6 months for a period of at least two years. 5. Areas with poor vegetation cover or erosion must be replanted or stabilized until an acceptable level of

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		vegetation cover is reached. 6. All construction related activities should be restricted to the development footprint and previously highly disturbed or cleared areas. Vehicle movement over areas of natural vegetation should be avoided. 7. No clearance of vegetation is permitted in the surrounding area. 8. No animals, including mammals, birds, snakes and invertebrates may be harmed or killed. 9. Advise neighbouring landowners to keep all animals away from the construction site.
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8.33 Socio-economic Aspects

The Contractor is referred to the conditions and mitigation measures of the Social Impact Assessment undertaken by Mr Tony Barbour, 2016, attached as Appendix G4 to the BA Report:

Table 17: All segments, construction phase socio-economic mitigation measures.

Potential Impact	Mitigation Measure
Creation of employment opportunities and income during the construction phase	Recommended enhancement measures include: In order to enhance local employment and business opportunities associated with the construction of Segments 1 to 5, the following enhancement measures should be implemented: 1. Where reasonable and practical, the CoCT should appoint local contractors and implement a 'locals first' policy as far as possible, especially for semi and low-skilled job categories; 2. Where feasible, efforts should be made to employ local contractors that are compliant with Broad Based Black Economic Empowerment (BBBEE) criteria. 3. The recruitment selection process should seek to promote gender equality and the employment of women wherever possible. The potential for employing women is likely to be highest for the re-vegetation component of the project.
Potential loss of structures and land due to establishment of SLP River Corridor	Affected property owners should be compensated for loss of structures and land. Compensation should be at market related prices, in line with relevant legislation and current policy.
Risk posed by construction workers safety and security of households	It is not possible to effectively mitigate against opportunistic crime, such as thefts and household robberies. However, the potential risks can be reduced by: Informing local residents and local rate payers associations of the timing and duration of the construction phase. This would enable households take measures to improve security and be more vigilant during the construction phase.
Potential noise, dust and safety impacts associated with construction related activities	1. Construction related activities should be confined to 8h00 and 17h00 from Mondays to Saturdays. No activities should be undertaken Sundays. 2. Dust suppression measures, such as regular wetting of surfaces and access roads should be implemented if possible; 3. The movement of heavy vehicles associated with the construction phase should be timed to avoid weekends and holiday periods; 4. Dust suppression measures must be implemented for heavy vehicles such as wetting of gravel roads on a regular basis and ensuring that vehicles used to move soil etc. are fitted with tarpaulins or covers; and 5. All vehicles must be road-worthy and drivers must be qualified and made aware of the potential road safety issues and need for strict speed limits.

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Potential Impact	Mitigation Measure
Influx of Workers to the Area: The temporary construction team employed to construct the proposed facilities will have an impact on the surrounding landowners and residents as there will be an increase in people and associated increase in movement to and from the site.	1. The construction team will only be present on site from Mondays to Saturdays and during working hours. 2. Staff will not be allowed to freely move in and out of the site after working hours.
Waste: A small amount of waste/ litter and building rubble/hazardous material will be generated during the construction phase of the SLP River upgrade.	1. Solid waste (construction waste and builders rubble) will be collected by the appointed contractor and disposed of at the registered licensed municipal landfill site in with proof of safe disposal as required. 2. The contractor shall ensure that the construction site, working and eating areas are maintained in a clean, hygienic and orderly state. 3. Separate bins should be provided for various materials to facilitate recycling. The bins should have liner bags for easy control and safe disposal of waste. 4. Sufficient quantities of suitable hydrocarbon absorption or remediation materials must be present on site at all times.

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9 POST-CONSTRUCTION PHASE

The post-construction phase relates to the activities that occur once construction is completed. It is important that a meeting be held on site between the Developer (CoCT), the CoCT's Environmental Branch, the CE, the ECO and the Contractor to approve all the remediation measures and to ensure that sections of the site have been returned to its natural state as relevant, and other areas vegetated as per the RCP, as relevant, to a condition that is approved by the ECO.

The post-construction phase will come to an end once all the mitigation measures below have been successfully implemented.

9.1 Construction Site

- All structures comprising the construction site are to be removed from the site and the area restored to its original condition.
- The area should be inspected for spills such as from vehicles, if any are found the Contractor needs to dispose thereof accordingly and rehabilitated as necessary.

9.2 Land Rehabilitation

- Any damage caused by vehicles to the site (including temporary roads) must be rehabilitated upon completion of construction activities.
- All unwanted soil from the construction phase is to be removed from the site.
- The site is to be free of litter and surfaces are to be checked for waste products.

9.3 Materials and Infrastructure

- All remaining building materials and equipment shall be removed from the site by the Contractor once construction is complete.

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10 OPERATIONAL PHASE ENVIRONMENTAL MANAGEMENT PROGRAMME / MAINTENANCE MANAGEMENT PLAN (OEMPr/MMP)

The operational phase relates to activities post construction. The City of Cape Town will be responsible to implement and maintain the following measures and requirements identified during the Basic Assessment process.

The tables below include the Method Statements as are relevant to this MMP.

10.1 Updating and Revisions of the OEMPr/MMP

This Operational Phase Environmental Management Programme (OEMPr), also referred to as a Maintenance Management Plan (MMP), was compiled prior to finalisation of the detailed design for the proposed river re-alignment, reconfiguration and structural "upgrading". As such, it is important that if the works are authorised, the OEMPr/MMP should be reviewed and if necessary revised on completion of actual implementation of the works. This would allow for design or other changes that have occurred during implementation to be incorporated into the programme, as well as any additional problems or potential management challenges not included in the programme to be added, and measures that in practice appear irrelevant or inadequate to be revised accordingly, so that the OEMPr/MMP that is implemented is a practical but thorough document that adequately addresses management of the Sir Lowry's Pass River in its affected reaches, with a view to meeting long-term management objectives as specified in the River Corridor Plan (Nell *et al*, 2012).

The information below was sourced from the Freshwater Ecosystems Maintenance Management Plan prepared by Dr Liz Day, Freshwater Consulting Services, 2016, attached as Annexure D to this document. Operational phase mitigation measures from the Freshwater Ecosystems Specialist Report by Dr Liz Day, Freshwater Consulting Services, 2016, which are not covered by the MMP, are also included below.

The OEMPr/MMP below are structured to include:

- General activities applicable to all segments of the river in the study area;
- Maintenance management activities specific to particular river reaches or segments, or similar groups of segments – note that Segment 3 management activities have however been separated into those pertaining to the canal and the diversion structures; and
- Segment 2 operational phase mitigation measures (which are not already included in the maintenance management activities above).

10.2 General Activities Applicable to all Segments

10.2.1 Water Quality Improvement

Critical to meeting the required management objectives for the Sir Lowry's Pass River in the present study area is the requirement, specified in both the River Corridor Plan and the specialist Aquatic Ecosystems Report for the river reconfiguration (Day, 2016), to address existing water quality and litter issues that have their source in the river reaches upstream of the study area – specifically in the informal settlements and other poorly serviced areas in and immediately abutting Sir Lowry's Pass River Village. While the installation of adequate servicing in these areas is clearly both necessary and the most desirable outcome from both human and ecosystem needs perspectives, the requirement to address water quality itself in the receiving downstream river reaches could be at least in part be addressed, in the short term, through interventions such as the installation of stormwater diversions to sewers, litter traps and improved management of sewers to reduce the effects of blockage and overflows.

The above interventions should be implemented as a matter of urgency.

Water quality monitoring at the upstream end of Segment 1 should inform the degree to which this requirement has been met. In order for the river to meet its Desired Condition of PES Category C upstream

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of the T2 with regard to water quality, it would at least need to meet the water quality criteria for Category C for the variables outlined in the table below.

Table 18: Threshold values for variables included in the City of Cape Town's E-WQI for non-saline river systems (after Day et al, 2012). [For all variables except pH and DO, listed values represent the upper threshold for each PES Category. For DO, values shown represent the lower threshold for each PES Category; for pH, the value must lie between the pH-min and pH max values for each PES category (threshold range).]

Category	Non saline Lowland Rivers (lower foothills and lowland rivers)							
	PO ₄ -P	NH ₃ -N	DO	EC	pH - min	pH - max	TIN	TSS
A	0.005	0.015	>8	38	6.4	7.80	0.25	<20
B	0.015	0.04375	>7	65	5.9	8.30	0.7	20 to <40
C	0.025	0.0725	>6	93	5.4	8.80	1	40 to <80
D	0.125	0.1	>4	120	4.9	9.30	4	80 to <200
E	1	0.12675	>2	147	4.4	9.80	10	200 to <500
F	2	0.2535	>1	175	3.9	10.30	20	500 to <1000
G	5	0.63375	>0	210	3.4	10.80	50	>1000

PO₄-P: Phosphates; NH₃-N: Ammoniacal Nitrogen; EC: Electrical Conductivity; TIN: Total Inorganic Nitrogen; TSS: Total Suspended Solids

In addition to meeting or improving upon the Category C criteria outlined in the table above, faecal coli limits should also conform with minimum acceptable levels for safe partial contact recreation, as shown in the table below (after Day et al, 2012).

Table 19: Water quality grades and corresponding threshold concentrations for faecal coliforms (including E. coli) for rivers in the City of Cape Town – table after Day et al. (2012).

Grade	Faecal coliform count (including E. coli) ¹
Target	≤ 1 000 CFU/100 ml
Acceptable	1 001-2 000 CFU/100 ml
Risk	2 001-4 000 CFU/100 ml
Unacceptable	>4 000 CFU/100 ml

¹The concentration of bacteria in water is usually expressed as numbers of colony-forming units (CFU) per 100 ml, which is a measure of the number of viable cells in a particular sample, where a colony represents an aggregate of cells derived from a single progenitor cell

10.2.2 Alien Plant Clearing

Ongoing removal of alien plants is required throughout the river reaches. The species believed to be of key concern at the time of compilation of this OEMP/MMP, as identified in the botanical appendix to Neil et al (2013):

- *Acacia saligna*;
- *Acacia cyclops*;
- *Acacia mearnsii*;
- *Arundo donax* (Spanish reed);
- *Commelina benghalensis* (wandering Jew);
- *Echium plantagineum* (Patterson's curse);
- *Eucalyptus camaldulensis*;
- *Ipomoea* spp. (Morning glory);
- *Tropaeolum* sp. (nasturtiums);
- *Rorippa nasturtium aquaticum* (watercress);
- *Sesbania punicea* (sesbania);
- *Xanthium strumarium*; and

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- *Pennisetum clandestinum* (kikuyu grass).

In addition to the above, it is likely that over time other problem species will also invade the river channel and its buffers, particularly where these have been disturbed for river works, or after large flood or fire disturbance. The above species must be maintained outside of the river corridor (including upper and lower floodplains) and its buffer in all segments. Given that construction phases will entail complete stripping of the existing riverine topsoil material in many areas, this measure is considered feasible. The table below outlines general alien control management measures.

Table 20: Operational phase alien plant management measures for all river segments.

Management Measure	Details	Timing/frequency	Skills & Expertise	Compliance & Monitoring
Alien plant clearing	1. Identify problem or potential problem species in the river or its buffer areas.	Annual inspection of river segments.	Sufficient botanical expertise to identify potential problem species.	- Records of alien clearing operations to be kept by the City of Cape Town and made available upon request. 5-yearly independent inspection / audit to identify problem areas and species.
	2. Identify appropriate control / removal measures based on current best practice that takes cognisance of the proximity of aquatic ecosystems.	Update annually if necessary.	Consult with alien clearing specialists as required with regards to alien clearing methods.	
	3. Remove and prevent the ongoing establishment of alien plants as listed above in the river channels and their buffer areas – cleared plant material to be removed from the river channel, floodplains and buffer areas. Manual labour with hand held tools only.	Alien clearing to be carried out at least annually in each river segment – preferably quarterly.	Supervised alien clearing.	
	4. Identify and remove other alien plant species that occur over time in the river channel and buffer areas, particularly those listed in NEMBA invasive alien plant species lists.	Annual inspections and inclusion of new species of concern in clearing activities as required.	As per (1) (above)	
	5. Reduce the risk of future invasion by encouraging (ideally by stipulating) the planting of indigenous plants in developments abutting the river channel.	Input into development applications and landscaping plan.	Environmental officials	

10.3 Maintenance management activities specific to each river segment

10.3.1 Segment 1

The management activities outlined for Segment 1 focus on those activities required for the maintenance of the river channel and banks in a PES Category C, as well as for the maintenance of the required levels of

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function of their ecological setback areas, comprising 20m wide strips on either side of the river channel, measured from top of bank.

10.3.1.1 Maintenance Management Activities in the River Channel

The table below outlines management activities for the river channel and banks.

Table 21: Segment 1 maintenance management measures for the river channel and banks.

Management Measure	Details	Timing/frequency	Skills & Expertise	Compliance & Monitoring
Water quality management	1. Implement measures as per Section 10.1. 2. Ensure that stormwater outlets are treated with required WSUDS measures (see Day 2016). 3. Monitor water quality in each segment to identify segments in which point source or other pollution results in a deterioration in water quality from its desired PES class (see Table 18).	As per Section 10.1. Design phase and ongoing Monthly monitoring of listed water quality variables at end of each segment	As per Section 10.1. Engineer and/or environmental official Water quality monitoring technician and analytical laboratory	As per Section 10.1.
Alien plant management	Implement measures as per Section 10.2.2.			
Removal of dumped waste	1. Where rubble or other waste is dumped in or along the river corridor and its buffer, this may be removed using machinery, and disposed of outside of all 1:100 year floodplains and avoiding any wetland or other sensitive ecological areas.	As required	Maintenance team	5 year audit
Sediment and debris clearing	1. Identification of the need for clearing of sediment and/or debris dumped or washed into the channel	Annual inspection in late spring (October) to identify blocked culverts/bridges or large accumulations of sediment or other solid waste in channel	Engineer and/or CoCT Environmental Official	5-yearly independent inspection / audit to identify problem areas – PES assessment to determine status in this segment
	2. Clearing of sediment from the channel a. May be undertaken with machinery or manual labour – provided rehabilitation carried out; b. Excavation to ensure that deepening of the channel does not occur – bridge levels to be used as	Unless motivated with regard to unusual levels of disturbance (e.g. large floods, fires, upstream disturbance) such measures should not be carried out more frequently	River maintenance team, under supervision of the CoCT Environmental Official and with input as required from freshwater ecologist	

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Management Measure	Details	Timing/frequency	Skills & Expertise	Compliance & Monitoring
	gauge; c. Areas of sediment removal to be minimised – wholesale excavation of the river channel not accommodated in this activity; d. Sediment and other dredged material to be removed within 48 hours of excavation and disposed of outside of the buffer area, the 1:100 year floodplain and avoiding any wetland or other sensitive ecological areas; e. Excavation to be followed by rehabilitation of disturbed areas, allowing for; i. Reshaping of banks to grades no steeper than 1:4; 3. Planting of appropriate locally indigenous vegetation on destabilised banks as required.	than two yearly Sediment removal to be in late summer (January/February) only, followed by rehabilitation		
Litter cleaning	1. Litter to be removed on a regular basis from the river channel to prevent local and downstream visual degradation as well as prevent blocking of culverts/bridges and flow pathways.	Monthly removal using manual labour	River maintenance team, under supervision of the CoCT Environmental Official	Annual inspection by municipal Environmental Officer; To be considered in 5 yearly audit.
Erosion repair and control	1. Channel to be inspected annually for signs of bank or bed erosion;	Annual inspection at end of wet season (October) as well as on ad hoc basis.	Engineer and/or environmental official	5 yearly audit
	2. Ideally, early intervention should limit maintenance requirements – a. Identify and remove new obstructions causing erosion – manual labour; b. Reshape localised bank collapse and replant with indigenous bank stabilising species;	As required	Construction to engineering and ecological specifications – under supervision of the CoCT Environmental Official and with input as required from freshwater ecologist.	
	3. Where erosion is more significant, and structural interventions are considered	As required – but potentially subject to Basic		

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Management Measure	Details	Timing/frequency	Skills & Expertise	Compliance & Monitoring
	necessary, these may only be utilised with support of an aquatic ecologist, taking cognisance of the need to limit areas of channel or bed lining, and to favour the use of soft engineering or engineering that allows for the establishment of plants (e.g. gabions with adapted planting ledges).	Assessment and/or general authorization through DWS is structural interventions considered.		

10.3.1.2 Management and Maintenance Activities in the River Buffer

Uses of the buffer areas:

The buffer area may be utilised for the following activities:

- Provision of play areas (on open grassed spaces);
- Space for walking, riding, running along the riverine corridor;
- Space for the provision of aesthetically landscaped areas that can be designed to double up as storm water amelioration devices;
- Areas that have high ecological value as terrestrial, indigenous landscapes, that contribute to the ecological value of the riverine corridor, while at the same time affording local residents with privacy and a low-maintenance amenity;
- Areas for the management of storm water, by integrating WSUDS approaches (swales, shallow detention ponds; filtration areas; seasonal wetlands, "bubble ups") into the broad riverine landscape.

The following activities are NOT considered suitable for buffer areas:

- The use of hardened surfaces – other than a narrow path along its upland edge (<1.5m in width), constructed of porous material to facilitate infiltration, to permit maintenance and policing;
- Alien vegetation - the buffer areas must be planted and maintained with locally indigenous vegetation;
- Uncontrolled horse crossings – if required, these should be designed such that they do not result in erosion knick-points in the river bed or banks, do not affect buffer function and do not interfere with the flow regime.

