



FINAL ENVIRONMENTAL MANAGEMENT PROGRAMME

FOR

PROPOSED BULK SEWER AND WATER PIPELINES – BIRCHLEIGH NORTH X 4

REF: GAUT 002/18-19/E2292

PREPARED FOR:

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ABBREVIATIONS

CoE	City of Ekurhuleni
ECO	Environmental Control Officer
EMPr	Environmental Management Programme
GDARD	Gauteng Department of Agriculture and Rural Development
NEMA	National Environmental Management Act
OHSA	Occupational Health and Safety Act
PPE	Personal Protective Equipment
PHRA-G	Provincial Heritage Resources Agency Gauteng
SAHRA	South African Heritage Resources Agency
SAPS	South African Police Service

INFORMATION SHEET

1 Details of the Environmental Assessment Practitioner (EAP)

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ENVIRONMENTAL MANAGEMENT PROGRAMME

2 Background and Introduction

2.1 Background

An Environmental Authorisation with Reference Number Gaut 002/13-14/E0347 and dated 28 September 2018 was issued by GDARD for the Proposed Esselen Park Integrated Housing Development.

The above approved development involves the development of approximately 7195 housing units (and associated services) on Portions 63 and 39 of the Farm Witfontein 15-IR, measuring approximately 172 hectares. The aim of the proposed township is to provide residential housing units. In addition, the proposed development also makes provision for supportive land uses such as business, education, community, municipal and churches that are primarily intended to serve the residents of proposed development (NEMAI Consulting, EIAR, 2016).

In order for the development to proceed, bulk sewer and water pipelines as well as the upgrading and extension of the existing link road to the north of the proposed Development are required.

Subsequently, Lokisa Environmental Consulting was appointed by LEBASH Architects (Pty) Ltd on behalf of City of Ekurhuleni to submit an application to the Gauteng Department of Agriculture and Rural Development (GDARD) for the proposed provision of bulk sewer and water pipelines to the Birchleigh North X 4 area as well as the upgrading and extension of the existing link road to the north of the proposed Esselen Park Integrated Housing Development.

2.2 Locality

Birchleigh North x 4 is situated approximately 4,6km north of Kempton Park, 1,4km west of the M57 and directly south of Link Road.

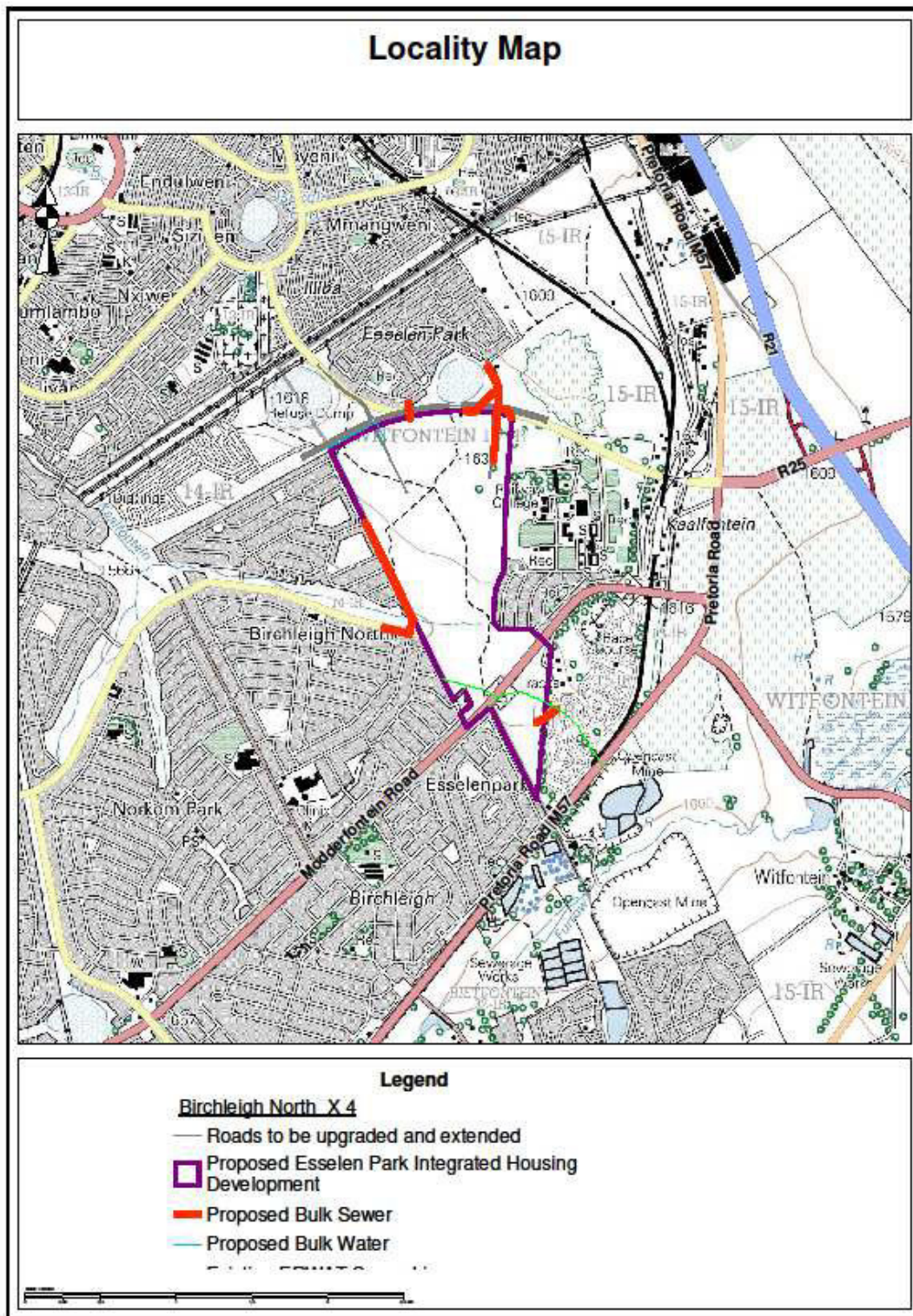


Figure 1: Locality Map

2.3 Project description

The project entails the provision of bulk sewer and water pipelines to the Birchleigh North X 4 area as well as the upgrading and extension of the existing link road to the north of the proposed Esselen Park Integrated Housing Development.

Bulk Water

The provision of bulk water will entail the upgrading of an existing pipe from point Y to point Z to a 450Ø pipe, approximately 492 m in length situated directly north of the project site.

Bulk Sewer

The provision of bulk sewage to the project site will entail the construction of the following pipelines:

- Approximately 375 m of new sewer pipes ranging between 160Ø to 500Ø from point A to point D;
- Approximately 160 m of new 160Ø sewer pipes from point E to point F;
- Approximately 640 m of new sewer pipes ranging between 160Ø to 250Ø from point G to point L;
- Approximately 120 m of new 160Ø sewer pipes from point K to point M;
- Approximately 280 m of new 160Ø sewer pipes from point H to point J;
- Approximately 100 m of new 160Ø sewer pipes from point N to point O.

The internal sewer pipelines required for the section of the Development to the south of the R25 will connect with the existing bulk ERWAT sewer pipeline traversing the development in an east west direction at point F.



Figure 2: Proposed Bulk Water and Sewer Pipelines

Roads

The existing link road to the north of the proposed Esselen Park Integrated Housing Development will be upgraded and extended as per the table below:

Table 1: Roads to be upgraded and extended

ROAD NAME	ROAD RESERVE (m)	UPGRADE LENGTH (m)
Road A	25	531.360
Road B	62	827.662
Road C	62	338.990
Road D	25	327.981

- Road A from point 1 to point 2
- Road B from point 2 to point 3
- Road C from point 3 to point 4
- Road D from point 3 to point 5



Figure 3: Roads to be upgraded and extended

2.4 Sensitivity according to the C-Plan

According to GDARD's conservation plan (C-Plan version 3.3) the proposed bulk sewer and water pipelines as well as the roads to be upgraded and extended falls within an Important Area and Ecological Support Area.