10.3.2 Segment 2

The sections of the river corridor addressed below are as described in Day (2016), and comprise:

- The lower floodplain, comprising an excavated trapezoidal channel, 38.5m at base, with height 1.1m, side slopes of 1:2.5 and thus 44 m in total width, which would largely contain the 1 in 7 year return period flood;
- A low flow channel, set within the lower floodplain – the low flow channel is intended to meander freely within the lower floodplain, although its initial alignment would be as per the naturally "preferred" channel configuration determined by Basson (2012);
- The upper floodplains, on either side of the lower floodplain, which would be protected by riprap berms of side slope 1:2.5, and which would contain the 1 in 100 year return period flood line. With the lower floodplain, the total channel width is some 85m;
- The Ecological and Management setback zone or buffer area, comprising an additional 10m width on either side of the upper floodplain, resulting in a total anticipated corridor width of 105m;

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- An (optional) multi-purpose setback zone, up to 15m in width, extending outwards from the Ecological and Management setback zone or buffer area to the development edge.

10.3.2.1 General Maintenance and Management Activities

The activities outlined in the table below are likely to be applicable at varying frequencies to most areas of the river corridor in Segment 2.

Table 22: Segment 2 maintenance management measures for the river channel and banks in.

Management Measure	Details	Timing/frequency	Skills & Expertise	Compliance & Monitoring
A. Routine operational phase management				
Water quality management	1. Implement measures as per Section 10.1.	As per Section 10.1.	As per Section 10.1.	As per Section 10.1.
	2. Ensure that stormwater outlets are treated with required WSUDS measures (see Day, 2016).	Design phase and ongoing.	Engineer and/or the CoCT Environmental Official.	
	3. Monitor water quality in each segment to identify segments in which point source or other pollution results in a deterioration in water quality from its desired class (see Table 18).	Monthly monitoring of listed water quality variables at end of each segment.	Water quality monitoring technician and analytical laboratory.	
Alien plant management	Implement measures as per Section 10.2.2			
Management of invasive indigenous or cosmopolitan species	Depending (largely) on soil and water salinity levels, <i>Typha capensis</i> and/or <i>Phragmites australis</i> are highly likely to establish and become invasive in the river channel. The following management measures are recommended: 1. <i>Typha capensis</i> should be cut back on a two yearly basis, to reduce the likelihood of setting (nuisance) seeds and to prevent senescence – cutting should be carried out using bush-cutters or other handheld tools and all plant material should be removed from the river corridor; 2. <i>Phragmites australis</i> is not considered a pest species and should be allowed to establish in the event that conditions support its growth.	Cutting of <i>Typha capensis</i> reeds should take place in late summer only – after the end of the bird breeding season and before seeds set in late summer (usually February). Frequency of cutting should be at least two-yearly as seeds set approximately every two years. Rotation of clearing of different sections of this river segment may be made on this basis.	River maintenance team under supervision / training of the CoCT Environmental Official.	5-yearly independent inspection / audit
Management of other	The river corridor represents a large area of open space, the long			

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Management Measure	Details	Timing/frequency	Skills & Expertise	Compliance & Monitoring
planted areas	term management of which must ensure that it retains hydrological, ecological and aesthetic function. The following measures apply to its long-term management, over and above those pertaining to indigenous and alien plant controls (see previous): 1. The low flow channel and lower floodplain, as well as the side slopes of the lower floodplain, leading to the upper floodplain: • Periodic cutting of senescent material and its replanting, with species as listed in Annexure B; • No mowing of these areas; • Removal of grasses that threaten to dominate systems. 2. The upper floodplain: • Grassed areas of the upper floodplain may be mown using tractors, lawnmowers or other mechanised approaches.	At least four-yearly, in late summer (February/ March) As required As required	Maintenance team at request of the CoCT Environmental Official.	
Removal of dumped waste and other debris	1. Identify areas where rubble / other waste has been dumped, and remove – machinery may access the multipurpose and ecological setback zones for rubble removal; removal of such material from the floodplains, their embankments and the low flow channel itself must be carried out using manual labour equipped with hand held tools / equipment. 2. Note that the areas most vulnerable to dumping will be the setback or buffer areas, and required installations such as bollards to prevent vehicle access for dumping purposes should be maintained.	Annual inspection in late spring (October) to identify problem areas; river segment must be walked by officials during inspections.	Engineer and/or the CoCT Environmental Official.	5-yearly independent inspection / audit
Litter removal	1. Removal of wind- and water-borne litter accumulated in the	At least monthly removal using	Maintenance team, under	Annual inspection by

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Management Measure	Details	Timing/frequency	Skills & Expertise	Compliance & Monitoring
	held tools; b. Must be carried out with a view to retaining the heterogeneity that is required to simulate natural conditions – thus the rough surface comprising depressions and low mounds that was developed during the construction phase should be emulated during maintenance activities; c. Areas of sediment removal to be minimised – wholesale excavation of any of the sections of the river corridor in this segment is not accommodated in this activity; d. Sediment and other dredged material to be removed within 48 hours of excavation and disposed of outside of the buffer areas, the 1:100 year floodplain and avoiding any wetland or other sensitive ecological areas; e. Excavation to be followed by rehabilitation of disturbed areas, to design specifications (see Day, 2016); f. Planting of appropriate locally indigenous vegetation on destabilised banks and surfaces as required. 3. Clearing of sediment from the setback areas including stormwater ponds and sediment traps may be carried out with machinery, provided that rehabilitation of cleared areas to design specifications occurs – e.g. depressional wetlands created in these areas are re-established and planted as per their original design. Note that as a principle it would		Environmental Official and with input as required from freshwater ecologist	

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Management Measure	Details	Timing/frequency	Skills & Expertise	Compliance & Monitoring
	be preferable for small volumes of sediment to be cleared from the corridor (mainly the low flow channel and lower floodplain) on a more frequent basis than for maintenance to take place only once critical loss of capacity has occurred, and then entailing largescale disturbance of extensive areas			
Maintenance of flood capacity and structural integrity	- Sediment to be removed as per previous activity (above), to maintain flood capacity in the river corridor; - No trees should be planted or allowed to establish in the lowflow channel, upper or lower floodplain or on the berms; - Vegetation planted in the river should not exceed 0.8m in height on the upper floodplains and berms and should not exceed 1.0m in the lowflow channel, or the lower floodplain and its banks; - Ogee weir bucket structures to be checked on at least an annual basis and any sediment or other debris (e.g. waste, litter, plants, logs) accumulating in these structures to be removed using manual labour.	As per previous Annual inspection Annual inspection Annual inspection	Engineer and/or the CoCT Environmental Official	5-yearly independent inspection / audit to identify problem areas
B. Interventions post flood or other large-scale disturbance				
Pre-construction sediment movement models conducted by Basson (2012) showed that, during floods probably in excess of 1:5 year events, significant levels of erosion between the drop weir structures, and specifically along the lowflow channel and the upper bank of the lower floodplain, would be expected. During larger floods, erosion of the upper floodplain, potentially exposing its riprap side slopes, might also occur. Such outcomes are addressed in the following management stipulations.				
Re-establishment of a river corridor that meets its management objectives including its desired Ecological State	1. An indigenous plant nursery with hardy plants suitable for establishment in eroded areas should be established and maintained, so that plants are available on a long term basis for planting in the riverine corridor. All plants in the nursery should be propagated from local Helderberg basin (Sir Lowry's Pass River or Lourens River) or Eerste	Ongoing Annual inspection at end of wet season (October) as well as on an ad	Indigenous plant cultivation and propagation Engineer and/or the CoCT Environmental	5 yearly audit, measured against management objectives in Day (2016)

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Management Measure	Details	Timing/frequency	Skills & Expertise	Compliance & Monitoring
	River catchment material. Propagation will require at least a 12-month lead-in time for seed collecting, germination and rooting of cuttings in the appropriate seasons, and growing in preparation for planting out in the field in autumn; 2. Identification of needs for engineering and/or landscaping interventions to address erosion: • Eroded pathways / walkways through the riverine corridor should be reinstated to design specifications, unless an improved design is available that meets ecological, hydrological and hydraulic requirements to the same degree or better: ◦ Broken or failed structures should be removed; ◦ Repairs should be undertaken with manual labour; ◦ Disturbed areas around the pathways of boardwalks should be reinstated, again using manual labour, to fill in or shape erosion areas and remove debris; ◦ Repaired structures should follow previous alignments unless motivation to the contrary is approved by the engineer and CoCT Environmental Official; • Erosion of the <u>lowflow channel</u> following <u>minor flood</u> events in the system should be actively managed: ◦ <u>Channel incision</u> should be addressed through the installation of minor gabion weirs, set into	hoc basis following storms likely to be in excess of 1: 5 year events	Official, Construction to engineering and ecological specifications - under supervision of the CoCT Environmental Official and with input as required from freshwater ecologist	

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Management Measure	Details	Timing/frequency	Skills & Expertise	Compliance & Monitoring
	the banks of the low flow channel; - o Bank erosion should be left largely unaddressed, as part of the design allows for the meandering of the low flow channel across the lower floodplain – in the event that erosion of the outer slopes of the lower floodplain up to the upper floodplain are threatened, consideration should be given to addressing erosion with manual reshaping (flattening) and planting of the channel banks and beds in affected areas; • Erosion of the lowflow channel and lower floodplain following <u>major floods</u> (in excess of the 1.5 year event) must be addressed with landscaping and planting sufficient to re-establish the vegetated design template, noting that the better the plant cover, the less frequent the need for such interventions; • <u>Exposed riprap</u> on the upper and lower floodplains following major floods must be re-covered with soils (potentially sourced in part from sediment removal activities elsewhere in the system) and the destabilized areas planted with locally indigenous vegetation likely to provide stability in flood conditions, noting that: - o No trees should be planted or allowed to establish in the lowflow channel, upper or lower floodplain or on the	As required – but potentially subject to Basic Assessment and/or authorization through DWS if new structural interventions considered		

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Management Measure	Details	Timing/frequency	Skills & Expertise	Compliance & Monitoring
	berms; - Vegetation planted in the river should not exceed 0.8m in height on the upper floodplains and berms and should not exceed 1.0m in the lowflow channel, or the lower floodplain and its banks; - Where large flood events result in significant damage to the system, the use of machinery to move soil and shape the riverine and floodplain areas may be considered, subject to approval / supervision from the CoCT Environmental Official.			

10.3.2.2 Restrictions on Activities in Different Zones of the River Corridor

Activities in the Ecological and Management setback zones or buffer areas:

These areas represent the minimum setback, and can be used for the following purposes only:

- 5m width abutting the edge of the berm / upper floodplain bank to be planted with locally indigenous vegetation to create a terrestrial / flood time ecological corridor;
- Remaining 5m may be grassed with water-wise hardy indigenous grasses;
- Setback area intended to provide management access to the river corridor – e.g. for sediment, litter and plant clearing activities;
- 1m wide path permitted to allow walking along the corridor;
- No vehicular access to the river floodplains to be permitted (use of bollards included in authorised design) other than for required mowing of upper floodplains (see above).

Activities in the multi-purpose setback zones:

These areas may be utilised for the following activities:

- Provision of play areas (note that play surfaces may not be lined /hardened or subject to channelized drainage into the riverine corridor);
- Space for walking, riding, running along the riverine corridor, in a safe environment where there is surveillance from adjacent communities, as opposed to down in the main river channel;
- Space for the provision of aesthetically landscaped areas that can be designed to double up as storm water amelioration devices;
- Areas that have high ecological value as terrestrial, indigenous landscapes, that contribute to the ecological value of the riverine corridor, while at the same time affording local residents with privacy and a low-maintenance amenity;
- Areas where developers can meet their obligations in terms of storm water management, by integrating WSUDS approaches (swales, shallow detention ponds; filtration areas; seasonal wetlands, "bubble ups") into the broad riverine landscape;
- Areas where developers can meet part of their obligations with regard to the provision of open space

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areas – such areas will have enhanced opportunities within the overall riverine corridor.

The following activities are **NOT** considered suitable for buffer areas:

- The use of hardened surfaces – other than a narrow path along its upland edge (<1.5m in width), constructed of porous material to facilitate infiltration, to permit maintenance and policing;
- Alien vegetation - the buffer areas must be planted and maintained with locally indigenous vegetation – (indigenous) grassed areas are permitted;
- Fences that extend into the buffer area.

Activities in the upper and lower floodplains and the lowflow channel area;

Controlled access to the river floodplains and low flow channel should be encouraged, to ensure that these areas are valued by local communities as important parts of their local space. However, the following restrictions to access apply:

- Access should be for passive recreation only – walking, bird watching, cycling – but not for play parks; fishing, grazing of animals, cultivation or collection of plants;
- Livestock grazing in the river channel and/or its buffer areas should not be permitted and active management against this impact must take place before new precedents are set;
- Access should be along demarcated pathways, laid out in consultation with the hydraulics / sediment specialist and a river ecologist to ensure no unintentional effects on flow or habitat quality;
- Domestic animals (i.e. dogs) should be allowed into the river corridor only if on a leash;
- If access is permitted by a particular development abutting the river, then provision must also be made for the collection of litter and other material from the pathways;
- Access routes should include "awareness" sign boarding, highlighting the ecological and other aspects of the river corridor to add to a culture of best practice in local communities;
- Unless sanctioned as part of flood maintenance activities or mowing of the upper floodplain only, (see specifications in this regard), no vehicles should be permitted into these areas.

10.3.3 Segment 3 and 6 Activities (the Artificial Canal)

The management activities outlined for these Segments (table below) focus simply on addressing flood capacity, hydraulic function and aesthetic issues such as litter. The system is artificial and the natural river channel (Segment 4) is considered an ecological priority.

Table 23: Segments 3 and 6 maintenance management measures.

Management Measure	Details	Timing/frequency	Skills & Expertise	Compliance & Monitoring
Sediment and debris clearing	1. Identification of the need for clearing of sediment and/or debris dumped or washed into the canal.	Annual inspection in late spring (October) to identify blocked culverts or large accumulations of sediment or other solid waste in canal.	Engineer and/or the CoCT Environmental Official	5-yearly Independent inspection / audit to identify problem areas
	2. Clearing of sediment from the canal: a. May be undertaken with machinery or manual labour; b. Sediment and other	Sediment removal in low flow conditions only.	River maintenance team	

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Management Measure	Details	Timing/frequency	Skills & Expertise	Compliance & Monitoring
	dredged material to be removed within 48 hours of excavation and disposed of outside of the 1:100 year floodplain and avoiding any wetland or other sensitive ecological areas.			
Litter clearing	- Litter to be removed on a regular basis from the canal to prevent local and (particularly) downstream visual degradation. - Clearing of litter from the canal - May be undertaken with machinery or manual labour; - Litter to be removed with immediate effect and disposed of at an approved waste disposal site.	Monthly removal	River maintenance team	To be considered in 5 yearly audit

10.3.3 Segment 3 Structures: Maintenance of Control Structures Between Segment 2, Segment 3 and Segment 4

The management activities outlined below focus on maintenance of two control structures (namely a diversion weir or other control structure at the end of the re-configured river channel (Segment 2) and construction of a new diversion weir / structure to allow the passage of a total of 8 m³/s during major flows into the natural Sir Lowry's Pass Channel downstream, with this water derived from both the Sir Lowry's Pass River and the Eastern Catchment, which enters Segment 2 upstream of the first diversion weir. All excess flows are passed into Segment 3 (the canal), where they join with treated effluent from the Gordon's Bay Waste Water Treatment Works.

Note that design details were not yet available for this structure at the time of writing and the management activities outlined below must be revised once the structure has been constructed.

Table 24: Segment 3 maintenance management measures.

Management Measure	Details	Timing/frequency	Skills & Expertise	Compliance & Monitoring
Sediment and debris clearing	1. Identification of the need for clearing of sediment or other debris dumped or washed into either structure.	Twice yearly inspections in late spring (October) and late summer (February) to check that the low flow release system into Segment 4 is fully functional.	Engineer and/or the CoCT Environmental Official	5-yearly independent inspection / audit – to be checked against PES of Segment 4, which is dependent on these maintenance measures.
	2. Clearing of sediment from the structures	Sediment / debris removal in low flow	River maintenance	

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Management Measure	Details	Timing/frequency	Skills Expertise &	Compliance & Monitoring
	a. May be undertaken with machinery or manual labour; b. Sediment and other dredged material to be removed immediately and disposed of outside of the 1:100 year floodplain and avoiding any wetland or other sensitive ecological areas.	conditions only, unless emergency intervention required as a result of high flow blockages.	team	
Litter clearing	1. Clearing of litter from the structures: a. May be undertaken with machinery or manual labour; b. Litter to be removed with immediate effect and disposed of at an approved waste disposal site.	Monthly removal	River maintenance team	To be considered in 5 yearly audit
Ecological connectivity along the river corridor	Both structures include terrestrial corridors, at least 10m in width on at least one side of the structure. These corridors must be maintained as characteristically vegetated with indigenous vegetation that provides vertical cover and habitat quality to a river ecologist's specifications. The following measures apply to its long-term management: 1. Periodic cutting of senescent material and its replanting, with species as listed in Annexure B is required; 2. Mowing of these areas is not permitted; 3. Removal of grasses that threaten to dominate systems is required; 4. Removal of litter and dumped waste is required: to be removed with immediate effect and disposed of at an approved waste disposal site; 5. Alien plant control is required (as per Section 10.2.2).	At least four-yearly, in late summer (February/ March) Annual maintenance Monthly As per section 10.2.2	Maintenance team at request of the CoCT Environmental Official	To be considered in 5 yearly audit

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10.3.4 Segment 4

The management activities outlined for Segment 4 in the table below focus on those activities required for the maintenance of the river channel and banks in a PES Category D, as well as for the maintenance of the required levels of function of their ecological setback areas, comprising 20m wide strips on either side of the river channel, measured from top of bank.

10.3.4.1 Maintenance Management Activities in the River Channel

Table 25: Segment 4 maintenance management measures.

Management Measure	Details	Timing/frequency	Skills Expertise &	Compliance & Monitoring
Water quality management	1. Implement measures as per Section 10.1.	As per Section 10.1.	As per Section 10.1.	As per Section 10.1.
	2. Ensure that stormwater outlets are treated with required WSUDS measures (see Day 2016).	Design phase and ongoing.	Engineer and/or the CoCT Environmental Official.	
	3. Monitor water quality at upstream and downstream ends of the segment, and if relevant, undertake additional sampling to identify segments in which point source or other pollution results in a deterioration in water quality from its desired class (see Table 18).	Monthly monitoring of listed water quality variables at end of each segment.	Water quality monitoring technician and analytical laboratory.	
Alien plant management	Implement measures as per Section 10.2.2.			
Litter clearing	1. Litter to be removed on a regular basis from the river channel to prevent local and downstream visual degradation as well as prevent blocking of culverts and flow pathways.	Monthly removal using manual labour.	River maintenance team, under supervision of the CoCT Environmental Official	Annual inspection by the CoCT Environmental Official; To be considered in 5 yearly audit
Removal of dumped waste	1. Where rubble or other waste is dumped in or along the river corridor and its buffer, this may be removed using machinery, and disposed of outside of all 1:100 year floodplains and avoiding any wetland or other sensitive ecological areas.	As required	Maintenance team	5 year audit
Specific measures for the unlined sections of the channel (between Dennehof and Lancaster Roads and downstream of Admiral's Drive)				
Plant and sediment management to retain	Plant management activities must ensure that the channel is maintained as a functional, reed and sedge dominated system,			5 year audit, checked against required PES category for this

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Management Measure	Details	Timing/frequency	Skills & Expertise	Compliance & Monitoring
floodflow capacity	as follows: 1. Plants on the channel banks or bed may be cut occasionally (no more frequently than every three years) using manual labour only and ensuring that indigenous plants (mainly reeds) are cut off above their bases to facilitate rapid regrowth rather than being excavated out with their roots – exposing the channel bed or bank by excavation must be avoided; 2. All cleared plant material and other debris to be removed within 48 hours of excavation and disposed of outside of the 1:100 year floodplain and avoiding any wetland or other sensitive ecological areas; 3. Where plant clearing activities trigger erosion, this should be addressed as outlined below.	No more frequently than every three years, and restricted to late summer / autumn only, allowing the vegetation to establish during the late spring and summer months	River maintenance team to be trained in conservative river management	segment
Addressing erosion	1. Channel to be inspected annually for signs of bank or bed erosion 2. Ideally, early intervention should limit maintenance requirements – a. Identify and remove new obstructions causing erosion – manual labour; b. Reshape localised bank collapse and replant with indigenous bank stabilising species; 3. Where erosion is more significant, and structural interventions are considered necessary, these may only be utilised with support of an aquatic ecologist, taking cognisance of the need to limit areas of channel or bed lining and to favour the use of soft engineering or engineering that allows for the establishment of plants (e.g. gabions with adapted	Annual inspection at end of wet season (October) as well as on <i>ad hoc</i> basis. As required As required – but potentially subject to Basic Assessment and/or general authorization through DWS if structural interventions considered.	Engineer and/or the CoCT Environmental Official Construction to engineering and ecological specifications – under supervision of the CoCT Environmental Official and with input as required from freshwater ecologist.	5 yearly audit

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Management Measure	Details	Timing/frequency	Skills & Expertise	Compliance & Monitoring
Sediment and debris clearing	planting ledges).			
	1. Identification of the need for clearing of sediment and/or debris dumped or washed into the channel. 2. Clearing of sediment from the channel must: a. Be carried out using manual labour only, and working to set channel levels; provided in the channel as part of its design specifications (see Day, 2016); b. Minimise the extent of sediment removal – wholesale excavation of the river channel is not accommodated in this activity; c. Sediment and other dredged material to be removed within 48 hours of excavation and disposed of outside of the buffer area, the 1:100 year floodplain and avoiding any wetland or other sensitive ecological areas; d. Excavation to be followed by rehabilitation of disturbed areas, allowing for: i. Reshaping of banks to grades no steeper than 1:4; 3. Planting of appropriate locally indigenous vegetation on destabilised banks as required.	Annual inspection in late spring (October) to identify blocked culverts or accumulations of sediment or other solid waste in channel. Unless motivated with regard to unusual levels of disturbance (e.g. large floods, fires, upstream disturbance) such measures should not be carried out more frequently than two yearly Sediment removal to be in late summer (January/February) only, followed by rehabilitation.	Engineer and/or the CoCT Environmental Official. River maintenance team, under supervision of the CoCT Environmental Official and with input as required from freshwater ecologist.	5-yearly independent inspection / audit to identify problem areas – PES assessment to determine status in this segment
Specific measures for the lined sections of the channel (Lancaster Drive to Faure Marine Drive)				
Plant and sediment management	Plant management activities must ensure that: 1. The lower vegetated gabion step as well as areas higher up the lined bank must be		River maintenance team trained in	5 year audit, checked against required PES category for this segment

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Management Measure	Details	Timing/frequency	Skills & Expertise	Compliance & Monitoring
	avoided during routine channel-clearing operations; 2. Plants on the lower vegetated gabion step or upper bank may be cut occasionally (no more frequently than every three years) using manual labour only and ensuring that indigenous plants (mainly reeds) are cut off just above their bases to facilitate rapid regrowth rather than being excavated out with their roots; 3. Clearing of vegetation from the Reno mattress on the channel base should take place in late summer / autumn only, allowing the vegetation to establish during the late spring and summer months; 4. All cleared plant material and other debris to be removed within 48 hours of excavation and disposed of outside of the 1:100 year floodplain and avoiding any wetland or other sensitive ecological areas.	No more frequently than every three years, and restricted to late summer / autumn only, allowing the vegetation to establish during the late spring and summer months Annually if required, but restricted to late summer / autumn only	conservative river management	

10.3.4.2 Management Maintenance Activities in the River Buffer

Uses of the buffers areas:

Where adequate space is available for buffer areas to be retained, they may be utilised for the following activities:

- Provision of play areas (on open grassed spaces);
- Space for walking, riding, running along the riverine corridor;
- Space for the provision of aesthetically landscaped areas that can be designed to double up as storm water amelioration devices;
- Areas that have high ecological value as terrestrial, indigenous landscapes, that contribute to the ecological value of the riverine corridor;
- Areas for the management of storm water, by integrating WSUDS approaches (swales, shallow detention ponds; filtration areas; seasonal wetlands, "bubble ups" into the broad riverine landscape;

The following activities are NOT considered suitable for buffer areas:

- The use of hardened surfaces – other than a narrow path along its upland edge (<1.5m in width), constructed of porous material to facilitate infiltration, to permit maintenance and policing;
- Alien vegetation – the buffer areas must be planted and maintained with locally indigenous vegetation.

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10.3.5 Segment 5

The management activities outlined below for this segment focus on allowing the conveyance of stormwater runoff through controlled swales, into the artificial canal.

Table 26: Segment 5 maintenance management measures.

Management Measure	Details	Timing/frequency	Skills Expertise &	Compliance & Monitoring
Sediment and debris clearing	1. Clearing of sediment from the canal: a. May be undertaken with machinery or manual labour; b. Sediment and other dredged material to be removed within 48 hours of excavation and disposed of outside of the 1:100 year floodplain and avoiding any wetland or other sensitive ecological areas.	Sediment removal to take place in late summer to autumn and in low flow conditions only.	River maintenance team	5-yearly independent inspection / audit to identify problem areas.
Litter clearing	1. Litter to be removed on a regular basis using machinery or manual labour; 2. Litter to be removed with immediate effect and disposed of at an approved waste disposal site.	Monthly removal	River maintenance team	To be considered in 5 yearly audit

10.3.6 Biodiversity Aspects

Table 27: Biodiversity maintenance management measures.

Potential Impact	Mitigation Measures
Rehabilitation and restoration of vegetation and ecological process - Implementation of the proposed Sir Lowry's Pass RCP (2013)	- It is imperative that all invasive alien plants are regularly cleared since this is likely to be an ongoing problem requiring regular clearing. In-stream clearing of invasive species must also be carried out. - Vegetation cover must be monitored along all rehabilitated areas, with specific attention to the RCP (2013). Vegetation cover should be measured using subjectively positioned 4m x 4m vegetation plots whereby species cover abundance is measured, along with fixed-point photography, to compare cover change over time. Monitoring should take place every 6 months for a period of at least two years. - Areas with poor vegetation cover or erosion must be replanted or stabilized until an acceptable level of vegetation cover is reached.
Safety issues – trapping of small fauna (including pets and people) in canal	The new canal must include mechanisms for the safe and easy exiting of the canal by small terrestrial fauna as well as humans.

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10.4 Segment 2 operational phase mitigation measures

Table 28: Segment 2 operational phase mitigation measures (additional to the above maintenance management measures).

Potential Impact	Mitigation Measures
Impacts as a result of encroachment of sources of disturbance, pollution and ongoing degradation along the river corridor	The following must be made conditions of authorisation / included in the title deeds for any development of adjacent parcels of land that have been freed up for development as a result of the changes in flood line allowed by this project: 1. Land use: a) High density, low cost housing should not abut the river corridor but should be set back from the edge of the river buffer, with a zone of other landuse – non low-cost housing, commercial areas, other – forming a zone between the river corridor and the zone of high impact land use, as and where practically possible. b) Low-cost housing areas must be designed so as to address the environmental and human health issues of backyard dwellings responsibly, by either: i. Prevention of such dwellings in design (e.g. double storey or duplex type settlements with managed public open spaces between, that do not allow for informal settlement) OR: ii. Allowance for backyard settlements in design, by: • Providing water, sewerage and domestic drainage systems for backyard dwellings. • Ensuring that sufficient capacity is included in sewage pipelines serving the development, to accommodate the additional volume of sewage generated by additional dwellings – note that in some cases, single plots may house three additional backyard dwellings, increasing sewage volume by four times the original potentially catered for, for a single residence only. • Inclusion of low-flow diversion systems in stormwater design, to allow for the diversion of contaminated low flows to the sewers if necessary in the future – <u>note that attention to the management of backyard settlements will reduce the need for such measures to be introduced, and the costs of their inclusion from a sewage treatment capacity perspective.</u> c) Inclusion of the following additional measures with regard to the development of high density, low cost housing in areas abutting the river corridor: • Adequate provision and maintenance of adequate litter and waste collection services from the start of development. • Control of livestock – livestock kraals, if required in settlements, should be managed so that their organic waste is contained, and does not seep or flow into water courses; ideally, livestock kraals are not recommended for inclusion in urban land use. • Inclusion of well-designed areas in which activities such as abattoirs, meat and fish stalls and fruit and vegetable vendors can operate in hygienic conditions, designed such that runoff or wash off is passed into bunded areas and thence into the sewers, rather than into the stormwater systems. • Attention to the development layout; such that open spaces, particularly those along river or other drainage lines, are not readily accessible by vehicles, and as such, are less likely to

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Potential Impact	Mitigation Measures
	attract dumping of waste - Minimising the extent of open water channels (other than the SLP River and other main water courses) through development areas, by managing stormwater underground in pipes where practical. d) Other developments abutting the river corridor: - Stormwater management for different land uses must be as stipulated in the stormwater masterplan for these areas (see Day 2014, Appendix D); - Setback areas / buffer areas: - The minimum 10m ecological and maintenance buffers allowed for in the current design of the channel in this segment allows for little integration of use between adjacent developments and the river corridor. The operational phase of the river corridor would however be more sustainable if the river corridor was incorporated into adjacent land uses, and recommendations outlined in the RCP (2013) for the design and use of an expanded buffer zone, (referred to as a "Multi-Purpose Setback Zone" in Nell <i>et al</i> (2013)) along one or both sides of the river, should be considered in this regard; - The restrictions of use on both the minimum ecological and maintenance buffer and the optional expanded buffer area should be as outlined in Nell <i>et al</i> (2013); e) Other land use constraints: - Livestock grazing in the river channel and/or its buffer areas should not be permitted and active management against this impact must take place before new precedents are set.
Localised scour and poor water quality as a result of inflows of stormwater from adjacent developments	- Stormwater runoff into the river channel must be addressed within development areas upslope of the river corridor and its 10m buffer zone so as to meet the requirements of the CoCT's Management of Urban Stormwater Impacts Policy (CoCT 2009); - Stormwater (once treated as above) should not be piped directly into the river channel, but should be allowed to be conveyed in landscaped, planted channels across the floodplains and allowed to pool and then dissipate in the lower floodplain. Such channels must be vegetated with plants able to withstand channelled flows, and should be maintained as such; - Sediment and litter traps must also be allowed for upstream of the river channel on all stormwater outlets from adjacent (or other) developments.
Loss of buffer function in order to allow space for recreational and other activities	- Incorporate expanded buffers into development plans as per Nell <i>et al</i> (2014) to allow for activities, as outlined below, to be incorporated into the riverine corridor: - Provision of play areas. - Space for walking, riding and running along the riverine corridor in a safe environment where there is surveillance from adjacent communities, as opposed to down in the main river channel. - Space for the provision of aesthetically landscaped areas that can be designed to double up as storm water amelioration devices. - Areas that have high ecological value as terrestrial, indigenous landscapes, that contribute to the ecological value of the riverine corridor, while at the same time affording local residents with privacy and a low-maintenance amenity. - Areas where developers can meet their obligations in terms of storm

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Potential Impact	Mitigation Measures
	water management, by integrating WSUDS approaches (swales, shallow detention ponds; filtration areas; seasonal wetlands, "bubble ups") into the broad riverine landscape. 2. Areas where developers can meet part of their obligations with regard to the provision of open space areas. Such areas will have enhanced opportunities within the overall riverine corridor.
Periodic repeated disturbance of the river and its floodplains as a result of the need to install services (e.g. water and sewage pipelines, electricity cables etc) across the river, to service the new developments that would be facilitated by changes in channel floodlines.	Provision must be made in the design of the ogee weirs for the incorporation of sleeves, conduits or other devices that will allow for their immediate or future use to convey electrical cables, water pipelines and sewers across the channel at existing points of obstruction, rather than allowing for multiple crossings for such services in the future.

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11 MONITORING PROGRAMME

The information below was sourced from the Freshwater Ecosystems Assessment prepared by Dr Liz Day, Freshwater Consulting Services, 2016, attached to the BA Report as Annexure G2.

11.1 Background

Among the recommendations for impact mitigation measures included in the sections above, is a requirement for monitoring of implementation of the OEMP/MMP and CEMP. While monitoring itself is not a mitigation measure, it does provide a tool for establishing the efficacy of the recommended mitigation measures and, if coupled with an effective response plan, can allow informed decisions to be made regarding the need to amend or adapt management activities.

Importantly, monitoring of change needs to begin with adequate data regarding baseline conditions, and a clear understanding of the variables that need to be measured, to track changes resulting from particular activities. If the variables selected for monitoring are incorrect or insensitive to the kinds of change likely to be triggered by an activity of concern, they will not assist in system management.

The following section provides a broad overview of the kinds of variables that should be monitored in the study area, in order to inform construction and operation phase management. This would need elaboration and expansion to a formal monitoring programme, in the event that the project was authorised.

11.2 Monitoring variables

The variables listed below need to be incorporated into a formal monitoring programme, which includes identification of different thresholds in indicator variables that should prompt particular management responses. Note that some variables (mainly water quality) are already monitored on a regular basis by the City of Cape Town. Additional monitoring sites would however be required, in order to track particular activities and their implications within the broader study area.

The variables listed in Table 28 should thus be monitored, with the number of sites to be determined during detailed monitoring programme compilation, and the frequency of monitoring likely to vary from weekly (during some construction activities) to monthly, quarterly or even annually, in the case of some variables such as Present Ecological State. Amendments to the monitoring programme should be allowed for on an ongoing basis, provided that they can be motivated for in terms of improved efficiency, interpretation or the efficacy of each component.

Table 29: Variables to include in a monitoring programme

Variable	Reason for inclusion
Flow	Allow for calculation of pollutant loading and provide a record over time of the river hydrological regime – flow measurements should be allowed for in Segment 1, Segment 2, the reconfigured Eastern channel and the natural channel downstream of the diversion weir
SASS5 macroinvertebrates	Indicate water and habitat quality – will allow monitoring of efficacy of reconfigured channel in terms of its riverine habitat quality; limited baseline data already available; additional baseline data ideally required
Fish	Provide a measure of the effects of longitudinal river fragmentation; also of the presence and population trends in different reaches of important populations of the endemic, genetically distinct <i>Galaxias</i> spp.
Water quality:	
<i>Escherichia coli</i>	Provides a measure of risks to human health associated with contact with water, and can be used in pollution tracking to isolate sources of faecal contamination
Total suspended	Allow for measure of risk of downstream sedimentation, and if separate analysis

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Variable	Reason for inclusion
solids	of organic and inorganic components occurs, will indicate extent of upstream erosion and organic loading
Major nutrients – Total phosphorus, orthophosphate, total ammonia, Nitrate and nitrite nitrogen, pH, EC and dissolved oxygen	Allow trends in water quality to be tracked over time – noting that the data indicate instantaneous quality only
Diatoms	Provide an additional measure of water quality, not dependent on habitat availability, that allows water quality to be gauged from the recent past into the medium term
Vegetation	Plot measurements should be used in the reconfigured channel to indicate the extent of indigenous plant cover, its diversity, and the extent of alien plant invasion
Present Ecological State	Provides a measure of river and wetland condition and can be used to highlight problem areas and the extent to which Desired State objectives are being met in different parts of the river.

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12 Fines, Measurement and Payment

12.1 Fines

Fines will be issued for the transgressions listed below. Fines may be issued per incident at the discretion of the Engineer. Such fines will be issued in addition to any remedial costs incurred as a result of non-compliance with this EMPr. The Engineer will inform the Contractor of the contravention and the amount of the fine, and will deduct the amount from monies due under the Contract.

Fines for the activities detailed below will be imposed by the Engineer on the Contractor and/or his Sub-contractors.

Table 30: Fines to be imposed for non-compliances with this EMPr.