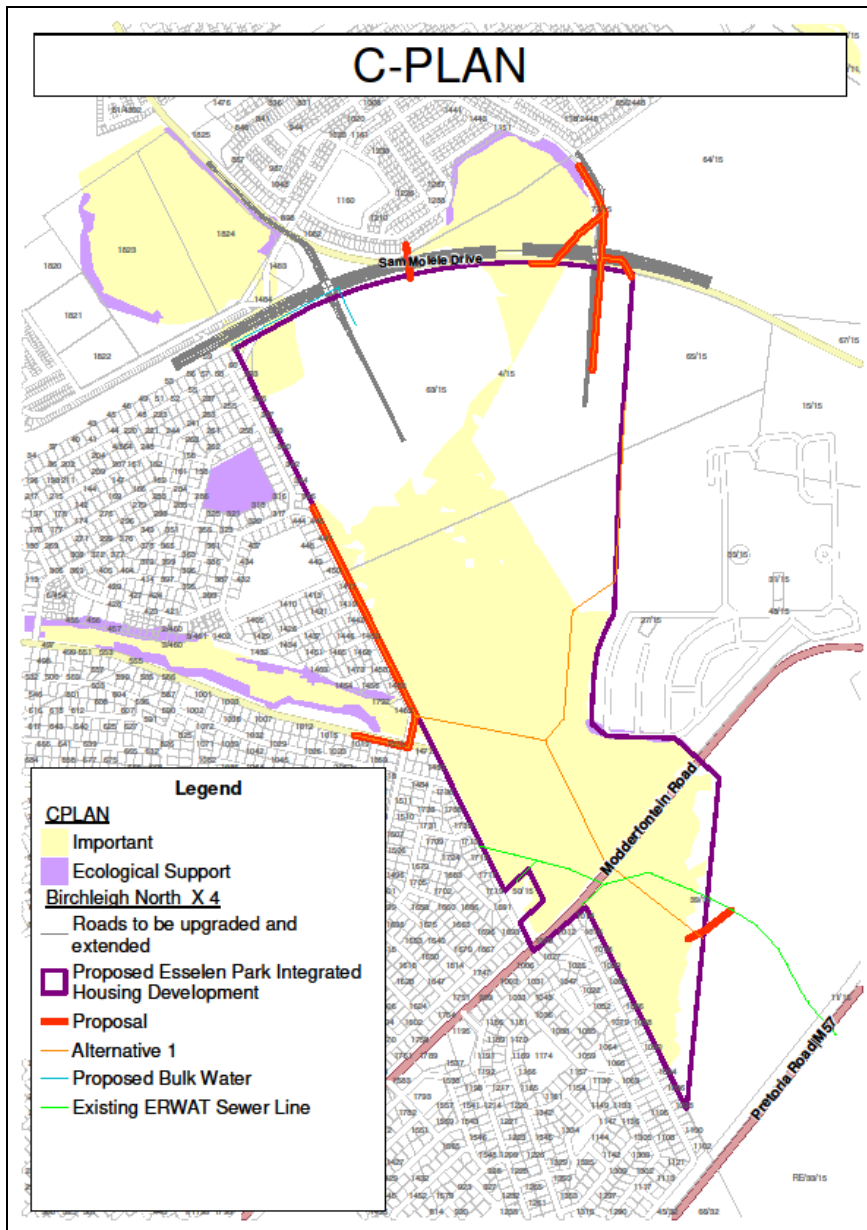


Figure 4: C-Plan

This Environmental Management Programme (EMPr) serves the purpose to ensure that the facility is operated in an environmentally responsible manner and that potential impacts identified and associated with this activity are adequately mitigated during the construction and operational phases of the project.

3 Objective of the EMPr

As per As per Section (1) of Appendix 4 of Regulation 982 an EMPr must comply with Section 24N of the Act and include –

Table 2: Requirements according to Appendix 4 of GNR 982

Requirements according to Appendix 4 of GNR 982	Section in report
a) Details of the EAP who prepared the EMPr and the expertise of that EAP to prepare the EMPr, including curriculum vitae.	Section 1 Annexure A
b) A detailed description of the aspects of the activity that are covered by the EMPr as identified by the project description.	Section 2
c) A map at an appropriate scale which superimposes the proposed activity, its associated structures and infrastructure on the environmental sensitivities of the preferred site indicating any areas that should be avoided, including buffers.	Section 2
d) A description of the impact management outcomes, including management statements, identifying the impacts and risks that need to be avoided, managed and mitigated as identified through the environmental impact assessment process for all phases of the development including – <ul style="list-style-type: none"> • Planning and design; • Pre-construction activities; • Construction activities; • Rehabilitation of the environment after construction and where applicable post closure; • Where relevant, operation activities. 	Section 4 Section 12
f) A description of proposed impact management actions, identifying the manner in which the impact management outcomes contemplated in paragraph (d) will be achieved, and must where applicable, include actions to – <ul style="list-style-type: none"> • Avoid, modify, remedy, control or stop any action, activity or process which causes pollution or environmental degradation; • Comply with any prescribed environmental management standards or practices; • Comply with any applicable provisions of the Act regarding closure where applicable; • Comply with any provisions of the Act regarding financial provision for rehabilitation, where applicable; 	Section 5 Section 12
g) The method of monitoring the implementation of the impact management actions as mentioned in the above paragraph (f);	Section 7
h) The frequency of monitoring the implementation of the impact management actions contemplated in paragraph (f);	Section 7 Section 12

i) An indication of the persons who will be responsible for the implementation of the impact management actions;	Section 6 Section 12
j) The time periods within which the impact management actions contemplated in paragraph (f) must be implemented;	Section 12
k) The mechanism for monitoring compliance with the impact management actions contemplated in paragraph (f);	Section 6
l) A program for reporting on compliance, taking into account the requirements as prescribed by the Regulations;	Section 7
m) An environmental awareness plan describing the manner in which - <ul style="list-style-type: none"> • The applicant intends to inform his or her employees of any environmental risk which may result from their work; and • Risks must be dealt with in order to avoid pollution or the degradation of the environment; and 	Section 8
n) Any specific information that may be required by the competent authority.	Section 9 & 10

4 A description of the Impact Management Outcomes

The purpose of the EMPr is to act as an instrument to be used by the City of Ekurhuleni to ensure sound environmental practices are incorporated during the construction and operational phase of the development.

The EMPr is a detailed programme for the implementation of the mitigation measures to minimise negative environmental impacts during the life-cycle of a project. The EMPr contributes to the preparation of the contract documentation by developing clauses to which the contractor must adhere for the protection of the environment. The EMPr specifies how the construction of the project is to be carried out and includes the actions required for the Post-Construction Phase to ensure that all the environmental impacts are managed for the duration of the project's life-cycle.

The EMPr is to be implemented in a co-operative spirit with all parties (project proponent, contractor, affected parties) involved in the setting of environmental objectives and practices.

The table below provides a summary of the identified impacts and their pre-mitigation and post-mitigation impact significance rating scores as per the environmental impact assessment process for the following phases of the proposed development –

- Construction phase; and
- Operational phase.