A	Any persons, vehicles, plant, or thing related to the Contractors' operations within the designated boundaries of a "no-go" area.	R 4 000.00
B	Any vehicle driving in excess of designated speed limits.	R 1 000.00
C	Any vehicle being driven, and items of plant or materials being parked or stored outside the demarcated boundaries of the site.	R 2 000.00
C	Persons walking outside the demarcated boundaries of the site.	R 500.00
E	Persistent and un-repaired oil leaks from machinery. The use of inappropriate methods of refuelling such as the use of a funnel rather than a pump.	R 3 000.00
F	Litter on site.	R 1 000.00
G	Deliberate lighting of illegal fires on site.	R 5 000.00
H	The eating of meals on site outside the defined eating area. Individual not making use of the site ablution facilities.	R 1 000.00
I	Any person, vehicle, item of plant, or anything related to the Contractors operations causing a public nuisance.	R 2 000.00
J	Other EMPr contraventions not listed above.	R 2 000.00

For each subsequent similar offence the fine may, at the discretion of the Engineer, be doubled in value to a maximum value of R100 000.

The Engineer shall be the judge as to what constitutes a transgression in terms of this clause, subject to the provisions of Clause 60(1) of the General Conditions of Contract. In the event that transgressions continue, the Contractors' attention is drawn to the provisions of Sub-clause 58(1)(b)(vi) of the General Conditions of Contract under which the Engineer may cancel the Contract.

Penalties:

- Where the Contractor inflicts non-repairable damage upon the environment or fails to comply with any of the environmental specifications, he/she shall be liable to pay a penalty fine over and above any other contractual consequence. *(In terms of the Conventional Penalties Act (1952) a creditor is not entitled to recover both the penalty and damages. Accordingly, were a Contractor causes damage, the Employer can either enforce a penalty or make the Contractor make good the damage, but not both.)*
- The Contractor is deemed NOT to have complied with this Specification if:
 - within the boundaries of the site, site extensions and haul/ access roads there is evidence of contravention of the Specification;
 - environmental damage ensues due to negligence;
 - the Contractor fails to comply with corrective or other instructions issued by the Engineer within a specific time;
 - the Contractor fails to respond adequately to complaints from the public.
- Payment of any fines in terms of the contract shall not absolve the offender from being liable from prosecution in terms of any law.

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4. An Environmental Performance Guarantee of 5% of Contract Value shall be deposited by the Contractor with the Engineer. This fund shall be used in the event of penalties or rehabilitation costs for non-conformance or contraventions of the EMP. The balance shall be given back to the Contractor at Contract closure.
5. The penalties suggested for transgressions are provided in the table below.

Table 31: Penalties for transgressions to this EMP.

a.	Erosion	A penalty equivalent in value to the cost of rehabilitation plus 20%
b.	Oil spills	A penalty equivalent in value to the cost of clean-up operation plus 20%
c.	Damage to indigenous vegetation	A penalty equivalent in value to the cost of restoration plus 20%.
d.	Damage to sensitive environments	A penalty equivalent in value to the cost of restoration plus 20%.
e.	Damage to cultural sites	A penalty to a maximum of R 100 000 shall be paid for any damage to any cultural/ historical sites
f.	Damage to trees	A penalty to a maximum of R100 000 shall be paid for each tree removed without prior permission, or a maximum of R5 000 for damage to any tree, which is to be retained on site.
g.	Penalties for removing or damaging trees:	
	Girth of trunk (1m above ground level)	Replacement value per tree
	0 – 15 mm	R100.00
	16 – 30 mm	R200.00
	31 – 50 mm	R500.00
	51 – 75 mm	R1 000.00
	76 – 100 mm	R2 500.00
	101 – 150 mm	R5 000.00
	150 – 300 mm	R10 000.00
	Larger than 300 mm	R15 000.00 to R100 000.00

12.1 Measurement and Payment

The sections below provide more information on the measurement and payment of mitigation measures prescribed in this EMP.

12.1.1 Environmental Awareness Training

- The organisation and attendance of the education course will be measured as a sum.
- The tender sum shall cover the time cost of all personnel attending the course, the provision of the venue and for any other operation necessary to comply with the requirements of the environmental awareness courses to the satisfaction of the Engineer/ECO/EO.

12.1.2 Refuse Removal

- The unit of measurement shall be a sum for the removal of refuse.
- The rate shall include the collection of refuse, for providing, maintaining and running the refuse vehicles, refuse bins and special refuse enclosures, and for all loading, unloading and double handling as required.

12.1.3 Site Demarcation

- The supply, installation and removal at the end of the construction of all temporary fences shall be measured by length for each type of fence scheduled.

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12.1.4 Dust Control

- The unit of measurement shall be a sum for watering and/ or straw stabilisation.
- The rate shall include the cost of obtaining, transporting and applying the water and/ or straw stabilisation including supplying and maintaining suitable water bowzers.

12.1.5 Pumping

- The unit of measurement shall be a sum for pumping water into or out of settlement ponds.
- The tendered rate shall include full compensation for supplying, installing, operating and maintaining the pumps and pump hoses.
- In the event of the contents of a settlement pond being removed by a suction tanker such removal shall be deemed to be allowed for.

12.1.6 Supply and Erection of Public Information Boards

- The supply and erection of public information boards shall be measured by number.
- (xx) A2 copy(ies) of the poster for the board shall be supplied to the Contractor. The rate shall cover the cost of securing the posters to the backing boards, the cost of all labour, materials, plant and equipment necessary for the erection, maintenance and removal on completion.

12.1.7 Supply and Erection of Construction Personnel Information Boards

- The supply and erection of construction personnel information boards shall be measured by number.
- The tendered rate shall cover the cost of all printing, labour, materials, plant and equipment, necessary for the erection, maintenance and removal on completion.

12.1.8 Speed Limit and Route Marker Signs

- The supply and erection of speed limit signs and signs to indicate the route up the access road to the site shall be measured as a sum.
- The tendered rate shall cover the cost of all labour, materials, plant and equipment, necessary for the erection, maintenance and removal on completion.

12.1.9 Fire Control

- The compliance with fire control requirements shall be measured as a sum.
- The tendered rate shall cover the cost of all labour, materials, equipment and any other operation or thing necessary to comply with the requirements including maintenance and replacement of defective or damaged equipment; and refilling.

12.1.10 "No go" Area Demarcation

- "No go" area fencing will be measured by length for each type of fence scheduled.
- The tender rate shall cover the cost of all labour, materials, plant and equipment necessary for the supply, installation and removal of the fences, including for all excavation, temporary strutting, backfilling of holes with earth, finishing and trimming and for any other operation necessary to complete the work to the satisfaction of the Engineer/ECO/EO.

12.1.11 All Other Requirements of the Environmental Management Specification

- All other work not measured elsewhere, associated with complying with any requirement of the environmental management programme shall be measured as a sum.

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- The tendered rate shall cover any cost associated with complying with the environmental management specification and shall include for all materials, labour and plant required to execute and complete the work as specified, described in the Schedule of Quantities or shown on the drawing(s).

13 AMENDMENTS TO THE EMPr/MMP

Any major issues not covered in the EMPr as submitted shall be addressed as an addendum to the EMPr, submitted for approval by DEA&DP and CoCT District Environmental and Heritage Management Branch prior to implementation.

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H: HEALTH AND SAFETY SPECIFICATION

HEALTH AND SAFETY SPECIFICATION

SIR LOWRY'S PASS RIVER UPGRADE PROJECT

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FOREWORD

This Health and Safety specification has been compiled under the guidelines of the Occupational Health & Safety Act no.85 of 1993 and amended Construction Regulations.

Huge emphasis is placed on the requirements of the New Construction Regulations 2014 under the Occupational Health and Safety Act and the Baseline Risk Assessment that form the basis of this specification.

Contractors are encouraged to not only read these two documents in isolation but must consider the By-Law Relating to Community Fire Safety 11257 and Relevant National Building Regulations SANS Codes 10400.

Should there be any contradiction between then document and the Act; the Act must take preference except where explicitly stated.

Similarly, where this document is silent on a specific Health & Safety requirement, the Act must be used as the minimum requirement.

Should you be unclear about anything set out in this document, please contact this office.

Ensuring you of our best intentions and service always

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1. INTRODUCTION AND BACKGROUND

1.1 Background to The Health and Safety Specification

The Construction Regulations (February 2014) place the onus on the Client to prepare a preconstruction Health and Safety specification, highlighting all risks not successfully eliminated during design setting standards for Health and Safety during construction phase. The Health and Safety Specification will be based on the findings of the Baseline Risk Assessment.

1.2 Purpose of The Health and Safety Specification

To assist in achieving compliance with the Occupational Health and Safety Act 85/1993 and the promulgated Construction Regulations (February 2014) to reduce incidents and injuries. This specification shall act as the basis for the drafting of the construction phase Health and Safety plan by the Principal Contractor.

The specification sets out the requirements to be followed by the Principal Contractor and their Contractors so that the Health and Safety of all persons potentially at risk may receive the same priority as other facets of the project e.g. Cost, programme, environment, quality etc.

2. HEALTH AND SAFETY SPECIFICATION

2.1 Scope

This specification covers the requirements for eliminating and mitigating incidents and injuries on Sir Lowry's Pass River Upgrade Project

The scope includes:

- Temporary Works (concrete work)
- Gabions
- Extensive Civil works
- Deep Excavations
- Electrical Work (Installations and decommissioning)
- Moving of Overhead Electrical Lines

The scope also addresses legal compliance, hazard identification and risk assessment, risk control and promoting a Health and Safety culture amongst those working on the project. The specification also makes provision for the protection of those persons other than employees.

2.2 Provision for Health & Safety Cost

The Principal Contractor and their contractors shall make adequate provision for the cost of Health & Safety Measures during the construction process as required by the Construction Regulation 5(1)(g). and must allow for (but not limited to) adequate funds for at least one Full-Time Safety Officer until all activities have been completed including Night Work if applicable, Equipment, Signage, Training for all relevant personnel, PPE, Edge Protection, Safe Access, Emergency/Rescue and Equipment, on site monitoring, adequate supervision, safe removal of rubble especially from elevated areas (e.g. Chutes, loading platforms etc.), adequate welfare facilities, Medicals.

3. INTERPRETATIONS

3.1 Application

This specification is a compliance document drawn up in terms of the South African legislation and is therefore binding. It must be read in conjunction with relevant legislation as noted previously.

3.2 Definitions

The definitions as listed in the Occupational Health and Safety Act 85/1993 and Construction Regulations (February 2014) shall apply.

4. MINIMUM ADMINISTRATIVE REQUIREMENTS

4.1 Notification of Intention to Commence Construction Work

The appointed CHSA shall inform the Provincial Director of the Department of Labour in writing as per the Annexure 1 in terms of CR 3.

A copy of the issued Construction Work Permit must be clearly displayed on the site notice board and at the site entrance.

4.2 Assignment of Contractor's Responsible Persons to Manage and Supervise Health and Safety on Site.

The Principal Contractor shall submit management and supervisory appointments as well as any relevant Appointments in writing (as stipulated by the OHS Act and Construction Regulations), prior to commencement of work. Proof of competency must be included.

Note: All appointments shall be done by the Chief Executive Officer/Managing Director or his/her assistant in terms of Section 16 of the OHS Act 85/1993 with exception to the Construction Manager in terms of Construction Regulation 8. The Construction Manager shall be full time on site unless an Alternate Competent Construction Manager has been appointed in writing.

Section 8 (OHS Act 85/1993) General duties of employers to their employees

"ensuring that work is performed, and that plant or machinery is used under the general supervision of a person trained to understand the hazards associated with it and who have the authority to ensure that precautionary measures taken by the employer are implemented; and"

Management and supervision of construction work

8. (7) "A construction manager must in writing appoint construction supervisors responsible for construction activities and ensuring occupational health and safety compliance on the construction site".
- (8) "A contractor must, upon having considered the size of the project, in writing appoint one or more competent employees for different sections thereof to assist the construction supervisor contemplated in sub regulation (7), and every such employee has, to the extent clearly defined by the contractor in the letter of appointment, the same duties as the construction supervisor: Provided that the designation of any such employee does not relieve the construction supervisor of any personal accountability for failing in his or her supervisory duties in terms of this regulation".

4.3 Competency of Principal Contractor Responsible Persons

The Principal Contractors' competent persons for the various risk management portfolios shall fulfil the criteria as stipulated under the Definition of Competent in accordance with the Construction Regulations (February 2014). Proof of competence for the various appointments must be included prior to start of work.

4.4 Compensation for Occupational Injuries and Diseases Act (Coida) 130 Of 1993

The Principal Contractor and their contractors shall submit a valid Letter of Good Standing from their Compensation Insurer-FEM or Compensation Commissioner to the Client's Representative as proof of registration before they commence work on site.

Note:

A client must ensure before any work commences on a site that every principal 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 (Act No. 130 of 1993);

A principal contractor must 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;

4.5 Occupational Health and Safety Policy

The Contractor and their Contractors shall submit a Health and Safety Policy signed by their Chief Executive Officer. The Policy must outline objectives and how they will be achieved and implemented by the Company / Contractor.

4.6 Health and Safety Organogram

The Principal Contractor and their Contractors shall submit an organogram with contact numbers, outlining the Health and Safety Site Management Structure including the relevant appointments / competent persons. In cases where appointments have not been made, the organogram shall reflect the intended positions. The organogram shall be updated when there are any changes in the site Management Structure and must be site specific.

4.7 Preliminary Hazard Identification and Risk Assessment

The Principal Contractor and their contractors shall develop Risk Assessments and Method statements by a competent person for the risk that they foresee during construction.

All Risk Assessments shall be conducted by the appointed Risk Assessor/Team PRIOR to start of any work. Note: This shall apply for all contractors.

Note, the Principal Contractor shall ensure that a competent Risk Assessor is appointed in writing and shall be Full Time on site for the duration of the project.

Principal Contractor to provide a 14-day Look Ahead Hazard Identification Risk Assessment (HIRA) for upcoming activities before they are encountered on a bi-weekly basis and forward an electronic copy to the appointed Health and Safety Agent.

Furthermore, the Principal Contractor and their contractors to ensure that Daily Safe Task Instruction/ Planned Tasked Observations are conducted prior to any activity with proof placed on file. Contractors may use their own Formats/Templates.

The following is a site-specific source of risks that have been identified but is not limited to and must as a minimum, be appropriately addressed by the Principal Contractor in their Health & Safety Plan with Control Measures but is not limited to:

Site Establishment

- Offloading of containers/site office
- Secure / Safe Storage of Material, Plant & Equipment
- Ablution Facilities
- Eating facilities
- Vehicle Access to Site
- Location of existing Services
- Hoarding Permits (If Applicable)
- Dealing with existing structures and Traffic
- Provision for drinking water for all staff

Crane Management System (I.e. All Cranes)

- Competency and Medical Certificates of Operator
- Load Test Certificates
- Rescue Plan
- Crane Management Plan/System to be provided
- (Emergency Procedures)
- CR 23 and Driven Machinery Regulations (2015) must be adhered to
- Relevant Inspections conducted by an LMI as per DMR 18 (2015)

Hoarding & Access Control

- Public Liability / Access Control / Compliance to Section 9
- Site needs to be Adequately Secured
- Relevant Construction Warning Signage
- Daily inspections with proof placed on file
- Hoarding to be in line with approved Drawings

Public Liability

- Effect of Construction Work on members of the public and existing property e.g. Neighboring Property
- Noise Control
- Dust Control
- Temporary lighting
- Relevant signage
- Hazardous Chemical Substances

Working near existing services

- Identification and protection of existing services
- Electrical Cables, Telkom, Data etc.

Civils Work

- Compliance to Construction Regulation 23
- Excavation & Compliance to Construction Regulation 13
- Persons/Equipment falling into Excavations
- Edge Protection
- Asphalt
- Road Cleaning to be maintained daily

The Use of Troxlers: Contractors to ensure compliance and provide i.e.

- License for use of Troxler and density material and equipment
- Leak Test Certificates
- Calibration Certificate
- Procedure when transporting with relevant signage displayed
- Risk Assessments
- Proof of Competency for operators

Plant & Machinery

- Principal Contractor to provide designated area should any plant and machinery be parked at night. Plant to be fully secured to avoid possible unauthorized access.

Scaffolding and Working at Heights

- Principal Contractors and their contractors to compile a Site-Specific Fall Protection Plan in Line with CR 10.
- The Scaffolding must comply with SANS 10085:1-2004, fully cladded including Catch Nets or similar equipment.
- Process to Remove Equipment, Tools Scrap, Material etc. to and from Elevated Positions.
- Compliance to Environmental Regulations for Workplaces 6(3).
- System to Protect Persons / items or material falling through Ceilings or any elevated positions/areas.
- Design Drawings to be provided by a competent person
- Temporary Works Designer to be appointed in writing.

Temporary Works

- Competent Temporary Works Designer to be appointed in writing
- Erecting and Stripping of Temporary Works
- Authorization for stripping to be given by the structural engineer
- Design Drawings issued by a competent person
- Casting of Concrete
- Drilling / Cutting into Slab
- Adequate Edge Protection- No Danger Tape
- Authorization to be provided in writing by a competent person (Before Concrete Pour) and Handover Certificates/Signed off by a Competent Person before Stripping any temporary works structures
- Daily Inspections to be conducted

Structural Steel

- Principal Contractor to submit Task Specific Method Statements and Task Specific Risk Assessments of their lifting and installation procedures e.g. Manually or Mechanically.
- Full compliance with CR 9, 10, CR 23 and DMR 18 (2015)
- Guide Ropes shall be used as far as reasonably practicable when busy with all lifting operations to assist with possible uncontrolled loads especially during inclement weather and restricted areas.
- Only competent persons to conduct operations

- Task Specific Fall Protection & Rescue Plan
- All work areas shall be adequately demarcated with spotters' present

Unplanned collapse of Material or structures- Contractor to provide control measures

- Principal Contractor to provide adequate protection to avoid falling objects e.g. Crash Decks, Catch Nets, Apron Fans etc. or any other similar protection as and where needed. Principal Contractor to assess all work areas prior to start of work.
- Structure to be inspected periodically by a competent person to render the structure safe. The structure to be maintained in such a manner so that it remains safe for continuous use.
- Records of inspections and maintenance are to be kept on file and must be made available on request to an inspector.
- Principal Contractor to provide full method statement and risk assessment

Traffic Management Plan to include but is not limited to i.e.: (The entrance road to site is being used by community)

- Delivering of Material and Equipment
- Advance construction Signage, Competent Flagmen and Compliance with all relevant regulation and legislation including the South African Road Traffic Signs Manual (SARTSM) Chapter 13.
- Plan to be Monitored and Reviewed at least monthly (Every 30 Days) or as the building programme/activities changes
- Adequate barriers and delineators to be provided and placed strategically as needed
- Procedure for maintaining road signage
- All employees working in or close to the road to wear Hi-Viz vests at all times
- Flagmen shall be provided and readily available to assist with all Deliveries

Demolition during construction phase

- Adequate measures to ensure the safety of public
- Identifying services of live services
- PPE
- Relevant signage to be displayed
- Noise- Procedure to control noise to be in place.
- Use of Portable Power Tools
- Combustibles
- Housekeeping
- Demolition method statement
- Dust inhalation

Public Liability

- Effect of Construction Work on members of the public and existing property eg
- Neighbouring Property and members of the public
- Noise Control
- Dust Control
- Temporary lighting
- Relevant signage
- Hazardous Chemical Substances

Lifting and Installation Procedures

- Principal Contractor to submit Full Method Statements of their lifting and installation procedures e.g. manually or mechanically.
- All lifting equipment to comply with Driven Machinery Regulation (2015)

Lifting and Installation Procedures

- Principal Contractor to submit Full Method Statements of their lifting and installation procedures e.g. manually or mechanically.

Waste Management Plan/System to be implemented

- Rubble to be stored neatly in bags/bins and collected as needed.
- Principal Contractors to provide sufficient Bins / Bags always and must be removed on a regular basis or as and when needed.
- All hazardous material to be stored separately and must be disposed of at an authorized landfill site. Proof of Disposal to be provided
- Rubble shall not be allowed to accumulate on site and shall be removed at regular intervals

Hot Works

- Principal Contractors and their contractors to ensure that Fire Equipment and adequate precaution measures are in place when grinding, welding / hot works etc. including PPE and demarcation
- Hot work permits to be issued once the area has been inspected by a responsible person and declared safe with proof placed on file. (Note- All permits should not exceed one (1) working day)
- Compliance with CR 25& 29

Temporary Flammable Liquid/Material Storage

- Principal Contractor to ensure that adequate ventilation is provided with Relevant Signage and Fire Precautions provided.
- Adequate Fire Equipment to be readily available.
- Compliance with all relevant legislation and regulations including the Community Fire Safety By-law Compliance and CR 25& 29

Working near of Electrical Cables

- Contractor to provide full method statement and risk assessment when working on live electrical Cables. Must be communicated to all staff prior to the activity.
- All Staff must be provided with the relevant Personal Protective Equipment (PPE)

Procedure to identify HV/Electrical Cables

**Electrical Installations – High and Low Voltage
Compliance to the Driven Machinery Regulations (2015)**

Installation of Sub-station

- A competent contractor must be appointed to install all specialized cables such as low/high/mega voltage cables in and around the site
- Must be carried out under supervision
- Excavations
- Cable laying/Stringing
- Lock out procedures
- Working with live cables/live installations
- Working in existing/new substations
- Tying in of new power lines onto existing lines

Safe Use of Portable Electrical Equipment

- Electrical Drilling Machine
- Angle Grinder
- Kango / Jack Hammer
- High Pressure Equipment
- Any Other Equipment used by Principal Contractor

Emergency Preparedness

- Emergency Evacuation Plan with Relevant Emergency Numbers
- Revision of Emergency Plan
- Principal Contractor to monitor site conditions and conduct Evacuation Drills as and when needed with proof placed on file (Roll call, report to be placed on file etc.)
- Enough workers are Trained (Competent) in the use of Fire Extinguishing Equipment
- Emergency assembly point to be established with the relevant signage displayed.
- Air horn/alarm/siren to be provided on site

Dust Control

- Principal Contractor to provide a procedure to control dust

Noise Control

- Principal Contractor to provide a procedure to control noise

Manual and Mechanical Handling**Mechanical Installations****Protection of Storm Water System**

- Method to Prevent Run Off into Storm Water System

Health Hazards

- Threats by bees, snakes, etc.
- Existing storage of hazardous materials
- Polluted drinking water
- Working with cementitious material
- Dust
- Noise
- Contaminated land
- Vibration
- Inhaling of Bituminous and cementitious material
- Exposure to Anime bases epoxy products

Environmental Management

- Working with fuel, lubrications and other chemicals
- Contaminated Land/Water
- Air and Dust Pollution;
- Noise Pollution;
- Water Pollution;
- Soil Pollution;
- Normal and abnormal operations;
- Lessons learned from incidents;
- Potential emergency conditions;
- The results of Internal and External Audits;
- Waste Management practices;

Additional Activities foreseen on site

- Public Safety- Relevant precautions to be taken (Hoarding/Physical Barriers, signage etc.)
- Process to move equipment, tools, scrap material, etc. to and from elevated positions.
- Storage/control of Hazardous substances
- Wet Works
- Concrete Works
- Use of Temporary Access
- Landscaping & Planting Plants
- Mass Earthworks
- Guard Rails
- Unforeseen activities

Principal Contractors and their contractors to ensure that the risk assessments, as well as other risks identified by them, are updated at least every 30 days or as the risk changes are recorded and communicated to all relevant parties with proof placed on file-CR 9. Note: All reviews must be signed off by the appointed Risk Assessor.

Note: All identified risks and hazards must be based on a documented method (method statements).

The Principal Contractor shall comply with the Occupational Health and Safety Act 85/1993, Construction Regulations and all relevant Legislation.

Furthermore, the Principal Contractor and their contractors shall provide a Monitoring and a Review Plan including a Risk Register indicating all activities.

Note: Principal contractor must ensure as far as is reasonably practicable, ergonomic related hazards are analysed, evaluated and addressed in a risk assessment.

4.8 Fall Protection Plan: Scaffolding / Working at Heights Including Rescue Plan (This Includes Excavations)

Working at heights includes any work that takes place in an elevated position. The Principal Contractor and their contractors must submit a risk/task-specific Fall Protection Plan in accordance with Construction Regulations 10. The Fall Protection Plan must be job specific, be reviewed at least monthly (Every 30 Days) or as the risk changes or after any incident. Contractors to ensure that medicals are provided for all persons exposed to elevated positions.

Scaffolding must comply with the requirements of SANS 10085-1:2004. Scaffolds are used extensively by Contractors and strict control measures must be in place to prevent Unauthorised alterations to scaffolding such as removing ties and scaffold boards.

Competent persons to be appointed in writing to:

- erect scaffolding (Scaffold Erector/s)
- act as Scaffold Team Leaders
- inspect Scaffolding daily and after inclement weather (Scaffold Inspector/s).
- The Scaffolding must comply with SANS 10085:1-2004, fully cladded including, Crash Decks etc. as and when needed

Note: No Trestle or Walkthrough Scaffolds may be used on site. Furthermore, the Contractor shall provide a site-specific Risk Assessment based on their Fall Risk.

Written Proof of Competency of above appointees to be available on Site.

Where scaffolding or work from scaffolding may negatively affect the public, it must include a scaffold fan/apron or access tunnel. Shade cloth must be used to enclose the scaffolding below the first fan/apron. Should the scaffolding be adjacent to an existing pavement of similar public walkway, a pavement gantry and crash deck will be required (overhead protective structure).

All employees working on heights must have a Medical Certificate issued by an Occupational Health Practitioner (OHP)

Note, The Principal Contractor shall provide a programme for the training of employees working from a fall risk position and the records thereof;

A fall protection plan must include

- a) a risk assessment of all work carried out from a fall risk position and the procedures and methods used to address all the risks identified per location;
- b) the processes for the evaluation of the employees' medical fitness necessary to work at a fall risk position and the records thereof;
- c) a programme for the training of employees working from a fall risk position and the records thereof;
- d) records thereof;
- e) the procedure addressing the inspection, testing and maintenance of all fall protection equipment; and
- f) a rescue plan detailing the necessary procedure, personnel and suitable equipment required to effect a rescue of a person in the event of a fall incident to ensure that the rescue procedure is implemented immediately following the incident.

4.9 Edge Protection and Penetrations (This includes excavations)

The Principal Contractor and their contractors must ensure that all exposed excavations and penetrations are guarded and demarcated always until permanent protection has been erected.

The Principal Contractor has the following options when contemplating the protection of openings, slabs and edges:

- A physical barrier at the edge of the excavation, which must be strong enough to carry the weight of a person in the process of falling.
- Any other suitable means of protection may be used that will prevent a fall.
- Alternatively, any other means of protection may be used that will prevent a fall.

Any person working near an unprotected/exposed excavation edge to wear fall prevention devices, like safety harness, lifelines etc.

The Principal Contractors' risk assessment must include these items. E.g. all other openings and areas where a person may fall.

4.10 Health and Safety Officer 8(5)

The Principal Contractor shall appoint at least a Full-Time Senior Safety Officer on site until all activities has been completed including Night Work if applicable with proof of competency to be attached to each appointment.

Note: The Safety Officers shall be registered with the South African Council for the Project and Construction Management Professions (SACPCMP) with proof provided, alternatively proof of the SACPCMP letter must be provided

Note: This applies to all contractors and their sub-contractors.

"No contractor may appoint a construction health and safety officer to assist in the control of health and safety related aspects on the site unless he or she is reasonably satisfied that the construction health and safety officer that he or she intends to appoint is registered with a statutory body approved by the Chief Inspector and has necessary competencies and resources to assist the contractor"

Furthermore, The Principal Contract shall ensure that all appointed Sub-contractors have a competent safety officer who shall visit the site as often as needed but at least once a month

Note: All Site Visits shall include Physical and Administrative inspections and attend to all Health and Safety Requirements

The following health & safety officer related duties will be required to be carried out:

- a) Health & safety audits and inspections including administrative and physical audits of all Contractors' health & safety plans, files and activities, and record findings in the form of audit reports to be kept in the health & safety file;
- b) Weekly inspection reports – site hazard survey findings recorded, and actions taken recorded;
- c) Assess, and finally approving sub-contractor H&S plans;
- d) Maintain and co-ordinate the Principal Contractor's health & safety management plan and file;
- e) Investigate near misses, incidents and injuries;
- f) Co-ordinate the function of reviewing the hazard identifications and risk assessments;
- g) Assisting with method statements and safe work procedures and checking whether the responsible persons follow these safe work procedures;
- h) Enforcing discipline on the site and checking on compliance with safety procedures, standards and rules;
- i) Co-ordinating health & safety induction training and weekly safety awareness sessions;
- j) Implement and enforce the site hot work permit system;
- k) Ensure that public protection protocols are adequate and well maintained;
- l) Conduct planned job observations to check whether workers are carrying out activities in accordance with the safe work procedures;
- m) Fire risk assessments and enforcement;

Note: "No contractor may appoint a construction health and safety officer to assist in the control of health and safety related aspects on the site unless he or she is reasonably satisfied that the construction health and safety officer that he or she intends to appoint is registered with a statutory body approved by the Chief Inspector and has necessary competencies and resources to assist the contractor", however an exemption was issued and all Safety Officers/Practitioners must now provide confirmation of application for registration of the construction health and safety discipline with the SACPCMP should he/she not be registered as yet.

4.11 Medicals

The Principal Contractor to ensure that all his or her employees including all appointed contractors 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 an Annexure 3.

Furthermore, the Principal Contractor must ensure that a Biological Monitoring Plan is implemented and conducted on all employees exposed/or working close to a sewer area or exposed to raw sewage. These employees must undergo a Hepatitis Antibody injection.

4.12 Health and Safety File (HSF)

The Principal Contractor/s and their contractors shall, in terms of CR 7(1), maintain the HSF on site always. The HSF is a file with permanent records containing information on aspects of the construction project - which will be necessary to ensure the health and safety of any persons who may be affected by the construction work.

The HSF must include all documentation required in terms of the Act and Regulations and must also include a list of all Contractors on site that are accountable to the Principal Contractors and the agreements between the parties and details of work being done.

The Principal Contractors shall appoint a suitably qualified person to prepare the HSF and to keep it up-to date for the duration of the contract.

4.13 The HSF Shall Include At Least The Following Information:

- a) Permit/Notification of Construction Work (CR 3)
- b) Copy of OHSA (updated) (GAR 4.)
- c) Proof of Registration and good standing with a COIDA Insurer (CR 5(1)(j) (The Principal Contractors shall submit a letter of good standing with the compensation Insurer, at the tender stage).
- d) OHSP agreed with client including the underpinning Risk Assessment/s & Method Statements CR 9(1)
- e) Designs/drawings including scaffolding and Temporary works (form work)
- f) A list of Contractors (Sub-Contractors) including copies of the agreements between the parties and the type of work being done by each Contractor (CR 7)
- g) Appointment/Designation forms
- h) Registers
- i) Inductions

The HSF/CD shall be handed over to the Client on completion of the contract. It must contain all the documentation as set out above, or as instructed, as well as any handed to the Principal Contractor by any subcontractors together with a record of all drawings, designs, materials used and other similar information concerning the completed project.

4.14 Health and Safety Representative(S)

The Principal Contractor and their Contractors shall ensure that competent Health and Safety Representative(s) are appointed under consultation and trained to carry out their functions as soon as the total workforce has reached a number of 20 employees or more. Should the Principal Contractor and their contractors have less than 20 employees, then the accumulative amount shall apply. The appointments must be in writing. The Health and Safety Representative shall carry out regular inspections at least monthly, keep records and report all findings to the Responsible Person forthwith and at Health and Safety meetings.

Note: The Principal Contractor and their contractors shall ensure that all certificates provided are issued by an accredited service provider as required by the National Qualification Framework Act 67/2000.

The number of representatives for each contractor shall be as per Section 17 of the OHS Act 85/1993, but as a minimum, The Principal Contractor shall appoint at least one competent Health and Safety Representative on the project.

4.15 Health and Safety Committees

Principal Contractor shall organize at least monthly Health & Safety meetings. Minutes and records shall be kept. Principal Contractors Health & Safety representative and responsible person shall attend this meeting. Principal Contractor to ensure that all Contractor Representatives attend these meetings.

Note: These meetings shall be conducted regardless how many contractors are appointed.

4.16 Health and Safety Training**4.16.1 Induction**

Principal Contractor shall ensure that all (including site visitors etc.) undergo site- specific induction presented by a competent person and proof placed in the Safety File prior to start of work. Employees to carry proof of inductions.

4.16.2 Awareness

The Principal Contractor shall ensure that, on site, toolbox talks take place at least once per week. These talks should deal with risks relevant to the construction work at hand. A record of attendance shall be kept in the Health and Safety file. All Principal Contractors have to comply with this minimum requirement. Contractors to ensure that the discussion is recorded on file (Topics with notes).

4.16.3 Health and Safety Site Rules

The Principal Contractors must develop a Set of Site-Specific Health and Safety Rules that will be applied to regulate the Health and Safety aspects on Site. Security and Access control must be included in the rules and those non-employees or visitors will not be allowed on site unaccompanied.

4.16.4 Competency

In accordance with the Construction Regulation the Principal Contractors shall appoint, in writing, competent persons (in addition to the Construction Managers – CR 8 (1)(2) & Construction Supervisor/s-8(7)(8) responsible for supervising construction work for the following work situations that may be expected on the site of the works, as applicable to the project.

A competent person may be appointed for more than one part of the construction work with the understanding that the person must be suitably qualified and able to manage and supervise at the same time the construction work on all the work situations for which he/she has been appointed.

The appointment of competent persons to supervise parts of the construction work does not relieve the Principal Contractors from any of his responsibilities to comply with all requirements of the Construction Regulations.

Note: The Principal Contractor and their contractors shall ensure that all certificates provided are issued by an accredited service provider as required by the National Qualification Framework Act 67/2000 and the South African Qualifications Authority (SAQA)

4.17 Environmental

The Contractor must ensure that all its sub-Contractors, employees and all persons entering the site during construction are fully aware of the environmental issues detailed in the CEMP.

The Contractor shall submit to the Client, for his approval, a SHEQ Plan (Safe, Health, Environmental and Quality) as part of the proposal for the works as well as Method Statements for activities to be undertaken, for approval by the Engineer.

It is the Contractor's responsibility to stay within the parameters of his/her activities and to execute said tasks within the applicable regulated Norms and Standards.
It is the responsibility of the Contractor to:

- Report to the Engineer any environmental incidents, e.g. hazardous substances spillage, damage to vegetation, public complaints, etc.
- Carry out instructions issued by the Engineer, required to fulfil his/her compliance with the CEMP.

4.18 Water Environments

When construction work is carried out over or near the water's edge, the following must be considered:

- Prevent persons from falling into the water i.e. body harnesses, edge protection/barrier netting or catch nets;
- Rescuing persons in danger of drowning – have rescue rings on hand;
- Should there be a danger of persons drowning when falling into the water, they must be provided with and wear life jackets.

Demarcation by means of orange barrier netting is the minimum requirement and must be set back 1.5m from the actual edge. Signage must also be posted up on the netting indicating the danger of falls and/or water environment – risk of drowning.

Construction Regulation (CR) 26

26. (1) A contractor must ensure that where construction work is done over or in close proximity to water, provision is made for-

- (a) preventing persons from falling into water; and
- (b) the rescuing of persons in danger of drowning.

(2) A contractor must ensure that where a person is exposed to the risk of drowning by falling into the water, the person is provided with and wears a life jacket.

When construction work is carried out over or near the water's edge, the following must be considered:

5. GENERAL RECORD KEEPING

The Principal Contractor and their Contractors shall keep and maintain Health and Safety records to demonstrate compliance with this Specification, with the OHS Act 85/1993, and with the Construction Regulations (February 2014).