Table 3: Identified impacts and their pre-mitigation and post-mitigation impact significance rating scores

Potential Impacts	Significance rating of impacts	Significance rating of impacts after mitigation
CONSTRUCTION PHASE		
1.1 Dust /Air pollution The generation of dust associated with construction activities & earthworks	Very Low	Very Low
2.1 Visual Impacts	Very Low	Very Low
2.2 Bulk earthworks	Very Low	Very Low
3.1 Soil erosion, loss of topsoil, deterioration of soil quality	Low	Low
3.2 Soil Pollution	Low	Very Low
4.1 Site clearing and the removal of vegetation	Low	Low
4.2 Degradation, destruction of habitats/ ecosystem	Low	Low
4.3 Impacts on fauna and flora	Medium	Low
4.4 Invasive species	High	Medium
5.1 Stormwater flow and drainage	Medium	Low
5.2 Impacts on water quality	Low	Low
5.3 Impacts on functioning of watercourses	Medium	Low
6.1 Noise/ vibration	Very Low	Very Low
6.2 Visual impact	Very Low	Very Low
7.1 Safety and Security	Low	Low
7.2 Employment opportunities	Positive - Medium	Positive – Medium
8.1 Destruction of cultural / heritage sites	Insignificant	Insignificant
9.1 Waste	Very Low	Very Low
9.2 Pressure on existing infrastructure and services	Low	Low
9.3 Excavation of trench within the freshwater resources	Low	Very Low
9.4 Installation of (sewer and water) pipelines and associated manholes	Low	Very Low
10.1 Functional design and alignment of Bulk Sewer & Water Pipes	Very Low	Very Low
OPERATIONAL PHASE		
11.1 Potential failure of infrastructure / possible leaks from the pipelines into the freshwater resources, causing incision and alteration of the hydroperiod of the freshwater resources and potential contamination of freshwater soils, groundwater and surface water	Medium	Low
12.1 Increased urban development in the area will likely place increased pressure upon the sewerage infrastructure (including the capacity of the receiving wastewater treatment works) and may result in overflows from the manholes, and potentially compromise the integrity of the pipeline itself.	Medium	Low
13.1 Contribute to the provision of quality basic services and infrastructure in the area	Positive – Very High	Positive – Very High
14.1 Failure to implement a rehabilitation plan during the operational phase	High	Low

5 A description of the proposed impact management actions

The specifications outlined in the EMPr are applicable to all activities undertaken by all persons involved in the execution of the works, including sub-contractors, the workforce and suppliers for the duration of activities for the proposed project.

In order to attain the impact management outcomes as outlined in Section 4 the EMPr is to address issues in the following manner:

1. Environmental Management considerations are implemented from the start;
2. Precautions against damage are taken timely, and
3. Impacts of the development on the environment are minimised.

6 Implementation of the EMPr

6.1 The Applicant

- 6.1.1 The overall responsibility for ensuring compliance lies with the Applicant.
- 6.1.2 The Applicant shall comply with the conditions set in the Environmental Authorisation by the GDARD.
- 6.1.3 The Applicant shall ensure that the Contractor and all staff members, sub-contractors and suppliers understand and adhere to the EMPr.
- 6.1.4 The Applicant shall ensure that all sub-contractors and suppliers are contractually bound to adhere to the EMPr and Environmental Code of Conduct.

6.2 Environmental Control Officer

- 6.2.1 The Applicant shall appoint a suitably qualified Environmental Control Officer (ECO) to supervise the implementation of the EMPr.
- 6.2.2 The Contractor must be notified of this appointment and furnished with the contact details of the ECO.
- 6.2.3 The ECO shall be responsible for:
 - Day to day implementation of the EMPr and coordination of all environmental matters on site.

- Ensuring that all staff members are adequately trained and aware of the EMPr and its Environmental Code of Conduct.
- Fortnightly environmental inspections (according to the criteria specified in the EMPr).
- Liaison with the project manager, client and public.

6.3 Contractor

- 6.3.1 The Contractor, including all sub-contractors, shall comply with the specifications in the EMPr.
- 6.3.2 A representative of each sub-contractor will receive a copy of the EMPr.
- 6.3.3 A representative of each sub-contractor will be required to sign the Environmental Code of Conduct to give assurance that they understand the EMPr and that they undertake to comply with conditions therein.

7 Environmental Reporting Procedures

An Environmental Incidents Register and an Environmental Complaints Register will be in place and will be maintained by the ECO. Upon occurrence of non-compliance or a complaint of an environmental nature the incident will be recorded in the relevant register.

The registers must be made available to the ECO upon every fortnightly site visit. EMPr related issues would be discussed at all construction site meetings. A copy of the relevant sections of the minutes of these site meetings must be made available to the ECO.

8 Environmental Awareness Plan

The ECO will be responsible for putting in place an Environmental Awareness Training Programme for all staff members. Before commencing with any work, all staff members shall be briefed about the Environmental Code of Conduct. The training programme has to be approved by the ECO. After being briefed about the contents of the Environmental Code of Conduct, staff members shall sign an Environmental Training register as proof of their training.

The training must include, but are not limited to:

- Identification of potential heritage resources
- Identification and avoidance of demarcated no-go areas
- Site access and security
- Safety measures

9 Environmental Control Measures

The EMPr outlines measures to be implemented in order to minimise any potential environmental degradation associated with the construction activities. It should serve as a guide for the Contractor and the construction workforce on their roles and responsibilities concerning environmental management on the construction site and provide a framework for environmental monitoring throughout the construction period.

Measures to control potential environmental impacts during the construction phase are specified. Except where otherwise stated, all these control measures will apply throughout the construction period and, as part of the project contract, the Contractor shall adhere to these measures at all times.

10 Contract

The Contractor/s shall be handed a copy of all relevant documentation regarding the project and shall, before any work is conducted, meet with the ECO in order that the contractor shall familiarise himself with the environmental issues concerning the site.

A commitment from the Contractor is required on the following issues:

- To take into consideration the landowners in the surrounding area;
- Always behave professionally on and off site;
- To ensure quality of work done, technical and environmental;
- To resolve problems and claims arising from damage immediately to ensure a smooth flow of operations (take relevant steps to ensure no further damage or disturbance and resolve environmental problems adequately with the use of risk management and emergency response procedures);
- To use this EMPr for the benefit of all involved;
- To preserve the natural environment by limiting destructive actions on site;

- To have an eco-friendly approach; and
- Not to litter.

An agreement is to be signed by the contractor that:

- He knows and understands the content of the EMPr; and
- He is able and shall comply with all legislation pertaining to the nature of the work to be done and all things incidental thereto.

11 Statutory, Legal and other requirements

The following sources of South African Law have been identified and will form the basis of the EMPr:

- Constitution of the Republic of South Africa, Act No. 108 of 1996
- National Environmental Management Act, 1998 (Act No. 107 of 1998) (NEMA)
- NEMA EIA Regulations, 2014 (Government Notice Regulations Nos. 982, 983, 984, 985)
- National Water Act, 1998 (Act No. 36 of 1998)
- National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004)
- National Road Traffic Act, (Act No. 93 of 1996)
- Conservation of Agricultural Resources Act, 1983 (Act No. 43 of 1983)
- National Environment Management: Air Quality Act, 2004 (Act No. 39 of 2004)
- Occupational Health and Safety Act, 1993 (Act No. 85 of 1993)
- National Heritage Resources Act 1999 (Act No. 25 of 1999) (NHRA)
- National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008)
- Gauteng Agriculture Potential Atlas
- GDARD Requirements for Biodiversity Assessments (Version 3)
- Red Data Plant Policy
- Gauteng Conservation Plan (C-Plan Version 3.3)
- South African Guidelines for Sustainable Drainage Systems
- Gauteng Environmental Management Framework
- City of Ekurhuleni by-laws

12 Environmental Management Programme

The following tables form the core of this EMPr for the construction and operational phases of this project. These tables should be used as a checklist on site, especially during the construction phase.