The Principal Contractor and their contractors shall ensure that all records of incidents / accidents, emergency procedures training, inspections, audits, etc. are kept in a Health and Safety file held in the site office.

The Principal Contractor must ensure that every contractor keeps and maintains its own Health and Safety file and must be readily available at all times. (The file must include the Contractor's health and safety plan). These records are crucial for inclusion in the Principal Contractors' consolidated health and safety file for handover to the Client on completion of construction work.

6. HEALTH AND SAFETY AUDITS, MONITORING AND REPORTING

The Client's Health & Safety Agent shall conduct 2 weekly Health and Safety audits/inspections with follow up audits of the work. Operations including a full audit of physical site activities as well as an audit of the administration Health and Safety. The Health and Safety Agent may conduct unannounced visits as and when needed.

The Principal Contractor and their contractors are obligated to conduct similar audits on their Contractors.

Detailed reports of the audit findings and results shall be reported on at all levels of project management meetings.

Copies of the reports shall be kept on file and must be readily available for inspection. The Principal Contractor must audit their Contractors and keep records of these audits in their Health and Safety files and must be available on request.

Note: The Principal Contractor shall ensure that all contractors documentation is assessed and approved prior to start of work with proof placed on file.

6.1 Internal Audits/Inspections

The Principal Contractor's safety manager/responsible person must conduct weekly inspections/audits with a detailed report. A copy of these inspections/audits must be placed on file for perusal by the Health and Safety Agent.

Note, these reports shall include photographic evidence.

Principal Contractor to provide a Corrective Action Plan within 3 days for all non-compliances noted in the Audits conducted by the Client's Health and Safety Agent.

Note: This Plan shall include proof that all non-compliances have been rectified and an electronic copy shall be sent to the Client Representative including the appointed Health and Safety Agent as proof of items closed out.

7. EMERGENCY PROCEDURES

The Principal Contractor/s shall submit a detailed Emergency Procedure and Evacuation Plan with assembly point and contact details in the case of any emergency. The procedure shall detail the response plan including the following key elements:

- ❖ List of key competent personnel; Details of emergency services;
- ❖ Actions or steps to be taken in the event of the specific types of emergencies; Information on hazardous material/situations.
- ❖ Emergency procedure(s) shall include, but shall not be limited to, fire, spills, accidents to employees, use of hazardous substances, bomb threats, major incidents/accidents, etc.

The Principal Contractors shall advise, inform and notify the Client, Agent, Engineer and all relevant authorities forthwith, of any emergencies, together with a record of action taken. This shall be confirmed in writing as soon as possible after the incident.

A contact list of all service providers (Fire Department, Ambulance, Police, Medical and Hospital, etc.) must be maintained and available to site personnel. These procedures shall form part of the OHSF. The Principal Contractor to ensure that the relevant staff is trained to perform such duties as required by the OHS Act. All emergency procedures must be monitored on a regular basis and must be in line with the building program.

The Emergency/Evacuation plan and routes must be revised on a regular basis for all employees and contractor (including staff) should any unforeseen event take place during the implementation phase/s of the project. Evacuation Drills must be conducted as and when needed. Contractor to assess all activities to ensure this is implemented with proof placed on file.

8. FIRST AID BOXES AND FIRST AID EQUIPMENT

The Principal Contractor and their Contractors shall appoint in writing First Aider(s). The appointed First Aider(s) are to be sent for accredited first aid training. Valid certificates are to be kept on site. All Contractors with more than 5 employees shall supply their own first aid box. Principal Contractor with more than 10 employees shall have trained, certified first aider on site at all times & First aid Box stocked always.

9. ACCIDENT / INCIDENT REPORTING AND INVESTIGATION

Injuries are to be categorized into first aid, medical, disabling and fatal. The Principal Contractor and their contractors must stipulate in its construction phase Health and Safety plan how it will handle each of these categories. When reporting injuries to the Client, these categories shall be used. All contractors must investigate and report on the 4 categories of injuries to the Principal Contractor at least monthly.

Contractors must investigate injuries and accidents involving their employees within seven days of the incident in the form on Annexure1 (General Administrative Regulations) and forward a copy on the investigation report to the principal contractor forthwith.

All incidents reportable in terms of the provision of Section 24 of the OHS Act 1993 must be reported to the local Dept. of Labour in the prescribed manner.

Should construction work be finished/completed within 3 days after any occurrence, the investigation shall be conducted before such construction work is completed.

The Principal Contractor and their contractors must report all injuries to the Client in the form of a spreadsheet, which includes all contractor injuries/incidents including near misses, property damage and man-hours worked for the month as well as the cumulative total. This report must be done on a monthly basis and must form part of the Principal Contractor's progress report.

Note: Principal Contractor must provide an Incident Register and must record all incidents when applicable

The Principal Contractor shall immediately notify the Client and Client's Health & Safety Agent of any hazardous or potentially hazardous situations that may arise during the performance of construction activities immediately or within 24 hours by means of a flash report.

Furthermore, the contractor shall liaise with the Client prior to any communication with any source of Media

10. HAZARDS AND POTENTIAL SITUATIONS

The Principal Contractor shall immediately notify the Client and Client's Health & Safety Agent of any hazardous or potentially hazardous situations that may arise during the performance of construction activities.

11. PERSONAL PROTECTIVE EQUIPMENT (PPE) AND CLOTHING

The Principal Contractor shall ensure that all workers are issued and wear but is not limited to i.e. hard hats, protective footwear, Hi-Viz vests and overalls. The Principal Contractor and their Contractors shall make provision and keep adequate quantities of SANS approved PPE on site always.

Contractors to provide control measures should employees continuously fail to use the prescribed PPE.

Contractors to provide control measures should employees continuously fail to use the prescribed PPE.

Note: The Client will remove any person from the construction site who is working without necessary personal protective equipment and/or clothing.

12. OCCUPATIONAL HEALTH AND SAFETY SIGNAGE

The Principal Contractor shall provide adequate on-site OHS signage. Including but not limited to: "no unauthorized entry", "report to site office", "site office", and "hard-hat area". Signage shall be posted up at all entrances to site as well as on site in strategic locations e.g. Access routes, entrances to structures and buildings, scaffolding and other potential risk areas / operations. All Contractors to adhere.

13. CONTRACTORS

The Principal Contractor shall ensure that all Contractors appointed by them comply with this Specification, the OHS Act 85/1993, and Construction Regulation (February 2014). The Principal Contractor may only appoint a contractor after approving the contractor's health & safety plan with proof placed on file. The Principal Contractor must audit each of its Contractors at least monthly, with audit reports filed in the health & safety file on site. The audit must include an administrative assessment as well as a physical inspection of the contractor's health & safety system.

The Principal Contractor must stop any Contractor from carrying out construction work that is not in accordance with the Principal Contractor's or Contractor's health & safety plan or if there is an immediate threat to the health and safety of persons.

The Principal contractor shall take all reasonable steps necessary to ensure co-operation between all Contractors to enable each of those Contractors to comply with the provisions of these regulations;

The Principal Contractor must ensure that their Contractors are registered and in good standing with a recognized compensation fund or with a licensed compensation insurer prior to work commencing on site;

The Principal Contractor must ensure that potential Contractors submitting tenders have made provision for the cost of health and safety measures during the construction process; The Principal Contractor shall discuss and negotiate with their Contractor the contents of the health and safety Plan and shall finally approve that plan for implementation;

14. NO-GO AREAS

Principal contractor and their contractors to avoid all no-go areas and ensure that all relevant parties/employees and visitors are informed. These areas will be identified by the Client.

15. PHYSICAL REQUIREMENTS

15.1 Demolition During Construction Process- (Method Statement/Procedure)

The Client/Principal Contractor must ensure that a demolition permit is obtained from the Local Authority prior to demolition work commencing on site. Proof of the permit must be placed on file for inspection.

The Principal Contractor and their contractors shall appoint a competent person in writing to supervise and control all Demolition work on site at all times.

Prior to any demolition work being carried out, the Principal Contractor shall submit a method statement and a detailed engineering survey for approval by the Client/Engineer. Acceptance will then be issued to the Principal Contractor to proceed with the demolition work. The

Principal Contractor shall ensure that demolition work complies with the Construction Regulations section 14 (February 2014). Principal Contractor to ensure that:

All Demolition work to comply with the Engineers methodology, procedures, requirements and drawings.

- Work should be carried out by competent operatives experienced in demolition work under the control of an experienced, competent supervisor.
- Restricted areas and safe distances should be established.
- Underground services to be considered, including electrical cables, water mains, etc. (If Applicable)
- All services should be disconnected prior to demolition.
- Adequate precautions against accidental collapse of the structure or adjacent structures should be in place.
- Pre-stressed reinforced concrete should be demolished under supervision of a suitably qualified and experienced engineer. (If Applicable)
- Measures should be taken to protect the public, e.g. 2m high fence, debris fans, etc.
- Floors should not be overloaded.
- All plant and equipment should be suitable for the task, well maintained, and inspected and tested in accordance with legislation.
- Work at heights should be minimized.
- Measures should be taken to protect persons working at height, e.g. working platforms, harness, nets, etc.
- Appropriate personal protective equipment (PPE) should be worn.
- Adequate Dust Control

15.2 Cranes (All) Including a Crane Management Plan, Rescue Plan & (Emergency Procedures)

The Principal Contractor and all Contractors shall ensure that lifting machinery and tackle is inspected before use and thereafter in accordance with the Amended Driven Machinery Regulations (2015). There must be competent lifting machinery and lifting tackle inspectors who must inspect the equipment daily or before use, taking into account that:

- Contractors to plan carefully when crane work is required. Overhead electrical cables to be kept in planning.
- All lifting machinery and tackle must carry a load test certificate and must have an inspector register.
- All lifting machinery and tackle have a safe working load clearly indicated.
- Regular inspections and servicing are carried out

Note: Records are kept of inspections and of service certificates conducted by an approved LMI

- There is proper supervision in terms of guiding the loads that includes a trained banksman/rigger to direct lifting operations and check lifting tackle,
- Rescue Plan to be provided
- Inventory to be provided and updated as and when needed

The operators are competent as well as physically and psychologically fit to work and in possession of a medical certificate of fitness to be available on site.

15.3 Confined Space Entry (If Applicable)

The Principal Contractor to prepare a confined space procedure in line with General Safety Regulation (5) OHS Act including Task Specific Risk Assessments, Method Statements and Emergency Procedures.

15.4 Construction Vehicles

Construction Vehicles and Mobile Plant may be inspected by the Client prior to being allowed on a project site and suppliers of hired vehicles, plant and equipment will be required to comply with this specification as well as the OHS Act and Regulations.

Construction Vehicles and Mobile Plant (Construction Vehicles & MP) 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/driven by trained, licensed competent and authorised operators/drivers. No unauthorised persons to be allowed to drive or operate Construction Vehicles & MP
- Operators and drivers of Construction Vehicles must be in possession of a valid medical certificate declaring the operator/driver physically and psychologically fit to operate or drive Construction Vehicles
- fitted with adequate signalling devices to make movement safe including reversing
- excavations and other openings must be provided with sufficient barriers to prevent Construction Vehicles from falling into same
- Provided with roll-over protection, appropriate seat fitted which shall be used during Construction Vehicle operations.
- Inspected daily before start-up by the driver/operator/user and the findings recorded in a register/log-book
- Construction Vehicles to be fitted with two head and two taillights whilst operating under poor visibility conditions, in addition they shall be equipped with 'hazard warning' lights, which must be used whenever the Construction Vehicles is on site.
- Construction Vehicles used for transporting persons must have seats firmly secured and sufficient for the number of persons being transported
- Operators to be issued with Personal Protective Equipment as required and identified by the Risk Assessments
- Only licensed and road worthy vehicles will be allowed on the public roads

No person may ride on a Construction Vehicles except in a safe place provided by the manufacturer for this purpose.

The construction site must be organized to facilitate the movement of Construction Vehicles so that pedestrians and other vehicles are not endangered. Traffic routes are to be suitable, sufficient in number and adequately demarcated.

Construction Vehicles left unattended after hours adjacent to roads and areas where there is traffic movement must be fitted with lights reflectors or barricades to prevent moving traffic encountering the parked Construction Vehicles.

In addition, Construction Vehicles left unattended after hours must be parked with all buckets, booms etc. fully lowered, the emergency brakes engaged and, where necessary, the wheels

chocked, the transmission in neutral and the motor switched off and the ignition key removed and stored safely.

Workers employed adjacent to, or on public roads must wear reflective safety vests
All Construction Vehicles inspection records must be kept in the OH&S File.

15.5 Deliveries

Delivery of materials and the safe movement of construction vehicles will be controlled by the Contractor always to alleviate any congestion or interference in the main road leading to the construction site.

Principal Contractor shall ensure vehicle management procedures are in place by way of flagmen control during contractor deliveries.

- No contractor vehicles are to be left unattended during deliveries.
- Existing parking bays, other than what has been agreed for the use by the Contractor, are not for the contractor or construction vehicles.

15.6 Hazardous Chemical Substances (HCS)

The Principal Contractor working with Hazardous chemical substances to obtain copies of all the (MSDS) Material Safety Data Sheets and this to be kept on site in the Health and Safety File. Risk Assessments to be compiled. First Aider to have copies of MSDS.

All hazardous waste shall be disposed of at an authorised landfill site and proof of disposal shall be provided upon request. Employees shall be provided with suitable PPE including Respirators as and when needed. Adequate control measures shall be taken to avoid exposure to employees and members of the Public.

15.7 Stacking of Materials

The Principal Contractor shall ensure that there are sufficient appointed stacking supervisors and all materials and equipment are stacked and stored safely. Double handling of material should be avoided and for this purpose, pallets and other stacking options should be used.

15.8 Civils Work

Principal Contractor to ensure that they comply with Construction regulation 23 and that the following is undertaken during civil work:

- A competent site supervisor to be on site always.
- Plant and equipment inspected daily, and registers kept.
- All operators of plant and vehicles trained, competent and physically and psychologically fit. Certificates to be put in Health & Safety File.
- Workers that are working close to the traffic to be visible and wear reflective vests.
- Adequate safety signage to be posted ahead of any work area in the road. (If Applicable)
- All signage, including delineators to be maintained and kept clean at all times.
- The required PPE must be worn always (Hard hats, safety shoes, overalls, etc.)
- Risk assessments to be conducted on all activities.
- A competent site supervisor to be on site always.
- Road Cleaning to be maintained daily

Laying of Pipes / Backfilling

- A competent site person to supervise lifting operations always.
- No employee to stand under any suspended load.
- Loads must not be slewed over personnel, plant, site huts or property.
- All lifting equipment and accessories must be marked with the Safe Working Load.
- Slings must not be placed on sharp edges.
- Workers to wear proper PPE always.
- Work to be stopped when weather conditions prevent safe operations during trenching work or lying of pipes.
- Everyone to stand clear of area being backfilled by mobile plant.

Method statement to be developed for connection to main sewer line and to water mains.

15.9 Excavations, Shoring, Dewatering or Drainage

The Principal Contractor and any relevant Principal Contractor shall make provision in their tender for shoring, dewatering or drainage of any excavations as per this specification.

The Principal Contractor shall make sure that:

- Excavations/trenches are inspected before every shift, after blasting, after unexpected fall of ground, after substantial damage of supports, and after rain.
- A record of these inspections must be kept;
- The location and nature of all existing services must be established before trenching operation is undertaken.
- Safe work procedures have been communicated to the workers;
- The safe work procedures are enforced and maintained by the Principal Contractor's and Contractors' Responsible Persons always;
- Safe access/egress is provided to all levels;
- No load, material, plant or equipment is placed or moved near the edge of any excavation or trench which may undermine the stability of the same unless adequate steps are taken to prevent the sides from collapsing;
- All excavations and trenches that are adjacent to public access routes must be barricaded and illuminated. The barrier shall be at least orange plastic webbing of 1m height (day and night) with delineators and orange traffic lights for night-time;
- All excavations next to existing buildings to be carefully monitored during such an operation.
- Permit to be provided by competent person prior to entering the Excavation

Should an HV cable be discovered, the Principal Contractor and their contractors shall cease all current works and activities, make the area safe and then immediately contact the Electrical Consultant/Principal Agent to provide a method statement prior to re-commencement. Proof of Communication shall be provided.

Furthermore, the Principal Contractor and their contractors shall ensure that the excavated sides are battered and include considering dewatering/creating site run offs during winter.

15.10 Erosion and Sedimentation Control

The Contractor shall take all reasonable measures to limit erosion and sedimentation due to the construction activities and shall, in addition, comply with such detailed measures as may be required by the Scope of Work.

Where erosion and/or sedimentation, whether on or off the Site, occurs, rectification shall be carried out in accordance with details specified by the Engineer.

Where erosion and/or sedimentation occur due to the fault of the Contractor, rectification shall be carried out to the reasonable requirements of the Engineer, at the Contractor's cost.

The Contractor shall ensure that the Municipality storm water system is kept free from sediment arising from the Works.

Any runnels or erosion channels developed during the construction period or during the vegetation establishment period shall be backfilled and compacted, and the areas restored to a proper condition. Stabilisation of cleared areas to prevent and control erosion shall be pro-actively managed by the Contractor. The method of stabilisation shall be determined in consultation with the Engineer.

15.11 High & Low Voltage Electrical Installations

Should high voltage electrical lines/fencing be present on the site perimeter, the Contractor must take extra caution and demarcate as far as reasonably practicable. These demarcations must be maintained for the duration of the construction work. The minimum safety clearances as per Electrical Machinery Regulations must be adhered to.

The Principal Contractor and their contractors must ensure that prior notice is given to Local Authority Electrical Department of any work involving electrical installation. A lock-out certificate must be issued to the relevant Principal Contractor. The Principal Contractor must ensure that a lock-out procedure is adhered to by his/her employees whenever required. The Principal Contractor must ensure that safety measures stipulated in the Electrical Installation Regulations, Machinery Regulations, General Machinery Regulations and Construction Regulations are adhered to at all times.