Table 4: Planning, Design and Pre-construction Phase

IMPACT	OUTCOME/ OBJECTIVE	MITIGATION MEASURES/ACTIONS	RESPONSIBILITY	MONITORING FREQUENCY
DESIGN Negative impacts on environment during construction	<ul style="list-style-type: none"> • Ensure proper initiation of project 	<ul style="list-style-type: none"> • Compile tender documentation and Specifications • All the aspects listed under Construction and Closure • Ensure acceptable management of environmental issues during construction. • Ensure that relevant environmental management specifications as per the EMPr are incorporated in the Tender and Contract documentation. • Appoint an ECO who must monitor the contractor's compliance with the EMPr. 	<ul style="list-style-type: none"> • Engineering Design Consultant • Applicant 	<ul style="list-style-type: none"> • N/A
FUNCTIONAL DESIGN AND ALIGNMENT OF BULK SEWER PIPE	<ul style="list-style-type: none"> • Ensure functional design of infrastructure 	<ul style="list-style-type: none"> • Adherence to cogent, well-conceived and ecologically sensitive designs and construction methods, and the mitigation measures provided as well as general good construction practice, is essential. 	<ul style="list-style-type: none"> • Engineering Design Consultant • Applicant 	<ul style="list-style-type: none"> • N/A
ENVIRONMENTAL EDUCATION AND TRAINING	<ul style="list-style-type: none"> • Ensure proper and sufficient environmental training and education for all construction personnel 	<ul style="list-style-type: none"> • The ECO will be responsible for putting in place an Environmental Awareness Training Programme for all staff members. • Before commencing with any work, all staff members shall be briefed about the Environmental Code of Conduct. • The training programme has to be approved by the ECO. • After being briefed about the contents of the Environmental Code of Conduct, staff members shall sign an Environmental Training register as proof of their training. 	<ul style="list-style-type: none"> • ECO • Contractor 	<ul style="list-style-type: none"> • Ongoing
SENSITIVE AREAS	<ul style="list-style-type: none"> • Ensure protection of sensitive areas during construction 	<ul style="list-style-type: none"> • Drainage areas are to be demarcated as sensitive areas and treated as NO-GO areas. 	<ul style="list-style-type: none"> • ECO • Contractor • Ecological/ Wetland Consultant 	<ul style="list-style-type: none"> • Ongoing
FAUNA AND FLORA Site clearing and the removal of vegetation	<ul style="list-style-type: none"> • Selective removal of vegetation during site clearing 	<ul style="list-style-type: none"> • Sensitive areas to be identified and mapped according to the specialist studies and input from the ECO. • It must be ensured that, as far as possible, all proposed infrastructure is placed outside of sensitive habitat 	<ul style="list-style-type: none"> • ECO • Contractor • Ecological Consultant 	<ul style="list-style-type: none"> • Ongoing

IMPACT	OUTCOME/ OBJECTIVE	MITIGATION MEASURES/ACTIONS	RESPONSIBILITY	MONITORING FREQUENCY
		<p>areas.</p> <ul style="list-style-type: none"> • Areas of increased ecological importance and sensitivity, such as watercourse areas, must be considered during all phases of the development planning and construction activities. • The boundaries of the development footprint areas are to remain as small as possible, be clearly defined and it must be ensured that all activities remain within defined footprint areas. • All areas of increased ecological sensitivity beyond the development footprint must be designated as No-Go areas and be off limits to all unauthorised vehicles and personnel. Vehicles must be restricted to travelling only on designated roadways to limit the ecological footprint of the proposed development activities. • It must be ensured that storm water is managed on site in a suitable manner. • Disturbance to birds, animals and reptiles and their habitats must be prevented at all times. • All rescue and relocation plans must be overseen by a suitably qualified specialist. 		

Table 5: Construction Phase

IMPACT	OUTCOME/ OBJECTIVE	MITIGATION MEASURES/ACTIONS	RESPONSIBILITY	MONITORING FREQUENCY
<p>FLORA AND FAUNA</p> <p>Site clearing and the removal of vegetation</p> <p>Impacts on existing fauna and flora</p> <p>Degradation, destruction of habitats/ ecosystem</p> <p>Invasive species</p>	<ul style="list-style-type: none"> • Prevention of impacts on existing fauna and flora • Protection of existing indigenous flora and fauna against degradation, destruction of habitats/ ecosystem • Eradication of invasive species 	<ul style="list-style-type: none"> • Site clearing is to be limited to only the area necessary for carrying out the specified works and the destruction of vegetation must be minimised. • Utilise single access roads only. • Indiscriminate habitat destruction to be avoided and the proposed development must remain as localised as possible (including support areas and services). • Erosion and runoff from the site could impact the nearby watercourse, so mitigation to control erosion and runoff must be in place during all phases of the proposed development activities. • No littering by construction workers is permitted. Any litter will be collected and removed off-site to a registered waste facility. • Care must be taken to avoid the introduction of alien plant species to the site and surrounding areas. (Particular attention must be paid to imported material). • Alien vegetation re-growth must be controlled throughout the entire site during the construction period. • No activity whatsoever, such as temporary housing, temporary ablutions, storing of equipment or any other use of the wetland/buffer area, may be permitted during the construction phase. The demarcated wetland/buffer area must be demarcated during the construction phase to prevent any misinterpretation or disturbance of this no-go zone. • The contractor must ensure that no fauna species are disturbed, trapped, hunted or killed during the construction phase. • The illegal hunting or capture of wildlife will not be tolerated. Such matters will be handed over to the relevant authorities for prosecution. • Disturbance to birds, animals and reptiles and their habitats must be prevented at all times. • Exotic vegetation already dominates the site and therefore encroachment and recruitment of exotics will 	<ul style="list-style-type: none"> • ECO • Contractor • Ecological Consultant 	<ul style="list-style-type: none"> • Ongoing by Contractor • Twice a month by ECO • Monthly report

IMPACT	OUTCOME/ OBJECTIVE	MITIGATION MEASURES/ACTIONS	RESPONSIBILITY	MONITORING FREQUENCY
<p>IMPACT ON FUNCTIONING OF THE WATERCOURSE</p> <p>Impact on the functioning of the watercourses as a result of the construction activities</p> <p>Impact on water quality</p>	<ul style="list-style-type: none"> • Minimise the impact on the functioning of the watercourses • Minimise the impact on the water quality 	<p>be enhanced following further site disturbances. This will require active management.</p> <ul style="list-style-type: none"> • Construction must preferably commence during the dry months. • Removal of soil and stockpiling of soil must occur outside the extent of the watercourse to prevent siltation and increased runoff during construction. This includes the buffer zones and 1:100-year flood lines. • Appropriate sanitary facilities must be provided for the life of the construction phase and all waste removed to an appropriate waste facility. • Chemical toilets must always be well serviced, spaced as per occupational health and safety laws, and placed outside the wetland buffer, 1:100-year flood lines and other sensitive areas. • Spill kits must be stored on site: In case of accidental spills of oil, petroleum products etc., good oil absorbent materials must be on hand to allow for the quick remediation of the spill. The kits must also be well marked and all personnel must be educated to deal with the spill. Vehicles must be kept in good working order and leaks must be fixed immediately on an oil absorbent mat. • No plant machinery may be stored or left near the aquatic areas, when not in use. • Any species of fauna encountered during the construction phase must be moved to a safe location where no harm can be bestowed on the species. • Any new erosion gullies must be remediated immediately. • Access routes must be demarcated and located properly so that no damage to the system can occur. These roads must be adhered to at all times. A large turning place must be provided for larger trucks and machinery. No grading of temporary access roads is allowed as this will create dust and water runoff problems. • Increased runoff due to removal of vegetation and 	<ul style="list-style-type: none"> • ECO • Contractor 	<ul style="list-style-type: none"> • Ongoing by Contractor • Twice a month by ECO • Monthly report

IMPACT	OUTCOME/ OBJECTIVE	MITIGATION MEASURES/ACTIONS	RESPONSIBILITY	MONITORING FREQUENCY
		<p>increased soil compaction must be managed to ensure the prevention of siltation and the maximum stream bank stability.</p> <ul style="list-style-type: none"> • Areas disturbed by the construction activities must be re-vegetated as soon as possible. • The wetland areas already suffer significant exotic vegetation inclusion, which is a general driver of ecological change throughout urban watercourses; • Recruitment of exotic vegetation must be controlled throughout all phases of the development. • No dumping of any excess building material or other wastes or litter must be allowed within any wetland and buffer areas. • Locate construction camp, refuelling depots, sanitation facilities and concrete batching plant 150m away from drainage area. • Utilize proper waste management practices. • Ensure handling, transport and disposal of hazardous substances are adequately controlled and managed. • Provide containment areas for potential pollutants at construction camps, refuelling depot and concrete batching plants. • Spillages must be cleared immediately and the ECO on site informed so that clean-up operations can commence. Polluted soils must be removed and disposed of at a registered disposal site. • Erosion must be actively managed during all phases of the proposed development activities in order to abate the impact of silts being transported to the watercourse. 		
<p>DEVELOPMENT FOOTPRINT, CONSTRUCTION CAMP AND RELATED ACTIVITIES</p> <p>Location of</p>	<ul style="list-style-type: none"> • Location of construction site office and related buildings must not be detrimental to the environment • Proper access control must be 	<ul style="list-style-type: none"> • It must be ensured that, as far as possible, all proposed infrastructure is placed outside of sensitive habitat areas. Where this is not possible. Suitable mitigation measures as outlined in the specialist reports must be adhered to. • All areas of increased ecological sensitivity beyond the development footprint must be designated as No-Go areas and be off limits to all unauthorised vehicles and 	<ul style="list-style-type: none"> • ECO • Contractor • Project Manager 	<ul style="list-style-type: none"> • Ongoing by Contractor • Twice a month by ECO • Monthly report