All installations must comply with SANS 10142 & the regulations of the OHS Act 85/1993 and Construction Regulation 24.

All temporary electrical installations must be inspected at least weekly with proof placed on file.

15.12 Installation and commissioning of mechanical equipment

A contractor must, in addition to compliance with the Electrical Installation Regulations and the Electrical Machinery Regulations, ensure that –

- before construction commences and during the progress thereof, adequate steps are taken to ascertain the presence of and guard against danger to workers from any electrical cable or apparatus which is under, over or on the site;
- all parts of electrical installations and machinery are of adequate strength to withstand the working conditions on construction sites;
- the control of all temporary electrical installations on the construction site is designated to a competent person who has been appointed in writing for that purpose;
- all temporary electrical installations used by the contractor are inspected at least once a week by a competent person and the inspection findings are recorded in a register kept on the construction site; and
- all electrical machinery is inspected by the authorized operator or user on a daily basis using a relevant checklist prior to use and the inspection findings are recorded in a register kept on the construction site.

15.13 Removal of Rubble & Debris

The Principal Contractor must ensure the safe removal of debris and rubble from all levels where demolition occur. A safe work procedure or method statement detailing the removal process and steps to be taken to contain the debris and rubble must be drafted and placed on File.

15.14 Permits

All relevant permits must be obtained from Local Authority (where needed) before any demolition and construction work commences. (Site hoarding permit, demolition permit, way leaves etc.)

15.15 Access Routes/ Haul Roads

On the Site and, if so required, within such distance of the Site as may be stated by the Engineer, the Contractor shall control the movement of all vehicles and construction equipment, including that of his suppliers, so that they remain on designated routes, are distributed so as not to cause an undue concentration of traffic, and that all relevant laws are complied with.

In addition, the movement of such vehicles and construction equipment shall be planned and operated to minimise disruption to regular users of the routes.

As far as possible the Contractor shall use existing access and haul routes. Damage to existing access roads because of construction activities shall be repaired to the satisfaction of the Engineer, using material like that originally used. The cost of the repairs shall be borne by the Contractor. New temporary access or haul routes may only be established with the prior approval of the Engineer. The rehabilitation of such routes shall be to the Contractor's own cost and to the approval of the Engineer.

Any directional signage required by the Contractor for the purposes of directing the movement of his own vehicles and construction equipment (or that of his subcontractors or suppliers) must be of a design and in a location approved by the Engineer. Directional signage may not be erected in such a manner that it interferes with sight lines or pedestrian movement.

15.16 Plant and Machinery**15.16.1 Pressure Equipment Regulations**

The Principal Contractor and their contractors shall comply with the Pressure Equipment Regulations and SANS 10087, including:

- Providing competency and awareness training to the operators,
- Providing PPE or clothing,
- Inspect Equipment regularly and keep record of inspections,
- Providing appropriate firefighting equipment (Fire Extinguishers) on hand,
- Correct storage of cylinders

15.16.2 Fire Extinguishers and Firefighting Equipment

The Principal Contractor shall provide adequate, regularly serviced fire-fighting equipment located at strategic points on site, specific to the classes of fire likely to occur. The appropriate notices and signs must be posted up as required. All fire extinguishers to be handled and inspected by competent persons in compliance with CR 29.

The Principal Contractor to provide an initial Fire Risk Assessment. Note: The Principal Contractor shall ensure that sufficient and suitable storage is provided for all flammable liquids, solids and gases.

The Principal Contractor shall ensure that enough workers is trained in the use of Fire Equipment.

15.16.3 Hired Plant and Machinery

The Principal Contractor shall ensure that any hired plant and machinery used on site is safe for use. The necessary requirements as stipulated by the OHS Act 85/1993 and Construction Regulations (February 2014) shall apply. The Contractor shall ensure that operators hired with machinery are competent and that certificates are kept on site in the Health and Safety file. All relevant Contractors must ensure the same.

15.16.4 General Machinery

The Principal Contractor shall ensure compliance with the amended Driven Machinery Regulations (2015), which include inspecting machinery regularly, appointing a competent person to inspect and ensure maintenance, issuing PPE or clothing, and training those who operate machinery.

15.17 Portable Electrical Tools

The Principal Contractor and their contractors shall ensure that the use of all portable electrical tools follows relevant legislation.

The Contractor shall ensure that all electrical tools, electrical distribution boards, extension leads, and plugs are kept in safe working order. Regular inspections and toolbox talks must be conducted to make workers aware of the dangers and control measures to be implemented e.g. Personal protection equipment, guards, etc.

A competent person to undertake routine/daily inspections and records are kept. Only authorized trained persons to use the tools, the safe work procedures to apply. Awareness training to be carried out and compliance enforced always, and PPE and clothing are provided and maintained.

Note: All power tools shall be inspected by the Authorised Operator daily with proof placed on file.

15.18 Welding Equipment

- Only authorized / trained persons to use the equipment.
- Welder using correct PPE - eye/ face/foot/body/respirator.
- Flashback arrestors fitted at cylinders and gauges when using gas welding equipment.
- Fire prevention methods to be applied.
- Where electric arc welders are used, equipment only to be used in a dry area, protected from wetness.
- All welding to be carried out in designated area, where not applicable welding screens to be used.
- Demarcation and signage

16. PUBLIC AND SITE VISITOR'S HEALTH AND SAFETY

Both the Client and the Principal Contractor have a duty in terms of the OHS Act 85/1993 to do all that is reasonably practicable to prevent members of the public and site visitors from being affected by the construction activities. Site visitors must be briefed on the hazards and risks they may be exposed to and what measures are in place or should be taken to control these hazards and risks. A record of these inductions must be kept on site in accordance with the Construction Regulations.

Appropriate Nets, Canopies, Hoarding, Fencing, Gantry's and Crash Decks etc. must be provided to protect members of the public and their vehicles passing / entering the site, in accordance with Construction Regulation 27. Sufficient Safety, direction Signage and Flagmen to be placed to direct traffic near the site.

Principal Contractor to ensure that no unauthorized persons enter the construction area by implementing access control measures / registers.

17. NIGHT WORK

Where work is required to be done during the night, and approved by the Engineer, the Contractor shall make adequate provision for additional lighting to ensure that the equipment and the areas where work is to be done are lighted. For this purpose, the Contractor will not be allowed just to make use of the lighting on the equipment, but to provide such floodlights on the plant and along the road to ensure 200 lux lighting levels.

The Contractor shall also make sure that this additional lighting is provided such that it does not interfere with the general traffic. Adequate lighting/illumination to be provided where required with backup generators. Security to be provided as and when needed. All emergency procedures to be in place. Adequate PPE to be provided for all employees e.g. Hi-Viz Vests.

18. OCCUPATIONAL HEALTH

18.1 Occupational Hygiene

Exposure of workers to occupational health hazards and risks is very common in any work environment, especially in construction. Occupational exposure is a major problem and Principal Contractor must ensure that proper health and hygiene measures are put in place to prevent exposure to these hazards.

The Risk to be looked at Includes: Ventilation

Adequate ventilation / extraction / exhausting in hazardous areas e.g. chemicals/ adhesives / welding / petrol or diesel/ motors running and in confined spaces /basements.

18.2 Noise

Tasks identified where noise exceeds 85 dBA. All reasonable steps to be taken to reduce noise levels at the source. Hearing protection to be used where noise levels cannot be reduced below 85dBA.

18.2.1 Noise Induced Hearing Loss

Where noise is identified as a hazard the requirements of the NIHL regulations must be complied with and the following must be included / referred to in the Health and Safety Plan:

- Proof of training with regards to these regulations.
- Risk assessment
- Monitoring carried out by an AIA and done according to SABS 083.
- Medical surveillance programme established and maintained for the necessary employees.
- Engineering methods considered
- Admin control (number of employees exposed) considered
- Personal protective equipment considered/decided on
- Describe how records are going to be kept for 40 years.

18.3 Dust

Principal Contractor to ensure that employees working with grinders, drills, etc. are issued with dust masks and dust exposure to be minimized at all times. Suitable measures to be implemented by the Principal Contractor to ensure that members of the public are not detrimentally affected by such activities. Working Area to be fully clad with a Hundred Percent Shade Cloth or anything similar.

18.4 Welfare Facilities

The Principal Contractor to provide at least one sanitary facility for every 30 employees on site, including changing facilities & hand washing facilities. Safe and adequate eating areas must be provided. Waste bins must be strategically placed and emptied regularly. Safe and clean storage areas must be provided for workers to store personal belongings and personal protective equipment.

18.5 Waste Management

Principal Contractor must implement their waste management in line with Environmental Terms and Conditions.

18.6 Alcohol and Other Drugs

The Principal Contractor and their contractors to ensure that no alcohol and other drugs are allowed on site. No person may be under the influence of alcohol or any other drugs while on the construction site. Any person on prescription drugs must inform his/her superior, who shall in turn report this to the Contractor forthwith. Any person suffering from any illness / condition that may have a negative effect on his/her safety performance must report this to his/her superior, who shall in turn report this to the Principal Contractor forthwith.

Any person suspected of being under the influence of alcohol or other drugs must be sent home immediately, to report back the next day for a preliminary inquiry.

The Contractor concerned must follow a full disciplinary procedure and a copy of the disciplinary action must be forwarded to the Principal Contractor for his records. No Smoking is allowed on site.

Stephan Julius

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CONSULTANTS

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19. ANNEXURE A- ACKNOWLEDGEMENT OF H&S SPECIFICATION**Annexure A: Acknowledgement of Health and Safety Specification**

Acknowledgement of Receipt of the Health and Safety Specifications:

I, _____ representing

_____ Contractor

Have satisfied myself with the content of the construction Health and Safety Specification and shall ensure that the Contractor and its personnel comply with all obligations / requirements in respect thereof.

Signature of Principal Contractor

DATE

Signature of Client Agent

DATE

COMMENTS:

20. ANNEXURE B APPOINTMENT OF PRINCIPAL CONTRACTOR

Appointment of Principal Contractor

IN TERMS, OF

OCCUPATIONAL HEALTH AND SAFETY ACT, ACT 85 OF 1993 & CONSTRUCTION
REGULATIONS 2014

CONSTRUCTION REGULATION 5(1)(k)

I, ... Client Responsible Person,
for do hereby appoint:
..... as the Principal Contractor
of Project

Responsibilities:

- Prepare a Health and Safety Plan to comply with the requirements of the Construction Regulation 5(1)(b), and in compliance with the Health and Safety Specification for the Project.
- Ensure co-operation between all contractors to enable each of those contractors to comply with the provisions of these regulations.
- Provide all contractors with the required safety specification for their area of responsibility.
- Appoint each contractor in writing in accordance with Construction Regulations.
- Ensure implementation of the contractor's health and safety plan
- Stop contractors from working if not in accordance with the client specification
- Provide health and safety information to contractors should their design change
- Ensure all contractors are registered and in good standing with the compensation commissioner
- Ensure contractors submitting tenders have made provision for health and safety during construction
- Ensure risk assessments are conducted & the identified controls are communicated to all employees and visitors.
- Ensure Compliance to Occupational Health and Safety Act 85/1993, Construction Regulations 2014, Community Fire Safety Bylaw and Relevant Sans Codes.

Signature:

Date:

Client / Principal Agent**Acceptance**

I, ... hereby accept and acknowledge that I understand the
requirements of this appointment.

Signature:

Date:

21. ANNEXURE C BASELINE RISK ASSESSMENT

Baseline Risk Assessment for Health and Safety Specification: Sir Lowry's Pass River Upgrade Project				
Activity	Risk Rating	Hazard	Control Measure	Responsible Person
Off-loading of Material/deliveries and	H	- Possible load falling - Public Safety-potential injuries to workers and members of the public	- All work areas to be adequately demarcated-All Activities to done under supervision - Ensure a spotter is available if and when needed. - Once site has been secured it must be maintained to avoid unauthorised. - Site security to be available. - Relevant construction signage to be displayed - Contractors to be aware of live services e.g. electrical cables.	CR 8.1
	M	Possible Collision/contact with property or stationary vehicles, workers and members of the public	- Driver to be in possession of a valid driver's licence. - All notices and signs to be obeyed. Driver to adhere to the speed limits. Employer and Driver to ensure that he is not intoxicated and must be of sober habits.	CR 8.1
Carrying of material	M	Possible Contact with fellow employees and result into possible injuries.	- Employees to take caution when walking on site - Employees to keep material as close to themselves or structure as possible to avoid possible contact with persons - Ensure your vision is not obstructed. - Watch your blind spots and get assistance when carrying heavy and large objects	CR 8.1
	L	Possible Falling material and possible foot and body injuries.	Operatives to ensure that all material are adequately secured. Appropriate PPE to be worn at all times. Don't carry material in precarious (dangerous) positions so as to obstruct your vision etc.	CR 8.1
	L	Possible Ergonomics /Possible back injuries	Employees to ensure that they use correct bending techniques. Please get assistance when lifting heavy objects.	CR 8.1
Off-loading of containers by means of Cranes	H	Possible Uncontrolled release of Container and material	- All work areas to be adequately demarcated with relevant signage displayed. - Competent flagman and riggers to be present - Only competent person to execute lifting operations - All operators to have relevant documentation as per CR 23 and DMR 18. - Task Specific Risk Assessments and Method Statement must be readily available and communicated to all relevant persons with proof placed on file. - Load test certificates for all lifting equipment and lifting Machinery.	CR 8.1

			• All Contractors to be informed of live services e.g. electrical cables. • Only certified and load tested Lifting Equipment and Machinery shall be used. Lifting equipment shall be of good standard with correct latches etc.	
		• Possible Collision with property or stationary vehicles, workers and members of the public	• All work areas to be adequately demarcated with relevant signage displayed. • Competent flagman and riggers to be present • Only competent person to execute lifting operations. • All deliveries shall take place in the designated areas.	CR 8.1
		• Possible Fall of persons while placing or removing chains from containers	• Safe Access to be provided.	CR 8.1
Tower Crane Erecting and Dismantling	H	• Possible Fall of Persons and Material • Possible Malfunction of Equipment • Possible Collapse of Crane due to inclement weather failure of concrete bases, over loading, non-compliant equipment • Malfunction to due unauthorized entry or lack of training • Personal harm to employees and members of the Public	• Principal Contractor shall comply with all relevant legislation and regulations and shall include but is not limited to i.e. DMR 18(2015), CR 7, 8, 10, 20, 22, General Safety Regulation and Section 8 & 9 of the OHS Act. • Furthermore, the Principal Contractor shall ensure that the following is provided and enforced prior to any activities and shall include but is not limited to i.e. • 1. Task Specific Method Statements and Risk Assessments. • 2. All employees shall be adequately informed with proof placed on file. • 3. Only competent and medically fit employees shall operate and conduct all operations • 4. Adequate control measures shall be provided with regards to Inclement Weather • 5. All equipment shall conform with the relevant standards and DMR 18(2015) • 6. All work areas to be adequately demarcated	CR 8.1
Handling of asbestos related products.	M	Possible exposure to Asbestos fibres.	• Monitoring of exposure to be done once a week by AIA. • Asbestos PPE to be issued, ex. FFP2 dust mask, disposable full asbestos overalls. • All workers to make use of the decontaminating area will be established prior to work starting. • Disposal of asbestos to be done at Vissershok and obtaining of an Asbestos disposal certificate.	CR 8.1
Excavations with Plant and Manually	M	• Possible Electrocution due to unknown electrical cables	• Only Competent Persons to conduct Activities. Task Specific Risk Assessments to be provided. All operators to comply with CR 13 and	CR 8.1

			CR 23. - Way leaves or drawings to be obtained from the Client. Where way-leaves are not available adequate control measures must be implemented eg using a Cable Detector to determine the presence of possible services especially electrical cables. - All work to be conducted under supervision	
		Damage to existing services	- Way leaves or drawings to be obtained from the Client. Where way-leaves are not available adequate control measures must be implemented eg using a Cable Detector to determine the presence of possible services especially electrical cables. - Only competent persons to excavate. - Compliance with CR 13. - All work to be conducted under supervision	CR 8.1
		Possible Excavation collapse	- Competent person appointed in writing to supervise excavations. - Daily inspections to be conducted - Adequate bracing and shoring required as and when needed. Plant to stay at least 1m clear of Embankment	CR 8.1
			Excavation inspected regularly (as per legal requirements) to ensure stability (register completed).	CR 8.1
			Access provided at least every 6 meters.	CR 8.1
			Shoring and bracing whenever necessary in opinion of competent person.	CR 8.1
			Backfilling done as soon as practicable.	CR 8.1
			Appropriate personal protective equipment issued.	CR 8.1
			Undertaking to wear signed and wearing enforced.	CR 8.1
			Relevant Signage to be provided and displayed	CR 8.1
		Possible falling of Persons into excavation	Task Specific FPP by competent person.	CR 8.1
			Physical barrier of at least 1-meter-high must be provided with relevant signage displayed	CR 8.1
			Backfilling to be done as soon as practicable.	CR 8.1
Operating of Mobile plant	M	Colliding with employees, public, possibly fatal. Damage to property	- Only Competent Persons to conduct Activities. Task Specific Risk Assessments to be provided. All operators to comply with CR 13 and CR 23. - Competent person who is medically fit must operate - mobile plant. This is also required from hiring companies. - Always be aware of other plant in your area and if the plant comes too close or in your working area rather stop operating and be safe. Never reverse without checking behind you to ensure that it is safe to do so. Operator must	CR 8.1

			be on the lookout for fellow employees and members of the Public coming onto site unnoticed. All plant shall have a fully functional reverse buzzer.	
		Vibration of plant can lead to falling objects from bucket	Do not operate loader if there is anyone in the working area. Don't overload loading bucket and ensure that material is adequately secured	CR 8.1
		Possible Risks when plant is stationary - People driving into plant.	Mobile plant must have appropriate lighting or reflectors in order to identify the location of the plant. Park in designated areas with boom lowered or raised	CR 8.1
		Damage to structure or plant. Loss of Machine	Machine must be locked, and keys taken with operator or given to supervisor to prevent unauthorized person operating machine.	CR 8.1
Brickwork and stacking thereof	L	Possible cuts, fractures to employees' body. Stacks falling over or collapsing, or bricks knocked from scaffold platform.	- Only Competent Persons to conduct Activities. Task Specific Risk Assessments to be provided. - Stacking of bricks must not be higher than two pallets and when stacking. Bricks shall not be stacked higher than toe boards when working on scaffolds. - Stay clear of suspended loads and ensure that only authorised persons give signals to crane operator when applicable.	CR 8.1
Working with Cement (Bagging/Plastering, Mortar etc.)	L	Cement dust, Respiratory problems.	- Only Competent Persons to conduct Activities. Task Specific Risk Assessments to be provided. - Dust masks to be used when spending even short periods of time in high dust areas and when using concrete saws/cutters or cement mixers.	CR 8.1
	L	Possible Contact with cement dermatitis, skin burns, skin irritation	- Avoid contact with the skin as far as reasonably practicable. Remove clothing that has been contaminated by wet concrete. - Wear suitable PPE e.g. Gum boots. - Wash hands thoroughly after contact and use a barrier cream.	CR 8.1
	L	Possible Eye injuries	Follow Safety instructions (MSDS) when using concrete additives.	CR 8.1
	L	Faulty hand tools and the excessive inhalation of cement dust.	Hand tools to be in good condition. Persons mixing mortar should wear dust masks when required.	CR 8.1
Lifting of Pipes	H	Unplanned release or dropping of load.	- Task Specific Method statements and Risk Assessments required as per CR 9 Excavators/digger-loader safe working load must be greater than the foreseeable weight of loads to be lifted. Load Test certificates of chains and slings to be obtained and put on file. - Compliance with CR 23 and DMR 18.	CR 8.1
	H	Objects falling from boom/bucket	Lifting to be supervised to ensure the stability of the machine and the load. Loads must not be slewed over personnel, public vehicle or where there is a risk of possible injuries or property damage. A banksman/rigger/spotter is to be used where driver's vision is impaired or	CR 8.1