IMPACT	OUTCOME/ OBJECTIVE	MITIGATION MEASURES/ACTIONS	RESPONSIBILITY	MONITORING FREQUENCY
<p>construction site office and related buildings</p> <p>Access control</p> <p>Ablution facilities</p>	<p>implemented</p> <ul style="list-style-type: none"> Adequate provision and control of ablution facilities 	<p>personnel. Vehicles must be restricted to travelling only on designated roadways to limit the ecological footprint of the proposed development activities.</p> <ul style="list-style-type: none"> An environmental awareness training programme for all staff members must be put in place by the Contractor. Before commencing with any work, all staff members shall be appropriately briefed about the EMPr and relevant occupational health and safety issues. No temporary accommodation or temporary storage sites to be erected within 100m of any river, stream, drainage line, wetland or farm dam. All construction material, equipment and any foreign objects brought into the area by contractors and staff to be removed immediately after completion of construction. All development footprint areas must remain as small as possible and must not encroach into the freshwater areas unless absolutely essential and part of the proposed development. It must be ensured that the freshwater habitat is off-limits to construction vehicles and non-essential personnel. The boundaries of footprint areas, including contractor laydown areas, are to be clearly defined and it must be ensured that all activities remain within defined footprint areas. Edge effects will need to be extremely carefully controlled. Planning of temporary roads and access routes must avoid freshwater areas and be restricted to existing roads where possible. Appropriate sanitary facilities must be provided for the life of the construction phase and all waste removed to an appropriate waste facility. All hazardous chemicals as well as stockpiles must be stored on bunded surfaces and have facilities constructed to control runoff from these areas; It must be ensured that all hazardous storage containers and storage areas comply with the relevant SABS 		

IMPACT	OUTCOME/ OBJECTIVE	MITIGATION MEASURES/ACTIONS	RESPONSIBILITY	MONITORING FREQUENCY
		<ul style="list-style-type: none"> standards to prevent leakage; • No fires must be permitted in or near the construction area; and • Ensuring that an adequate number of waste and “spill” bins are provided will also prevent litter and ensure the proper disposal of waste and spills. • Construction related traffic to and from site to be minimised. • Access to construction site to be controlled. • Vehicles must be restricted to travelling only on designated roadways to limit the ecological footprint of the proposed development activities. • The Contractor shall make available safe drinking water fit for human consumption at the construction camp and all other working areas • No water for drinking, cooking or other purposes must be taken out of farm dams without prior consent of the landowners. • Washing and toilet facilities shall be provided on site and in the construction camp • At least 1 toilet must be available per 15 workers using the construction camp • Toilet paper must be provided and must be available at all times • Only certified portable toilets to be used. These are not to be situated within 100m of any watercourses or artificial impoundments (farm dams). These portable toilets to be administered and serviced by a certified, registered company only. 		
<p>EARTHWORKS AND SOIL</p> <p>Earthworks/ Excavations</p> <p>Soil erosion, loss of topsoil, deterioration</p>	<ul style="list-style-type: none"> • Prevent/limit soil erosion, loss of topsoil, deterioration of soil quality and soil pollution 	<ul style="list-style-type: none"> • Avoid development on excessively steep slopes. • Avoid cutting steep embankments • Provide the necessary erosion protection measures. • Appropriate erosion and stormwater management structures must be installed around the construction site. • All construction vehicles, plant, machinery and equipment must be properly maintained to prevent leaks. 	<ul style="list-style-type: none"> • ECO • Contractor 	<ul style="list-style-type: none"> • Ongoing by Contractor • Twice a month by ECO • Monthly report

IMPACT	OUTCOME/ OBJECTIVE	MITIGATION MEASURES/ACTIONS	RESPONSIBILITY	MONITORING FREQUENCY
<p>of soil quality</p> <p>Soil Pollution</p>		<ul style="list-style-type: none"> • Plant and vehicles are to be repaired immediately upon developing leaks. Drip trays shall be supplied for all repair work undertaken on machinery on site or campsite area. • Drip trays are to be utilised during daily greasing and re-fuelling of machinery and to catch incidental spills and pollutants. • Drip trays are to be inspected daily for leaks and effectiveness, and emptied when necessary. This is to be closely monitored during rain events to prevent overflow. • Vehicles to be used during the construction phase are to be kept in good working condition and must not be the source of excessive fumes. • Fuels and chemicals must be stored in adequate storage facilities that are secure, enclosed and bunded. • All excavations and foundations must be inspected regularly. • Erosion must be actively managed during all phases of the proposed development activities in order to abate the impact of silts being transported to the watercourse. • Erosion management procedures could include the use of silt traps, silt fencing, hay bale fences, etc to protect the wetland areas. • Topsoil stockpiles must be protected from erosion. • Ensure correct position of construction caps, equipment yards, refuelling depots, concrete batching plant etc. to avoid areas susceptible to soil and water pollution. • Ensure appropriate handling of hazardous substances. • Remediate polluted soil. • Recommendations as per the Geotechnical Report to be implemented. 		
<p>AIR QUALITY AND DUST</p> <p>The generation of dust associated with</p>	<ul style="list-style-type: none"> • Limitation of dust during the construction phase 	<ul style="list-style-type: none"> • Dust must be suppressed at construction areas during dry periods by the regular application of water or a biodegradable soil stabilisation agent. • Speed limits must be implemented in all areas, including public roads and private property to limit the levels of 	<ul style="list-style-type: none"> • ECO • Contractor 	<ul style="list-style-type: none"> • Ongoing by Contractor • Twice a month by ECO • Monthly report

IMPACT	OUTCOME/ OBJECTIVE	MITIGATION MEASURES/ACTIONS	RESPONSIBILITY	MONITORING FREQUENCY
construction activities & earthworks		dust pollution. <ul style="list-style-type: none"> It is recommended that the clearing of vegetation from the site must be selective and done just before construction so as to minimise erosion and dust. Excavating, handling or transporting erodible materials in high wind or when dust plumes are visible must be avoided. All materials transported to site must be transported in such a manner that they do not fly or fall off the vehicle. This may necessitate covering or wetting friable materials. No burning of refuse or vegetation is permitted. 		
VISUAL IMPACTS Visual impacts as a result of construction activities	<ul style="list-style-type: none"> Ensure that the construction site is not visually intrusive 	<ul style="list-style-type: none"> Site development to be limited to footprint area. The site must be managed appropriately and all rubbish and rubble removed to a permitted landfill site. Excess soil and bedrock must be disposed of at an appropriate facility. A certificate of disposal must be obtained for any waste that is disposed of. Excess concrete must be disposed of correctly and at an appropriate facility. No waste may be placed in any excavations on site. The construction camp must be located as far from other properties as possible. Lighting on site is to be sufficient for safety and security purposes, but shall not be intrusive to neighbouring residents, disturb wildlife, or interfere with road traffic. 	<ul style="list-style-type: none"> ECO Contractor 	<ul style="list-style-type: none"> Ongoing by Contractor Twice a month by ECO Monthly report
NOISE Noise as a result of construction activities	<ul style="list-style-type: none"> Reduce noise from construction activities impacting on neighbours and on the fauna residing on the site 	<ul style="list-style-type: none"> Noise levels shall be kept within acceptable limits, and construction crew must abide by National Noise Laws and local by-laws regarding noise. No sound amplification equipment such as sirens, loud hailers or hooters are to be used on site except in emergencies and no amplified music is permitted on site. Construction / management activities involving use of the service vehicle, machinery, hammering etc., must be limited to the hours between 7:00am and 5:30pm 	<ul style="list-style-type: none"> ECO Contractor 	<ul style="list-style-type: none"> Ongoing by Contractor Twice a month by ECO Monthly report

IMPACT	OUTCOME/ OBJECTIVE	MITIGATION MEASURES/ACTIONS	RESPONSIBILITY	MONITORING FREQUENCY
		<p>weekdays; 7:00am and 1:30pm on Saturdays; no noisy activities may take place on Sundays or Public Holidays.</p> <ul style="list-style-type: none"> • Activities that may disrupt neighbours (e.g. delivery trucks, excessively noisy activities etc.) must be preceded by notice being given to the affected neighbours at least 24 hours in advance. • Equipment that is fitted with noise reduction facilities (e.g. side flaps, silencers etc.) must be used as per operating instructions and maintained properly during site operations. 		
<p>TRAFFIC</p> <p>Disturbance caused by construction traffic</p>	<ul style="list-style-type: none"> • Prevent construction vehicles from disturbing the general public and environment 	<ul style="list-style-type: none"> • The Contractor is to ensure traffic safety at all times, and shall implement road safety precautions for this purpose when works are undertaken on or near public roads. • Construction vehicles to use public roads outside peak hours. • No construction vehicles exceeding defined speed limits. • Appropriate traffic safety signage will be provided to warn the public of construction traffic and flagmen must be on duty where traffic merges with normal road traffic. 	<ul style="list-style-type: none"> • ECO • Contractor 	<ul style="list-style-type: none"> • Ongoing by Contractor • Twice a month by ECO • Monthly report
<p>PRESSURE ON EXISTING INFRASTRUCTURE AND SERVICES</p>	<ul style="list-style-type: none"> • Minimise pressure on existing infrastructure and services 	<ul style="list-style-type: none"> • Integrity of existing services to be ensured. 	<ul style="list-style-type: none"> • ECO • Contractor 	<ul style="list-style-type: none"> • Ongoing by Contractor • Twice a month by ECO • Monthly report
<p>SOLID WASTE MANAGEMENT</p> <p>Refuse and waste produced during the construction phase</p> <p>Dumping of building material, rubble and any material used during construction or rehabilitation.</p>	<ul style="list-style-type: none"> • Ensure wastes are appropriately stored, handled and safely disposed of at a licensed waste facility • Ensure separation at source and recycling • Control of dumping of 	<ul style="list-style-type: none"> • It must be ensured that construction related waste or spillage and effluent do not affect the immediate and surrounding habitat boundaries. • Proper rubbish/waste bins to be provided. These to be emptied weekly and the waste to be removed to an official waste disposal site. Once again only by officially registered waste-disposal companies and only to official waste sites. • Domestic waste generated on site must be separated at source and recycled • Recycling of building material • Stripping and storage of topsoil for rehabilitation • Waste must not remain on site for more than 2 weeks 	<ul style="list-style-type: none"> • ECO • Contractor 	<ul style="list-style-type: none"> • Ongoing by Contractor • Twice a month by ECO • Monthly report

IMPACT	OUTCOME/ OBJECTIVE	MITIGATION MEASURES/ACTIONS	RESPONSIBILITY	MONITORING FREQUENCY
Stockpiled material	building material, rubble and any material used during construction or rehabilitation. <ul style="list-style-type: none"> • Manage stockpiled material 	<ul style="list-style-type: none"> • Waste disposal certificates must be obtained for any waste that is disposed of • No open fires to be made in the veld • No dumping of building material and rubble shall take place other than where it is required to be used as fill • All stockpiled material shall be controlled and shall be removed on the completion of construction • Methodology of storing topsoil to be approved by ECO • Waste disposal certificates must be obtained for stockpiled material that is disposed of. • To avoid compaction of soil and material left in heaps • Trucks removing excavated material must use existing roads • No waste may be placed in any excavations on site • Spoil must be disposed of at a licensed Landfill site • Waste disposal certificates must be obtained for any waste that is disposed of 		
POLLUTION Soil, surface and groundwater pollution	<ul style="list-style-type: none"> • Minimise soil, surface- and groundwater pollution 	<ul style="list-style-type: none"> • All hazardous materials such as but not limited to paint, turpentine and thinners must be stored appropriately to prevent these contaminants from entering the terrestrial and water environments. • Provide containment areas for potential pollutants at construction camps • Fuels and chemicals must be stored in adequate storage facilities that are secure, enclosed, bunded and lined • Any residue from spillages shall be removed from site by appropriate contractors. Handling, storage and disposal of excess or containers of potentially hazardous materials shall be in accordance with the requirements of the adjudicating authority or any other relevant department. • All vehicles must be regularly inspected for leaks. Re-fuelling must take place on a sealed surface area to prevent ingress of hydrocarbons into the topsoil; • In the event of a vehicle breakdown, maintenance of vehicles must take place with care and the recollection of spillage must be practiced near the surface area to 	<ul style="list-style-type: none"> • ECO • Contractor 	<ul style="list-style-type: none"> • Ongoing by Contractor • Twice a month by ECO • Monthly report

IMPACT	OUTCOME/ OBJECTIVE	MITIGATION MEASURES/ACTIONS	RESPONSIBILITY	MONITORING FREQUENCY
		<p>prevent ingress of hydrocarbons into topsoil and subsequent habitat loss.</p> <ul style="list-style-type: none"> • All spills should they occur, must be immediately cleaned up and treated accordingly. • Drip trays are to be utilised during daily greasing and re-fuelling of machinery and to catch incidental spills and pollutants • Drip trays are to be inspected daily for leaks and effectiveness, and emptied when necessary. This is to be closely monitored during rain events to prevent overflow • The Contractor must have a basic spill control kit available at each construction camp site and around the construction site. The spill control kits must include absorptive material that can handle all forms of hydrocarbon as well as floating blankets / pillows that can be placed on watercourses. 		
<p>SAFETY AND SECURITY</p> <p>Impacts on social well-being of general public and construction personnel</p>	<ul style="list-style-type: none"> • Ensure social well-being of general public and construction personnel 	<ul style="list-style-type: none"> • Signs must be erected on all entrance gates to the site camp indicating that no temporary jobs are available, thereby limiting opportunistic labourers and crime. • The site and crew are to be managed in strict accordance with the Occupational Health and Safety Act (Act No. 85 of 1993) and the National Building Regulations. • All structures that are vulnerable to high winds must be secured (including toilets). • Potentially hazardous areas such as trenches are to be cordoned off and clearly marked at all times. • The Contractor is to ensure traffic safety at all times, and shall implement road safety precautions for this purpose when works are undertaken on or near public roads. • Necessary Personal Protective Equipment (PPE) and safety gear appropriate to the task being undertaken is to be provided to all site personnel (e.g. hard hats, safety boots, masks etc.). • All vehicles and equipment used on site must be operated by appropriately trained and / or licensed 	<ul style="list-style-type: none"> • ECO • Contractor 	<ul style="list-style-type: none"> • Ongoing by Contractor • Twice a month by ECO • Monthly report

IMPACT	OUTCOME/ OBJECTIVE	MITIGATION MEASURES/ACTIONS	RESPONSIBILITY	MONITORING FREQUENCY
		<p>individuals in compliance with all safety measures as laid out in the Occupational Health and Safety Act (Act No. 85 of 1993) (OHSa).</p> <ul style="list-style-type: none"> • An environmental awareness training programme for all staff members shall be put in place by the Contractor. Before commencing with any work, all staff members shall be appropriately briefed about the EMP and relevant occupational health and safety issues. • All construction workers shall be issued with ID badges and clearly identifiable uniforms. • Access to fuel and other equipment stores is to be strictly controlled. • Emergency procedures must be produced and communicated to all the employees on site. This will ensure that accidents are responded to appropriately and the impacts thereof are minimised. This will also ensure that potential liabilities and damage to life and the environment are avoided. • Adequate emergency facilities must be provided for the treatment of any emergency on the site. • The nearest emergency service provider must be identified during all phases of the project as well as its capacity and the magnitude of accidents it will be able to handle. Emergency contact numbers are to be displayed conspicuously at prominent locations around the construction site and the construction crew camps at all times. • The Contractor must have a basic spill control kit available at each construction crew camp and around the construction site. The spill control kits must include absorptive material that can handle all forms of hydrocarbon as well as floating blankets / pillows that can be placed on water courses. • The Contractor shall make available safe drinking water fit for human consumption at the site offices and all other working areas. • Appropriate sanitary facilities must be provided for the 		

IMPACT	OUTCOME/ OBJECTIVE	MITIGATION MEASURES/ACTIONS	RESPONSIBILITY	MONITORING FREQUENCY
		<p>life of the construction phase and all waste removed to an appropriate waste facility.</p> <ul style="list-style-type: none"> The chemical toilets servicing the camp must be maintained in a good state, and any spills or overflows must be attended to immediately. At least 1 toilet must be available per 20 workers using the camp. Toilet paper must be provided. The Contractors site must be located on the high side of the site so any leakages or spillages will be contained on site. HIV AIDS awareness and education must be undertaken by all Contractor staff. 		
<p>ECONOMIC OPPORTUNITIES</p> <p>Employment opportunities for local community</p>	<ul style="list-style-type: none"> Make provision for local employment where possible. 	<ul style="list-style-type: none"> Make use of local labour Provide clear and realistic information regarding employment opportunities and other benefits for local communities in order to prevent unrealistic expectations. Provide skills training for construction workers. 	<ul style="list-style-type: none"> Contractor 	<ul style="list-style-type: none"> Ongoing by Contractor
<p>CONCRETE AND CEMENT PREPARATION AND HANDLING</p> <p>The use and preparation of concrete on site has the potential to impact negatively on the environment</p>	<ul style="list-style-type: none"> Concrete spills must be contained on site and mitigated. 	<ul style="list-style-type: none"> No mixed concrete may be deposited outside of the designated construction footprint. A batter / dagga board mixing trays and impermeable sumps must be provided, onto which any mixed concrete can be deposited whilst it awaits placing; and Concrete spilled outside of the demarcated area must be promptly removed and taken to a suitably licensed waste disposal site. Waste disposal certificates must be obtained for any waste that is disposed of. 	<ul style="list-style-type: none"> ECO Contractor 	<ul style="list-style-type: none"> Ongoing by Contractor Twice a month by ECO Monthly report
<p>STORM-WATER MANAGEMENT</p> <p>Stormwater flow and drainage</p>	<ul style="list-style-type: none"> Manage storm water flow and drainage 	<ul style="list-style-type: none"> It must be ensured that storm water is managed on site in a suitable manner. Special care must be taken during construction to ensure sediment rich storm water does not leave the site. 	<ul style="list-style-type: none"> ECO Contractor 	<ul style="list-style-type: none"> Ongoing by Contractor Twice a month by ECO After heavy rains Monthly report

IMPACT	OUTCOME/ OBJECTIVE	MITIGATION MEASURES/ACTIONS	RESPONSIBILITY	MONITORING FREQUENCY
<p>GRAVES, ARCHAEOLOGICAL AND OTHER HERITAGE SITES</p> <p>Destruction of cultural/heritage sites</p>	<ul style="list-style-type: none"> • Protection of cultural and heritage sites • Protection of graves 	<ul style="list-style-type: none"> • Ensure that construction staff members are aware that heritage resources could be unearthed and the scientific importance of such finds. • Ensure that heritage objects are not to be moved or destroyed without the necessary permits from the South African Heritage Resources Agency (SAHRA) in place 	<ul style="list-style-type: none"> • ECO • Contractor • PHRA-G • SAHRA • SAPS 	<ul style="list-style-type: none"> • Ongoing by Contractor • Twice a month by ECO • Monthly report
<p>EXCAVATIONS OF TRENCHES WITHIN THE FRESHWATER RESOURCES</p> <p>Disturbances of soils leading to increased alien vegetation proliferation, and in turn to further altered freshwater habitat</p> <p>Altered runoff patterns and alteration to flow patterns, leading to increased erosion and sedimentation of freshwater habitat.</p>	<ul style="list-style-type: none"> • Care should be taken during the removal of topsoil • Control excavation and trenching leading to stockpiling of soil within close proximity to the excavated area. 	<ul style="list-style-type: none"> • During trenching, the topsoil as well as the vegetation must be removed and be stockpiled outside of the buffer area. • Excavated materials (from the trenches) must not be contaminated and it must be ensured that the minimum surface area is taken up, however the stockpiles may not exceed 2m in height. Mixture of the lower and upper layers of the excavated soil must be kept to a minimum, so as for later usage as backfill material. • After installation of the pipelines and manholes, the open trenches must be closed immediately, in sections so as to ensure that no open trenches are left open for extensive periods. • Trenches must be backfilled with the stockpiled excavated materials. • Development within the freshwater resources provides the opportunity to rehabilitate the shores of the pan wetlands, which suffer profound impacts from large-scale dumping 	<ul style="list-style-type: none"> • Contractor 	<ul style="list-style-type: none"> • Ongoing by Contractor
<p>INSTALLATION OF SEWER AND WATER PIPELINES AND ASSOCIATED MANHOLES</p> <p>Erosion of the exposed trench</p> <p>Potential sedimentation of the</p>	<ul style="list-style-type: none"> • Ensure proper mixing and casting of concrete • Ensure placement of bedding material within the excavated trench underneath the pipelines 	<ul style="list-style-type: none"> • No contamination of surface and ground water may be allowed during the installation of the pipelines and manholes. 	<ul style="list-style-type: none"> • Contractor 	<ul style="list-style-type: none"> • Ongoing by Contractor

IMPACT	OUTCOME/ OBJECTIVE	MITIGATION MEASURES/ACTIONS	RESPONSIBILITY	MONITORING FREQUENCY
<p>freshwater resources</p> <p>Potential impacts on water quality and contamination of soils within the freshwater resources</p> <p>Potential of backfill material to enter the freshwater resources, increasing the sediment load within the freshwater resources</p> <p>Potential for over-compaction of soils within the freshwater resources.</p>				
<p>CLOSURE AND REHABILITATION</p> <p>Reduction in the potential of land if construction and construction camp sites are not rehabilitated</p>	<ul style="list-style-type: none"> • The Freshwater Resource Rehabilitation and Management Plan to be implemented. 	<ul style="list-style-type: none"> • To ensure that the rehabilitation of the construction area take place and the impact of these activities are limited. • Construction rubble must be collected and disposed of at a suitable landfill site. • All alien vegetation in the footprint area as well as immediate vicinity of the proposed development must be removed. Alien vegetation control must take place for a minimum period of two growing seasons after rehabilitation is completed. • Incorporate adequate erosion management measures in order to prevent erosion and the associated sedimentation of the watercourse areas. • All disturbed habitat areas must be rehabilitated and reseeded with an indigenous seed mixture as soon as possible to ensure that faunal habitat is re-instated 	<ul style="list-style-type: none"> • ECO • Contractor 	<ul style="list-style-type: none"> • Ongoing by Contractor • Twice a month by ECO • Monthly report

Table 6: Operational phase

IMPACT	OUTCOME/ OBJECTIVE	MITIGATION MEASURES/ACTIONS	RESPONSIBILITY	MONITORING FREQUENCY
FLORA AND FAUNA	<ul style="list-style-type: none"> • Protection of existing indigenous flora and fauna 	<ul style="list-style-type: none"> • Only existing roadways must be utilised during maintenance and monitoring activities to avoid indiscriminate movement of vehicles. 	<ul style="list-style-type: none"> • Applicant 	<ul style="list-style-type: none"> • Ongoing
WATERCOURSES ON SITE	<ul style="list-style-type: none"> • Protection of the watercourses on site. 	<ul style="list-style-type: none"> • Do not drive through watercourses unless over an existing bridge or road. 	<ul style="list-style-type: none"> • Applicant 	<ul style="list-style-type: none"> • Ongoing
ECONOMIC OPPORTUNITIES Employment opportunities for local community	<ul style="list-style-type: none"> • Make provision for local employment where possible. 	<ul style="list-style-type: none"> • None 	<ul style="list-style-type: none"> • Applicant 	<ul style="list-style-type: none"> • Ongoing
STORM WATER MANAGEMENT	<ul style="list-style-type: none"> • Ensure maintenance of storm water system 	<ul style="list-style-type: none"> • Regular maintenance of system. 	<ul style="list-style-type: none"> • Applicant 	<ul style="list-style-type: none"> • Ongoing
PRESSURE ON EXISTING INFRASTRUCTURE AND SERVICES	<ul style="list-style-type: none"> • Minimise pressure on existing infrastructure and services 	<ul style="list-style-type: none"> • Integrity of existing services in the area to be ensured. 	<ul style="list-style-type: none"> • Applicant 	<ul style="list-style-type: none"> • Ongoing
SERVICE PROVISION Contribute to the provision of quality basic services and infrastructure in the area	<ul style="list-style-type: none"> • Ensure efficient and operational quality basic services and infrastructure in the area 	<ul style="list-style-type: none"> • Provision of water and sewer services to the community • In order for the authorized Proposed Esselen Park Integrated Housing Development to proceed, bulk sewer and water pipelines need to be provided to drain the proposed development. 	<ul style="list-style-type: none"> • Applicant 	<ul style="list-style-type: none"> • Ongoing
FAILURE OF INFRASTRUCTURE Potential failure of infrastructure / possible leaks from the pipelines into the freshwater resources, causing incision and alteration of the hydroperiod of the freshwater resources and potential contamination	<ul style="list-style-type: none"> • Ensure that additional freshwater areas are not inundated as a result of leaks or bursting of the pipeline. 	<ul style="list-style-type: none"> • Ensure a quick response and attendance to the matter in case of a leakage or bursting of the pipeline. • The sewer line and manholes must be pressure tested for integrity upon the completion of construction. • It is recommended that the managing authority test the integrity of the sewer line at least once every five years or more often should there be any sign or reports of a leak. 	<ul style="list-style-type: none"> • Applicant 	<ul style="list-style-type: none"> • Ongoing

IMPACT	OUTCOME/ OBJECTIVE	MITIGATION MEASURES/ACTIONS	RESPONSIBILITY	MONITORING FREQUENCY
of freshwater soils, groundwater and surface water				
<p>REHABILITATION</p> <p>Failure to implement a rehabilitation plan during the operational phase</p>	<ul style="list-style-type: none"> • Ensure proper implementation of Freshwater resource rehabilitation and management plan 	<ul style="list-style-type: none"> • As excavating requires the use of heavy earth-moving machinery, the potential to compact wetland soils is high. Access into wetland zones must be via a single access route and vehicular movement outside of the designated access routes must be prohibited. • The impact area must be limited to the infrastructure zones as well as the immediate support and service areas (i.e. access roads). Indiscriminate habitat destruction through storage of materials, and driving vehicles outside of designated access routes must be avoided. • All activities and storage of materials that can take place outside of the wetland and buffer zones must preferably not be undertaken within wetland areas. • Soils that are removed from wetland zones during excavation must be stored within their respective layers and, once the pipelines have been established, reinstated in reverse order. This is done in order to conserve the correct soil layering within the wetland zones. • Soils must be stored next to the trench on a layer of shade cloth (or similar material) that will allow for the complete removal of soils from the storage area. This will allow for the quick and spontaneous rejuvenation of the underlying vegetation that would otherwise be smothered by persistent soil. This is, however, applicable only to short-term storage of soils. If the excavation is expected to 	<ul style="list-style-type: none"> • Applicant 	<ul style="list-style-type: none"> • Ongoing

IMPACT	OUTCOME/ OBJECTIVE	MITIGATION MEASURES/ACTIONS	RESPONSIBILITY	MONITORING FREQUENCY
		<p>remain open for a prolonged period, then it is recommended that soils be stored outside of the wetland zones.</p> <ul style="list-style-type: none"> • Once the excavation has been filled, the surface must be landscaped to mimic the natural topography. This is to ensure proper surface water drainage and the avoidance of gully erosion formation. • Impact areas must be revegetated with wetland plants that can be harvested from the existing wetland. Harvesting must be done from a wide area in order to limit the impact to the donor areas. • If the topography of the site is such that erosion is a concern from surface water runoff, then a geotextile must be utilised to further stabilise soils. • Soils can be further stabilised through the use of straw bales that can be anchored in place by hammering a wooden stake through the centre into the ground. A line of anchored straw bales is regarded as being very effective in curbing soil erosion. They are also preferable over the use of synthetic materials as they can be left in place as they will either be burnt during the flowing veld fire cycle or rot in place over time. • Wetland zones that have suffered compaction during the construction process must be shallow-ripped, landscaped and re-vegetated with wetland species found within adjacent wetland areas. 		

13 Site documentation, monitoring and reporting

13.1 What needs to be monitored

- Site clearance
- On-site sanitary facilities
- Excavation
- Community relations
- Removal of rubble
- Disposal of Material
- Construction activities
- Protection of buildings and structures
- Protection of the watercourse on site
- Construction of structures
- Progress in terms of construction programme
- Rehabilitation
- Re-vegetation

13.2 How, what procedures

- Site inspections by the ECO
- Site inspections by the Contractor
- Reporting to by the Project Manager

13.3 Recording of Information/Data

The standard site documentation shall be used to keep records on site. All documents shall be kept on site and be made available for monitoring purposes. The documentation shall be signed by all parties to ensure that such documents are legal.

The following documentation shall be kept on site:

- Environmental Authorisation
- Copy of the Environmental Management Programme

- Environmental Complaints register
- Environmental Incidents register
- Environmental Training register

13.4 Reporting

Who should be reported to?

- Applicant
- GDARD
- City of Ekurhuleni
- SAHRA
- PHRA-G

14 Post Construction Audit

A post construction environmental audit is to be conducted by the ECO in order to ensure that all conditions of the EMPr have been adhered to.

15 Amendments to the EMPr

The EMPr is to be submitted to the GDARD for approval prior to implementation. Any changes to the EMPr are to be indicated in the form of addendums.

ANNEXURE A

CURRICULUM VITAE OF EAP

CV for Delia de Lange

Family name: De Lange

First names: Delia

Profession: Environmental Consultant

Date of Birth 09 April 1978

Nationality: South African

Civil status: Single

Key Qualifications:

Institution (Date from-Date to)	Degree(s) or Diploma(s) obtained
University of Pretoria 1997 - 2000	LLB
University of Pretoria 2002 - 2004	BSc Geography
University of Pretoria 2005 - 2005	BSc (Hons) Geography
North-West University 2013 - 2015	Masters in Development and Management

Language skills:

Afrikaans : Native

English Speak, write and read (excellent)

Membership of professional bodies: IAIAAsa

Present position: Environmental Consultant

Years within the firm: 2007 - current

Specific experience in the region:

Country	Date from – Date to
South Africa: Strategic Environmental Assessment Project Management Environmental Management Community Facilitation Environmental law Environmental Management Policies and Programmes	2006 - current

Environmental Monitoring and Auditing Integrated Environmental Management Environmental Impact Assessments Sensitivity Analysis, Planning and Mapping Impact Evaluation and Significance Rating Structure Planning Social Impact Studies Environmental Mitigation and Control	
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Professional experience:

Date from – Date to	Location	Company	Position	Description
2006 - 2007	Kempton Park	EIM Environmental Services	Environmental Consultant	<ul style="list-style-type: none"> • Applications for the cell phone industry. Vodacom & MTN
2007- current	Pretoria	Lokisa Environmental Consulting CC	Environmental Consultant	<ul style="list-style-type: none"> • EIA/ Scoping applications • Basic Assessments • Water use licence applications • Facilitation of Projects; • Environmental Impact Assessments • Environmental Management Programmes

ANNEXURE B

ENVIRONMENTAL CODE OF CONDUCT

The applicant is committed to ensuring that the construction of the development is done according to the highest environmental standards so that the ecological footprint of the development is minimised where possible.

The applicant requires that all construction personnel involved in the construction process accept their responsibilities towards the EMPr and the environment. This includes all permanent, contract or temporary workers as well as any other person involved with the project or visiting the site. Ignorance, negligence, recklessness or a general lack of commitment will not be tolerated.

If you do not understand the rules you must seek assistance to ensure compliance. The following people can assist you in ensuring compliance with the EMPr.

Your Supervisor:

Environmental Control Officer:

Project Manager:

ANNEXURE D

ENVIRONMENTAL INCIDENTS REGISTER

Environmental Incidents Register						
Date	Incident	Action Required	Responsible Person	Action Implemented	Date Implemented	Action