Working with Hazardous Substances	L	Possible Respiratory problems.	where operating in congested areas. Respirators to be used when spending even short periods of time. Adequate ventilation required. Ensure that all containers are clearly identified when decanting.	CR 8.1
		Dermatitis, Skin burns, Skin sensitization	Avoid contact with the skin as far as reasonably practicable. Use barrier cream if possible.	CR 8.1
		Possible Eye injuries	Remove clothing that has been contaminated by wet hazardous substances.	CR 8.1
			Wear suitable PPE as listed below. Wash hands thoroughly after contact and use a barrier cream.	CR 8.1
			Follow Safety instructions (MSDS) as indicated by the MSDS.	CR 8.1
Storage of Hazardous Substances	H	Possible Explosion/fires Possible	Comply with CR 25 & CR 29. Store all Hazardous Substances in the correct categories. Store all flammable material separately. Ensure relevant signage is clearly displayed. Adequate fire extinguishers to be readily available. Fire Risk Assessment to be conducted by a competent person. Hazardous bins to be provided.	CR 8.1
Electrical Installations	M	Possible Electrocution, even fatal. Damage to equipment	- Task Specific Method statements and Risk Assessments required as per CR 9. - Competent contractor to be appointed if necessary. - Equipment to be used to detect live/high voltage cables. - Restricted areas to be identified. - All installations must comply with SANS 10142 & the regulations of the OHS Act 85/1993 and Construction Regulation 24 and Electrical Installation Regulations. - Toolbox Talks to be conducted on Risk Assessments with declarations / acknowledgement signed daily. - Relevant PPE to be used. - Lockout procedures to be provided where applicable. - Only competent persons to be used with proof of competency to be provided.	CR 8.1
			- CoC must be issued for all electrical installations. - All temporary electrical installations to be inspected at least weekly and prior to use. - All cables to be treated as live.	CR 8.1
Working at Heights including but is not limited to Scaffolds and Ladders	H	Possible Fall of persons, Possible Death	- Task Specific Method statements and Risk Assessments required as per CR 9. - All work to be done under supervision. - Compliance with Fall Protection Plan. - All exposed to heights to medically fit issued by OHP/OHN. - Scaffolding to be SANS 10085-1:2004 compliant. - Daily inspections to be conducted as per CR 12. PPE to be worn at all times.	CR 8.1
		Possible Falling	As far as reasonably practicable, all	CR 8.1

		Objects / Equipment. Falling/slipping	- equipment to be tied to rope. - No items to be thrown from elevated positions but must be safely lowered. - No persons to work underneath overhead work area or ground. - No work on open structures at heights during inclement weather. - No work on scaffolding during wet conditions/inclement weather.	
Scaffold erecting & dismantling	H	Possible Falling of persons; Collapse of Scaffold structures and damage property and employees.	- Design Drawings required. - Work on scaffolds to be coordinated by appointed scaffold supervisor. - Lanyard to be used when erecting & dismantling scaffolding. (Scaffold erectors) Compliance with SANS 10085-1:2004, CR 12 and CR 16. - All scaffolding to be inspected daily and after inclement weather and findings recorded in a register. - Fully boarded platforms must be provided at all times - Only those employees who are authorised may be on the scaffold. - Where safe platforms cannot be erected, safety harnesses are compulsory.	CR 8.1
			- Guard rails and toe boards compulsory. - PPE required for persons working on scaffolding: safe shoes; hardhats. - Area below to be cordoned off. - Platforms to be cleaned on a daily basis. - Only competent erectors to change structure of scaffold. - No overloading of scaffold, PPE used: Safety boots, helmets, overalls.	CR 8.1
Working with Power Tools	H	Possible Contact with moving parts.	- Task Specific Method statements and Risk Assessments required as per CR 9. - Only competent personnel should operate these tools.	CR 8.1
			Machines to be checked before use, guards are correctly fitted and work properly.	CR 8.1
		Noise above 85Dba	Employees to be issued with relevant PPE including hearing protection.	CR 8.1
		Possible Malfunction of Blade	Blades should be regularly inspected to ensure they are sharp/good condition	CR 8.1
		Possible Back Injuries	Employees to be trained on proper lifting and bending techniques.	CR 8.1
Working with Hand Tools	M	Possible Eye Injury	- Visual checks must be completed by operatives on tools prior to their use. - Eye protection is to be provided and used whenever work is done using cold chisels or other tools where there is risk of flying particles or other pieces of the tool breaking off.	CR 8.1
		Possible Injury to hands, feet and body	- Tools are required to be suitable for the purpose for which they to be used. - Open bladed knives, screwdrivers, and other sharp tools are to be carried and used so as not to cause injury to the user or others.	CR 8.1
		Possible	Tools should not be left lying around.	CR 8.1

		Tripping over tools	they constitute a severe tripping hazard and they are liable to get damaged.	
Lifting Operations	M	Uncontrolled release of material	- Task Specific Method Statements and Risk Assessments required with proof of communication. - Rescue Plan and task specific Fall Protection Plan required, to be compiled by competent person. - Competent Banksman/Rigger to be readily available	CR 8.1
			- Banksman/Rigger to have signalling device - No person to be under suspended load - No Crane operations when banksman/Rigger is not available or present - Only appointed banksman/rigger to assist with lifting operations.	CR 8.1
Working in Confined Space	H	Possible Body Injuries, Property Damage, Possible	- The Principal Contractor to prepare a confined space procedure in line with General Safety Regulation (5) OHS Act including Task Specific Risk Assessments, Method Statements and Emergency Procedures. Ensure that all work areas are adequately demarcated - Ensure that all ducts are adequately secured and that it can take the relevant loads	CR 8.1
		- Respiratory complication due to Lack of Ventilation - Hazardous Material being used e.g. Sealants etc.	- Safe Access Required at all times. Adequate Ventilation and supervision required at all times - All hazardous substances to be assessed and ensure that MSDS are provided, all employees to be informed and First Aider has copies	CR 8.1
Steel Fixing	M	Hand, back injuries	A competent contractor to be appointed. Manual handling to be minimized by the use of lifting equipment.	CR 8.1
	M	Cuts and abrasions	Only competent persons will use grinders and equipment.	CR 8.1
			PPE to be supplied and used, including gloves.	CR 8.1
			Trained steel fixers to be used who understand bending schedules and drawings.	CR 8.1
			Steel fixers will only work in areas that are protected with handrail when above 2 meters or use suitable fall arrest system.	CR 8.1
			Ladders to be removed or boarded up to prevent access outside working hours.	CR 8.1
Temporary Works	H	Possible Collapse of Structure	- Task Specific Risk Assessment s and Method Statement Required prior to activity - Compliance with CR 12. - Competent Contractor to be appointed - Temporary Works designer to be appointed - Design drawings to be approved by engineer and must be current	CR 8.1
			Handover Certificates required Before Concrete Pours and Before Stripping	CR 8.1

			any Temporary Works material (Proof to be placed on file)	
			Task specific risk assessment to be compiled and Formwork to be inspected daily by competent person with proof placed on file	
	H	Falling of Persons/Material/Equipment	- All material to be adequately secured - Task Specific Fall Protection Plan - Adequate Signage and Demarcation required. - Only Authorised persons to enter these areas- erecting and stripping. Area must be declared safe prior to any person entering decks - Compliance with CR 12. - All RISK assessments and method statements to be communicated with relevant persons (Proof placed on file.)	CR 8.1
Work at Heights/Roof Work including Cladding, Trusses and Purlins etc.	H	Fall of persons, Possible Death	- Task Specific Fall Protection Plan, Risk Assessments and Method Statements required - PC shall comply with CR 9 and CR 10. - All employees shall be in possession of Working at Heights Training issued by an Accredited Service Provider - All work to be done under supervision. - Compliance with Fall Protection Plan. - Rescue kit to be available on site. - PPE to be worn at all times. - Life lines to be installed as and when needed and must be secured to a fixed structure - How the roof work was planned/Method Statements. - That the roof workers are competent (trained, experienced, knowledgeable) - Life lines (Proof of Certification) and anchor points (Load Tested) are provided and installed by a competent person and with proof placed on file - That no Roof work is carried during inclement weather or where conditions are hazardous to workers. - That fragile material/areas are demarcated, and signs posted. - That suitable platforms are provided where fragile materials exist. - That there are suitable and sufficient guardrails or barriers and toe boards or other similar means of protection to prevent the fall of any person, material or equipment: Rescue Plan. - All employees exposed to heights must be declared medically fit by an Occupational Health Practitioner. (Annexure 3) - Note: The Principal Contractor and their contractors shall ensure that all life lines are load tested and all Safety Harnesses shall be inspected on a Daily basis by a competent person with proof of inspections placed on file.	CR 8.1
	H	Falling Objects /	As far as reasonably possible, all equipment to be tied to rope.	CR 8.1

		Equipment. Falling/slipping	• No items to be thrown from roof, but to be safely lowered. • No persons to work underneath overhead work area or ground. • No work on open structures at heights in wet weather. • No work on scaffolding during wet conditions.	
		• Malfunction of lifts and lifting equipment	• Proof of notification to the DOL to be obtained • (Annexure 1) • Load test certificates to be obtained. • Competent contractor to be appointed.	CR 8.1

Note: All Activities to be re-assessed by the Principal Contractor and their contractors prior to start of work and must be communicated with all relevant employees with proof placed on file.

Compiled by:

Stephan Julius (Construction Health & Safety Agent with SACPCMP – CHSA/014/2014)

Assisted by:

Darion Hendriks

CITY OF CAPE TOWN

WATER AND SANITATION

CONTRACT NO. 256Q/2019/20

SIR LOWRY'S PASS RIVER - 2.7 KM RIVER UPGRADE FROM THE N2 TO FALSE BAY, GORDON'S BAY

C3.6 Annexes

CONTENTS

Annex 1: Monthly Project Labour Report

Annex 2: B-BBEE Sub-contract Expenditure Report

Annex 3: Joint Venture Expenditure Report

Annex 4: Targeted Labour Contract Participation Expenditure Report

Annex 5: Targeted Enterprises Contract Participation Expenditure Report

ANNEX 1

CITY OF CAPE TOWN MONTHLY PROJECT LABOUR REPORT



Instructions for completing and submitting forms

General

- The Monthly Project Labour Reports must be completed in full, using typed, proper case characters; alternatively, should a computer not be available, handwritten in black ink.
- Incomplete / incorrect / illegible forms will not be accepted.
- Any conditions relating to targeted labour stipulated in the Contract (in the case of contracted out services or works) shall apply to the completion and submission of these forms.
- This document is available in Microsoft Excel format upon request from the City's EPWP office, tel 021 400 9400, email EPWPLR@capetown.gov.za.
- Project Details**
If a field is not applicable insert the letters: N/A
- Only the Project Number supplied by the Corporate EPWP Office must be inserted. The Project Number can be obtained from the Coordinator or Project Manager or from the e-mail address in point 4 above.
- On completion of the contract or works project the anticipated end date must be updated to reflect the actual end date.
- Beneficiary Details and Work Information**
Care must be taken to ensure that beneficiary details correspond accurately with the beneficiary's ID document.

- A new beneficiary is one in respect of which a new employment contract is signed in the current month. A certified ID copy must accompany this labour report on submission.
- Was the beneficiary sourced from the City's job seeker database?
- The contract end date as stated in the beneficiary's employment contract.
- Where a beneficiary has not worked in a particular month, the beneficiary's name shall not be reflected on this form at all for the month in question.
- Training will be recorded separately from normal working days and together shall not exceed the maximum of 23 days per month
- Workers earning more than the maximum daily rate (currently R450 excluding any benefits) shall not be reflected on this form at all.
- Submission of Forms**
Signed hardcopy forms must be scanned and submitted to the City's project manager in electronic (pdf) format, together with the completed form in Microsoft Excel format.
- Scanned copies of all applicable supporting documentation must be submitted along with each monthly project labour report. Copies of employment contracts and ID documents are only required in respect of new beneficiaries.
- If a computer is not available hardcopy forms and supporting documentation will be accepted.

PROJECT DETAILS

Numbers in cells below e.g. (0) refer to the relevant instruction above for completing and submitting forms

CONTRACT OR WORKS		EPWP SUPPLIED													
PROJECT NAME: (5)		PROJECT NUMBER: (6)													
DIRECTORATE:		DEPARTMENT:													
CONTRACTOR OR VENDOR NAME:		CONTRACTOR OR VENDOR													
CONTRACTOR OR VENDOR		E-MAIL ADDRESS:													
CONTACT PERSON:		CONTRACTOR OR VENDOR													
PROJECT LABOUR REPORT CURRENT MONTH (mark with "X")		TEL. NUMBER:													
JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	YEAR			

ACTUAL START DATE (yyyy/mm/dd)		ANTICIPATED / ACTUAL END DATE (yyyy/mm/dd)		(7)	
TOTAL PROJECT EXPENDITURE / VALUE OF WORK DONE TO-DATE (INCLUDING ALL COSTS, BUT EXCLUDING VAT)					
R					

MONTHLY PROJECT LABOUR REPORT



CITY OF CAPE TOWN
ISIXEKO SASEKAPA
STAD KAAPSTAD

BENEFICIARY DETAILS AND WORK INFORMATION

CONTRACTOR WORKS PROJECT NUMBER:		Year		Month		Sheet 1 of							
(3) No.	(5) First name	(6) Surname	(8) ID number	(9) New Beneficiary (Y/N)	Gender (M/F)	Disabled (Y/N)	(10) Job seeker database (Y/N)	Contract start date (DDMMYY)	(11) Contract end date (DDMMYY)	(12) No. days worked this month (excl. training)	(13) Training days	(14) Rate of pay per day (R-c)	
1													
2													
3													
4													
5													
6													
7													
8													
9													
10													
11													
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13													
14													
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17													
18													
19													
20													
												0	0 R

Declared by Contractor or Vendor to be true and correct:	Name	Signature
	Date	

Received by Employer's Agent / Representative:	Name	Signature
	Date	

ANNEX 2

CITY OF CAPE TOWN

CONTRACT NO. AND NAME:

CONTRACTOR:

B-BBEE SUB-CONTRACT EXPENDITURE REPORT BASED ON PAYMENT CERTIFICATE NO.

Value of the contract (as defined in the Preference Schedule) (P*)		R	B-BBEE Status Level of Prime Contractor		
Name of Sub-contractor (list all)	B-BBEE Status Level of Sub-contractor ¹	Total value of Sub-contract (excl. VAT) ¹	Value of Sub-contract work to date (excl. VAT) ¹	Value of Sub-contract work to Sub-contractors with a lower B-BBEE Status Level than Prime Contractor	
Sub-contractor A		R	R	R	
Sub-contractor B		R	R	R	
Sub-contractor C		R	R	R	
			Total:	R	
			Expressed as a percentage of P*		%

¹Documentary evidence to be providedSignatures

Declared by Contractor to be true and correct:

Date:

Verified by Employer's Agent/
Employer's Agent's Representative:

Date:

ANNEX 3

CITY OF CAPE TOWN

CONTRACT NO. AND NAME:

CONTRACTOR:

JOINT VENTURE EXPENDITURE REPORT BASED ON PAYMENT CERTIFICATE NO.

Value of the contract (as defined in the Preference Schedule) (P*)		R	B-BBEE Status Level of Joint Venture		
Name of Joint Venture partner (list all)	B-BBEE Status Level of each JV partner as at contract award	Percentage contribution of JV partner per JV Agreement ¹ A	Total value of JV partner's contribution (excl. VAT) ¹ $B = A\% \times P^*$	Value of JV partner's contribution to date (excl. VAT) ¹ C	Value of JV partner's contribution as a percentage of the work executed to date $D = C/P^* \times 100$
JV Partner A		%	R	R	%
JV Partner B		%	R	R	%
JV Partner C		%	R	R	%

¹Documentary evidence to be providedSignaturesDeclared by Contractor
to be true and correct:

Date:

Verified by Employer's
Agent/
Agent's
Representative:

Date: