DRAFT ENVIRONMENTAL MANAGEMENT PROGRAMME

FOR

NKETOANA BULK WATER UPGRADING PROJECT (FREE STATE)

PREPARED FOR

NKETOANALOCAL MUNICIPALITY

ON BEHALF OF

RTT CONSULTING (PTY) LTD

PREPARED BY

NSVT CONSULTANTS

JULY 2019

Contents

1. INTRODUCTION

RTT Consulting (PTY) Ltd has appointed *NSVT Consultants* as independent environmental assessment practitioners to undertake an Environmental Impact Assessment as well as the Water Use License application process to ensure environmental compliance in terms of Environmental Management Amendment Act (NEMA) Act 107 of 1998, for the construction of water pipeline from Lindley WTW to the Leratswana reservoir along the R707 Provincial road. The construction of the water pipeline will take place Subsequent to NSVT Consultants completion of the draft Environmental Management Plan (EMPr) for the construction of a raw water pipeline upgrade from the Lindley Water Treatment Works towards the Leratswana reservoir in the Free State. Sections of the new pipeline development will have to adhere to environmental specialist recommendations outlined in the Ecological and Heritage Impact Assessments for the proposed route upon receipt of the Environmental Authorisation for the proposed new pipeline from the Department of Economic Small Business Development Tourism and Environmental Affairs, of which is the competent authority due to its location, Furthermore the draft EMPr will guide the contractor and the Resident Engineers on how to go about construction in an environmentally sensitive manner in the predominantly agricultural environment. There are multiple sections of the envisaged pipeline to be constructed that require a Water Use License, the Department of Water and Sanitation will in this instance require the engineering drawings as well as engineer's comments as to how the construction will commence in those water channel prone areas of the proposed route, the Department of Water and Sanitation will however provide guidance as to how construction must be conducted in the route proposed as to avoid any degradation of the natural water channels that may already exist between Lindley as well as Arlington.

2. DETAILS OF ENVIRONMENTAL ASSESSMENT PRACTITIONER

The curriculum vitae of the EAP is attached hereto as **Appendix A**.

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QUALIFICATIONS	B. Sc (Natural Science) B. Sc Hons (Wildlife)	**EXPERIENCE**	15 years working in the environmental management field as an EAP. She has completed environmental impact assessment, basic assessment, drafting of EMPRs and environmental compliance monitoring for various development within the Free State., North West, Northern Cape and Eastern Cape Provinces.
EXPERTISE/ TRAINING	Resources & Sustainability, Physical & Biological Environment and Informatics, 2006 Project Management for Environmental Management, 2006 Social & Economic Sustainability, 2006 Use of Matrices in EIA, 2008 Public Participation Training, 2010 Introduction to Social Impact Assessment, 2011 Integrating HIV/Aids and Gender related issues into EIA Process, 2013 Integrated Water Resources Management, Water Use Authorisation and Water Use License Application, 2013 One Environmental System-2015	**PROFESSIONAL AFFILIATE**	SACNASP Professional Natural Scientist-4000161/09 Member of International Association for Public Participation Southern Africa Affiliate-2010/ZA/FS/0001) Member of international Association for Impact Assessment SA-2191

3. PROJECT DESCRIPTION

3.1. BACKGROUND INFORMATION

The development site for the construction of the envisaged water pipeline is located in the Nketoana Local Municipality of which is situated approximately 219km outside of Bloemfontein. The new development consists of approximately 19.4km of new pipeline and will be laid within the vicinity of the R707 provincial road, the location of the chosen route is due to consultation with the relevant stakeholders (landowners) in the proposed area because of concerns over how the new construction of the pipeline might hinder the phonological agricultural potential of the route selected. The proposed water pipeline construction is influenced by the growing water demand within the Leratswana community in the Nketoana Local Municipality, limited water resources including seasonal and the growing population due to the cycle of harvesting the farming community. The Nketoana Local Municipality is faced with challenges of providing potable water to the residents of Leratswana well as Ntha effectively, this is primarily due to the dysfunctional bulk water infrastructure associated with the Local Municipality, the development will provide residents with potable drinking water which may reach all residents and meet the future water demands of population growth.

3.2 SENSITIVITY OF THE CONSTRUCTION SITE

The construction site on which the activity will be undertaken is fairly developed and is primarily used for agriculture, the findings of a field survey from Ecological specialist indicates the following:

- Clumps of the provincially protected aquatic bulb species *Crinum bulbispermum* were found to be present within the two significant ephemeral watercourses;
- Individuals of the provincially protected species *Erythrina zeyheri* & *Helichrysum nudifolium* were also found to be well represented within the extended terrestrial natural portions along the proposed pipeline route;
- Numerous small ephemeral water drainage lines and two significant ephemeral watercourses traverse the proposed pipeline route;
- The Eastern Free State Clay Grassland (Gm 3) and Central Free State Grassland (Gh 6) vegetation are nationally vulnerable therefore needs to be conserved;
- Rocky outcrop area could be utilised by various specialised reptilian species (snakes and lizards) as refuge and for breeding/persistence purposes;
- The surveyed area is relatively topographically flat and therefore there is minimal threat from erosion and the subsequent smothering of wetlands and nearby watercourses;
- Mitigation measures to reduce the overall significance of the proposed development activities should be taken into consideration.

It should be noted that, in order to conserve the ecological structures within the region, a holistic habitat conservation approach should be adopted. This includes keeping general habitat destruction and construction footprints to an absolute minimum within the terrestrial habitat as well. Conserving the habitat units will ultimately conserve the species communities that depend on it for survival. This can only be achieved by the efforts of the contractor during the various processes of the construction phase.

Sensitivity maps are compiled based on the information above and they are shown in *Figures 1, 2 and 3* below:

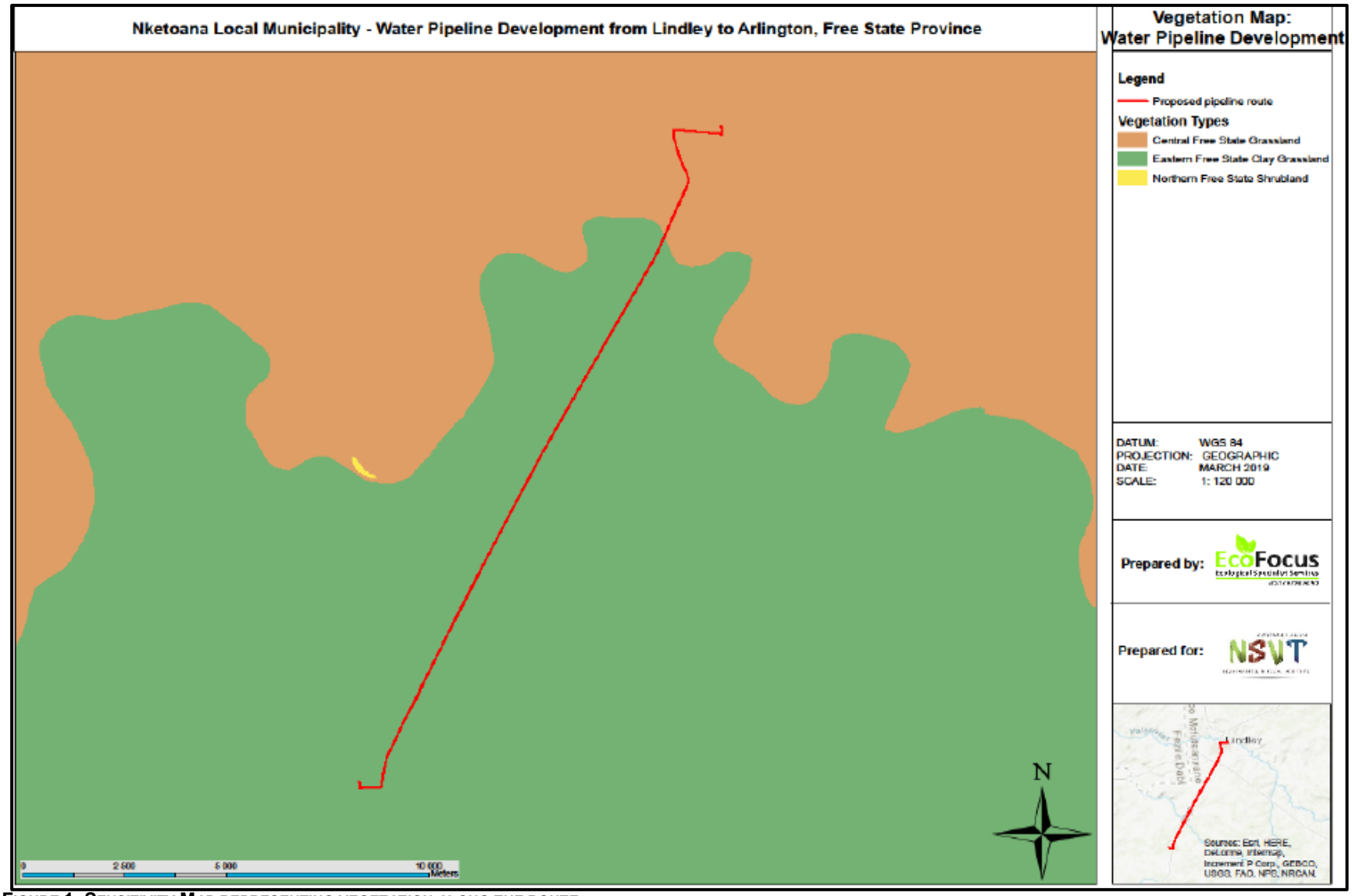

FIGURE 1: SENSITIVITY MAP REPRESENTING VEGETATION ALONG THE ROUTE

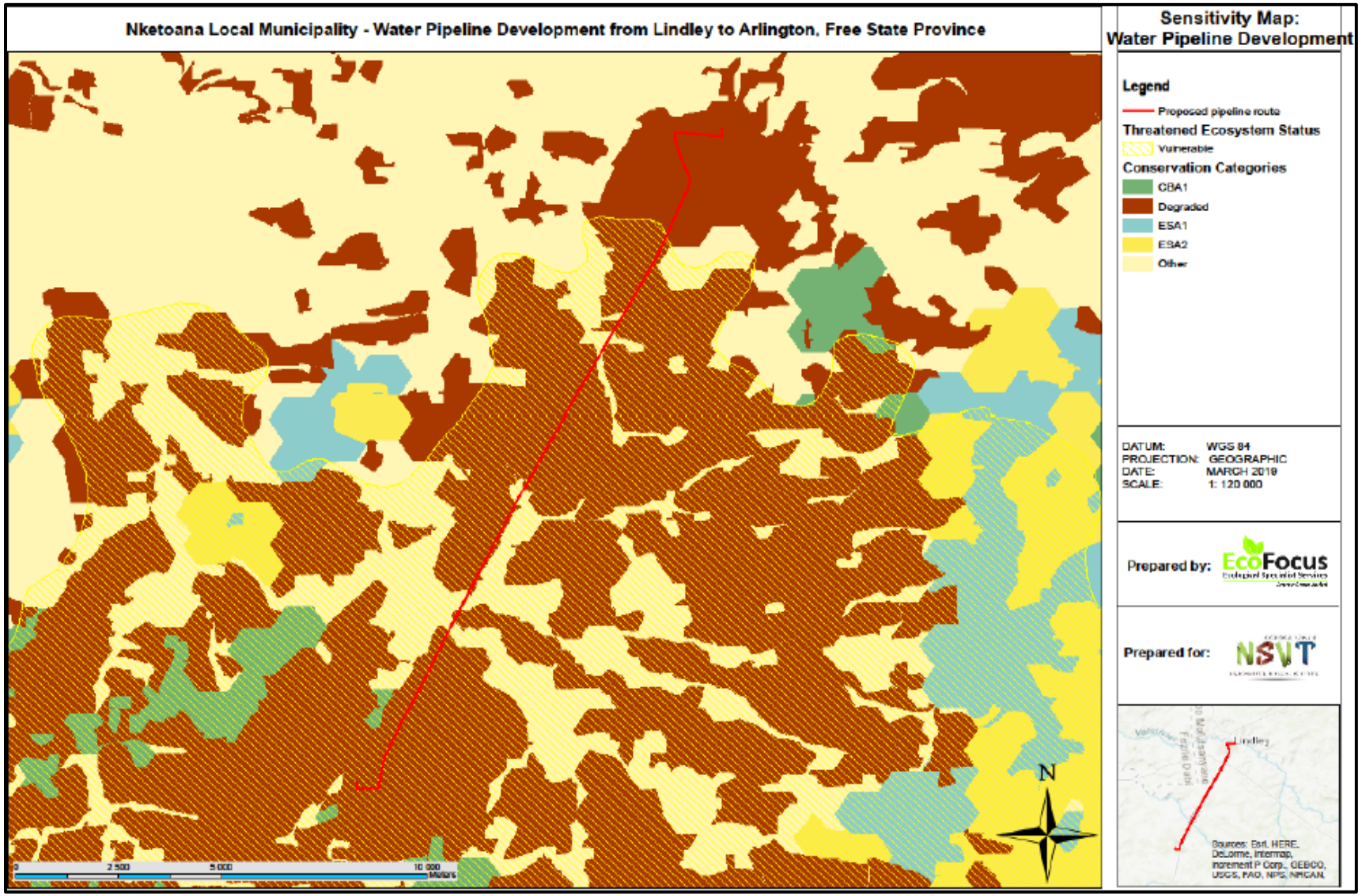

FIGURE 2: MAP DEPICTING CONVERSATION STATUS ASSOCIATED WITH PIPELINE DEVELOPMENT

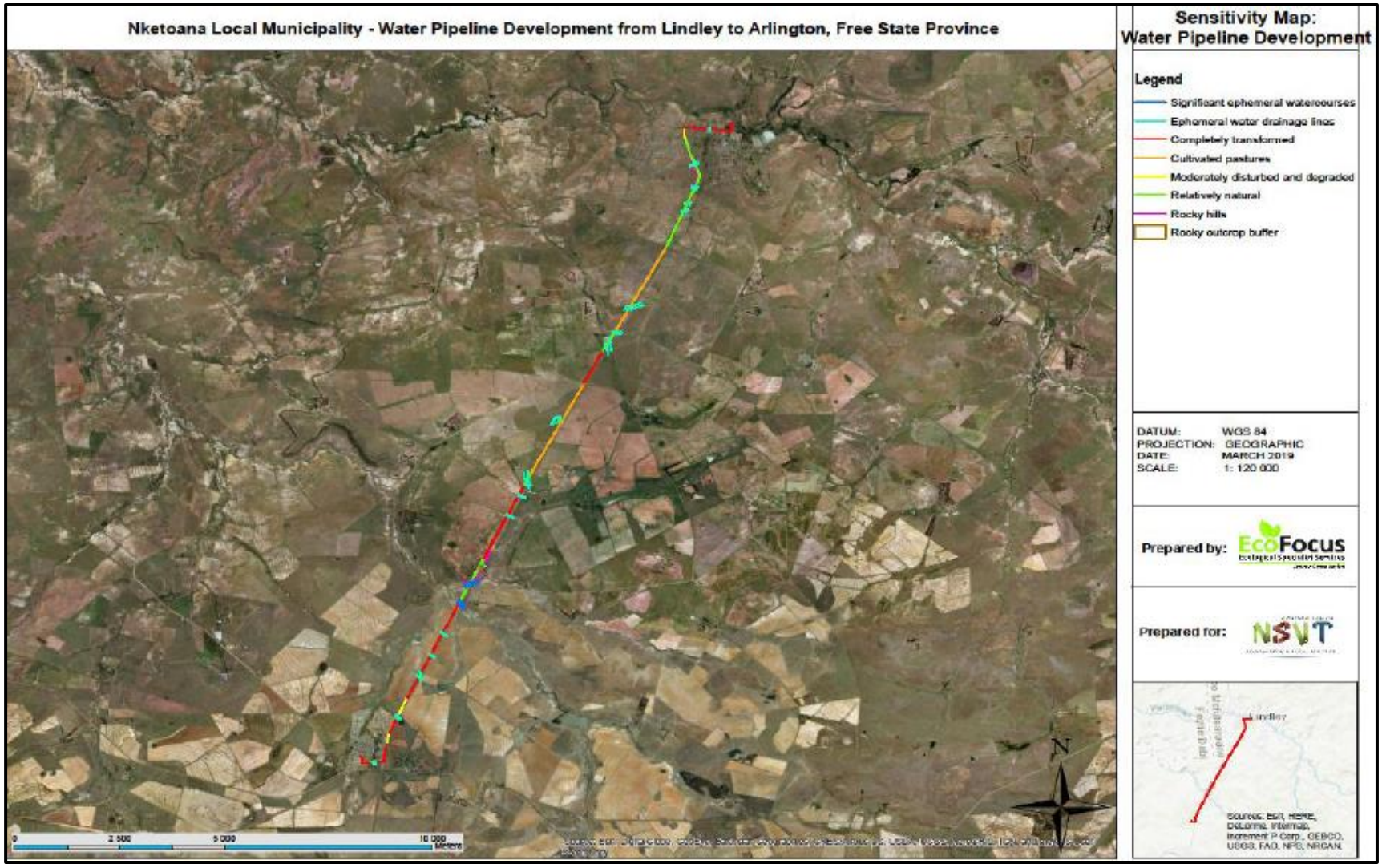

FIGURE 3: MAP ILLUSTRATING THE WATER CHANNEL CROSSINGS

4 CHECKLIST FOR THE PIPELINE PROJECT

1. Give a detailed description of the development:

The development of the pipeline construction consists of the following components:

- The water pipeline will be starting from the new high lift pump station at Lindley WTP to the existing reservoir in Leratswana. At Lindley WTP, the electrical capacity is available for new electrical panel and new pumps.

- The pipeline length will be approximately of 19.4Km considering a diameter of 250mm of uPVC material Class 16 and Class 9.

- Fittings and accessories will be recommended according with the pipe class.

- The calculated AADD (Average Annual Daily Demand) is 25.51l/s for Arlington and Leratswana area including farmers demand. The preferred option has the following advantages;

  More direct and less complex bulk supply pipe route,

  Ease constructability of the pipeline and pumping stations;

  Pumping station easily accessible from existing access road,

  Low high operational energy costs due to low pumping head.

- The following disadvantages will be encountered with regards to the preferred pipeline route;

  The pipeline will be running close to a grave yard before the reservoir in Leratswana and will be evaluated another route inside of township and will increase 600 meters of pipe,

  The lead times in resolving land issues.

2. Give a brief description of the surrounding area:

The pipeline is placed predominantly on private property whereby the purpose of the land is primarily of agricultural use for growing cash crops such as sunflower and maize. The are multiple drainage line that feed into the two first order rivers between Lindley and Arlington along the proposed route for development.

3. Is the project significantly different from the surrounding land use?

No, it is located on land that is solely of vast agricultural potential, this however will provide the farmers in the region receive adequate water from the municipality at any given moment during the phonological period of their farming cycles. Harvesting in time will not be hindered due to potable and readily available water for the two towns respectively.

4. <u>Are any of the following located on the site chosen for the development?</u>

i. River, stream, dam, wetland – Yes, there are man-made dams as well as ephemeral water drainage lines within the pipeline route.

ii. Open space area – Yes, it is vast open land for farming cash crops.

iii. Residential (formal or informal settlement) – Residential settlements are located on vast individual properties for the seasonal farm workers.

iv. Area of cultural importance, e.g. graveyards, old houses, museum, etc. – No areas of cultural importance exist apart from the sandstone outcrop near one of the two bridge crossings that should be avoided as indicated in the Heritage Impact Assessment report.

5. <u>Are there any protected areas close to the construction site?</u>

No, there are no protected areas within/near the route for the new pipeline constructed.

6. <u>Will the project be considered a noisy intrusion to the neighbours?</u>

No, the increased noise levels will be during construction, thereafter it will be general noise levels of the farming area and vehicles travelling on the R707.

7. <u>Would it be necessary to construct roads to access the construction site?</u>

No, there are existing access routes within the farm boundaries in order to access the proposed pipeline to commence and complete construction.

5 ENVIRONMENTAL MANAGEMENT PROGRAMME

5.1. INTRODUCTION

The EMPR has been divided into four different phases associated with the development, namely the pre-construction planning phase, the construction phase and operational phase. This draft EMPR will be considered a Final EMPR if approved by DESTEA. It should be read in conjunction with the contract documentation to ensure the contractor works in an environmentally sensitive manner, thus ensuring the impacts on the environment and neighbouring farm properties are kept to a minimum. Should there be any conflict between the EMPR and project specifications, then terms herein shall be secondary.

5.2 OBJECTIVES OF THE EMPR

The aim of the EMPR is to ensure that impact on the environment due to the construction of the new development is limited. To achieve this, the EMPR has the following objectives:

- To identify possible impacts of the proposed activity on the environment and mitigation thereof.
- To provide information on construction activities associated with the identified environmental issues.
- To provide guidelines for the management of the identified environmental issues.
- To provide guidelines to the responsible person to follow appropriate contingency plans in the case of various possible impacts.

5.3 RESPONSIBLE PERSON (S)

The implementation of this EMPR requires the involvement of various role players, each with specific responsibilities to ensure that the development is completed in an environmentally sensitive manner.

The Developer: Nketoana Local Municipality

Responsibility: To implement the final EMPr after approval by DESTEA before completion of the construction phase and ensure the constructed development complies with the NEMA requirements and the Environmental Authorisation.

The Project Consultants: *RTT Consulting (PTY) Ltd*

Responsibility: To undertake the detailed design for the pipeline development and to ensure that necessary permit has been obtained. To ensure the contractor sign the EMPr before completion of construction.

The Environmental Control Officer:

Responsibility:

- To ensure that the contractor implements the EMPr for the duration of the project from construction to post-construction (decommissioning of the asbestos pipeline).
- To review the method statements with the resident engineer.
- To maintain direct open line between the project consultant, contractor and the project steering committee (PSC).
- To audit the implementation of the EMPr and compliance to the environmental authorisation once a month until project completion.

The Contractor:

Responsibility:

- To implement the EMPr and keep a copy on-site for the duration of the construction phase because obligations imposed by the document are legally binding to environmental legislation.
- To comply with the Environmental Authorisation and undertake his construction activities in an environmentally sensitive manner and rehabilitation of the site.
- To undertake good housekeeping practices during duration of the project.
- To ensure that adequate environmental awareness training takes place in the language of the Employees.

Designated Environmental Officer:

Responsibility:

- To implement the environmental management plan.
- To maintain records of environmental queries for duration of the construction.
- To resolve environmental issues during the construction phase of the project.

The Project Steering Committee (Environmental Forum): A committee that comprises of representatives of the Project Consultants, Engineers, Councillor, Ward Committee, Local Community, Beneficiaries, Farmers and Contractor.

Responsibility:

- To monitor the implementation of the EMPr.
- To assist in sourcing general workers from the local community.
- To ensure participation of local contractors during construction.
- To assist in resolving social or environmental issues that may arise during construction.

5.4 METHOD STATEMENT

A method statement outlines construction activities to be undertaken with mitigation measures. The contractor should give a written statement to the resident engineer at least two weeks before the activity so that any irregularities can be handled before construction commences and also communicated to the Employees. The format of the method statement should clearly indicate the following:

1. Construction and Operational Procedures
2. Materials and Equipment used
3. How and where materials will be stored
4. When actions will be undertaken

Based on the EMPr specifications, the following method statements are required as a minimum:

- Site clearing
- Site layout and establishment
- Storage of hazardous substances and accidental spillages of hazardous substances
- Cement mixing
- Waste management procedures
- Wastewater management procedures
- Traffic accommodation
- Erosion remediation
- Fire control and emergency procedures

5.5 ENVIRONMENTAL AWARENESS TRAINING

The contractor and his Employees involved with the work on the construction phase are to be briefed on their obligation towards environmental protection and methodologies in terms of the EMPr prior to work continuing. The briefing should be done by the designated Environmental Officer prior to construction in the form of an on-site talk (toolbox talks).

The basic rules of conduct, which should be considered for the duration of the project, are tabulated below.

Table 1: Basic Conduct Rules during Construction

Do	Do Not
Use of toilet facilities provided and report	Make open fires for cooking, dedicated areas should be provided.
Clear your work areas of litter and building rubbish at the end of each day	Allow any cement bags or litter to be blown around
Report all leakages and/or spillages	Access the neighbouring properties without the owners' consent
Confine work and storage of equipment and comply with all safety procedures	Collect fire wood in neighbouring areas
Provide fire extinguisher in good working condition and easily accessible	Dispose of cigarettes and burning matches randomly
Use areas designated for food preparation	Do not leave food lying around
Only emergency repairs of construction vehicles is allowed on the construction site	Enter any fenced off neighbouring areas
Use all safety equipment and comply with all safety procedures	Dump any waste substance into the donga
Prevent excessive dust and noise	

5.6 RECORD KEEPING

There should be an up to date filing system at the site office for the duration of the project whereby method statements, environmental incidents report, training records, audit reports and public complaints register are kept. It is advised that photographs of the site should be taken pre-, during and post-construction as a visual reference. These records should be kept for a minimum of 2 years after completion of the project.

5.7 PENALTIES

In cases of transgressions and non-compliance to the EMPr by the contractor, he should be liable to a penalty fine. Transgressions should be recorded in a dedicated register and be kept at the site office for the duration of the project. The resident engineer will issue the penalties in terms of the severity on the environment; however, *Table 2* below may be used as a guideline.

Table 2: Penalties for Transgressions

TRANSGRESSION	PENALTY
Littering and bush-toileting	R1000
Concrete mixing on the ground	R2000
Spillages	R1000-R10 000 depending on the magnitude)
Soil erosion	R2000
Veld fires	R5000

The Draft Environmental Management Programme is outlined in *Table 3* below. Adherence to this plan during construction will ensure that the environmental impacts associated with the pipeline development will be mitigated to a greater extent thus promoting sustainable development. The commitment and co-operation of the identified responsible person(s) will ensure effective implementation of the EMPr pre-construction and post-construction; therefore it is imperative that there is file dedicated for Environmental Documentation.

Table 3: Draft Environmental Management Programme

ASPECT	POSSIBLE IMPACT	MITIGATION PLAN	RESPONSIBLE PERSON (S)	OBJECTIVES	FREQUENCY
1. PRE-CONSTRUCTION PHASE					
Project Contract and Programme	Adherence to the EMPR	◊ The EMPr must be included in the tender documentation and a copy of should be available on-site for the duration of the project. ◊ The environmental responsibilities should be formalized, and environmental awareness should be introduced to the labourers in their language as toolbox talks.	**CONTRACTOR & ENGINEERS**	Ensure that EMPr is adhere to	Frequency Once off
Location of Camp and Depot	Environmental damage	◊ The camp depot should be located in an area where Leratswana and Lindley residents as well as R707 road users are not disturbed or inconvenienced. ◊ The contractor should provide the project consultant/ engineer with the layout plan of the camp depot for approval before commencement with the construction phase. The plan should include site offices, temporary fencing boundary, sanitation facilities, waste and petroleum products storage facilities, stockpiling areas, etc. The parking of vehicles, storage of equipment and materials must strictly be confined to designated areas.	**CONTRACTOR & RESIDENT ENGINEERS**	Prevent environmental damage and disturbance of neighbouring land users	Frequency Once off

		◊ If located on the "virgin" ground, the area has to be rehabilitated once the project is completed.			
MANAGEMENT ACTION		A camp depot must be approved by the Resident Engineer			
Water Supply	Source of water during the construction phase.	◊ Potable water must be available at the camp depot, office site and construction site. It should be obtained from the Nketoana local municipality. ◊ No boreholes can be established without DWS approval.	**CONTRACTOR, ENGINEERS & MUNICIPALITY**	Prevent borehole establishment without DWS approval.	Frequency Once off
MANAGEMENT ACTION		A written agreement between the contractor and property owners or Water Use License			
Access Control	Hazards to livestock, and stealing of construction materials	◊ Fence or suitably secure main site office and material storage area. ◊ Unauthorized entry should be prohibited.	**CONTRACTOR AND ENGINEER**	Keep the site secure from trespassing or theft and keep animals out.	Frequency Once off
MANAGEMENT ACTION		Site access register and complaints book should be in place.			
Access route	Erosion and dilapidation of the access routes	◊ Upgrade the access routes used during construction to an acceptable condition. ◊ Proper maintenance should be done to ensure the quality of the access routes.	**CONTRACTOR, ECO & ENGINEERS**	Prevention of dilapidation of access route	Frequency Weekly
MANAGEMENT ACTION		Audit checklist, photographs			

ASPECT	POSSIBLE IMPACT	MITIGATION PLAN	RESPONSIBLE PERSON (S)	OBJECTIVES	MONITORING ACTION AND FREQUENCY
Power Supply	Safety Impacts	◊ Limit the power supply cables & ensure the safety of the workers and neighbouring residents. ◊ All health and safety laws and regulations should be adhered. ◊ A safety officer should be appointed to undertake safety audits.	**CONTRACTOR & ENGINEERS**	Implement safety measures	Frequency Monthly
MANAGEMENT ACTION		Safety Audits Report and Record keeping of all permits obtained from DWS			
Solid Waste	Littering/ Pollution of environment with waste materials	◊ Refuse receptacles with lids should be placed at the camp depot and on the construction sites. ◊ They should be easily accessible. ◊ System for regular waste removal must be set up. ◊ Refuse bins should be clearly marked to avoid mixing of hazardous and general waste. ◊ Letter or agreement between contractor and pollution control officers or companies dealing with hazardous waste should be on site.	**CONTRACTOR& ENGINEERS**	Prevent environmental pollution with waste materials and visual impact.	Frequency Duration of the Project
MANAGEMENT ACTION		Method Statement for storing, handling, and disposal of waste and Record keeping of all records			
Sewage	Pollution of environment with waste materials	◊ Adequate sanitation facilities e.g. chemical toilets must be provided at the camp depot and construction site. ◊ Bush toileting is prohibited ◊ Letter of consent from a registered waste facility to allow contractor to empty the toilet facility at their sewer	**CONTRACTOR & ENGINEERS**	Prevent environmental pollution	Frequency Duration of the project

		system should be in the environmental document.			
MANAGEMENT ACTION		Record keeping copies of all permits			
Social & Socio-Economic Aspects	Dissatisfaction	◊ A project steering committee (PSC), which comprises of the municipality, Engineers, contractors, farmers and community representatives must be convened and details of the project discussed. ◊ The PSC must meet regularly to address any concerns/ issues from the neighbouring land users and employing local labourers.	**CONTRACTOR, ENGINEERS & LANDOWNERS**	Ensure satisfaction of works and neighboring land users	Frequency Monthly
MANAGEMENT ACTION		Contravening of PSC meetings and Records of the Minutes			
ASPECT	**POSSIBLE IMPACT**	**MITIGATION PLAN**	**RESPONSIBLE PERSON (S)**	**OBJECTIVES**	**MONITORING ACTION AND FREQUENCY**
Health & Safety	Danger to the Farmers, Leratswana and Lindley community, especially children	◊ The site should be clearly demarcated for safety reasons and non-employees, neighbouring community and passerby shouldn't be allowed on the construction site as a precautionary measure. ◊ The contractor should provide employees with suitable equipment to protect them from hazards being presented and that will allow them to work without risk to the health in a hazardous environment, e.g. hard hats, gloves, boots, etc. ◊ Safety signs complying with SABS and SANS standards should be	**CONTRACTOR & ENGINEERS**	To avoid endangering of the community members in proximity to the pipeline construction.	Frequency Once off

		placed on-site in a manner clearly visible to the public. ◊ Construction methods should adhere to the Occupational Health and Safety Act (Act 85 of 1993). ◊ A safety officer should arrange a safety awareness meeting with the Lindley and Arlington community.			
MANAGEMENT ACTION		Risk register should be in place			
◊ **2. CONSTRUCTION PHASE**					

Water accumulation on farm properties.	Destruction of ephemeral streams along the pipeline route.	◊ Any soil that is removed for trenching within the ephemeral streams must be stored in their respective layers and returned to the excavation in reverse order. ◊ Soils must be stored outside of the drainage stream zones in order not to smother established vegetation growth in the drainage line. ◊ Adequate site reinstatement must be implemented in order to abate the formation of erosion through modification of the surface water hydrology. ◊ The movement of heavy machinery within stream crossings must be prohibited. ◊ Indiscriminate habitat destruction must be avoided and the construction footprint, including service and support areas should be kept to a minimum.	**CONTRACTOR & RESIDENT ENGINEER**	To avoid the complete destruction of the water drainage lines endemic to the region.	Frequency Throughout construction.

Flora	Loss of vegetation	◊ A specialist must be appointed to undertake a search and rescue prior to vegetation clearance. ◊ An Adequate plant relocation management plan must be compiled by a suitably qualified ecologist. ◊ It is recommended if any of the provincially protected aquatic bulb species *Crinum bulbispermum* are discovered in the ephemeral watercourse portions, they must be removed prior to commencement of any vegetation clearance. ◊ Land surveyor should flag sensitive areas prior to vegetation clearance. ◊ Topsoil must be reserved and used as a top layer on disturbed areas to enable plant succession. ◊ Mechanical tools should be used for vegetation clearance. ◊ Vegetation clearance should be confined to the development footprint and set out to avoid substantial vegetation disturbance. ◊ Rehabilitate denuded areas with appropriate species as per specifications. ◊ All excavations to be filled and rehabilitated before construction moves off sites. ◊ All declared aliens must be effectively cleared.	**CONTRACTOR, ENGINEER, AND ECO**	Prevent impacts on flora and destruction of red Data Species	<u>Frequency</u> Once off
MANAGEMENT ACTION		ECO audit check list, Photographs taken before the clearance of the site including unique site.			

ASPECT	POSSIBLE IMPACT	MITIGATION PLAN	RESPONSIBLE PERSON (S)	OBJECTIVES	MONITORING ACTION FREQUENCY
Topsoil	Loss of Topsoil	◊ Exposure of bare ground will be minimized. Topsoil stripping should be limited and it should be stored separately from subsoil, i.e. no mixing of soils. ◊ In situ material should be removed to an average depth of 1000mm. ◊ Cleared and grubbed topsoil must be stockpiled as a top layer of at least 150mm thickness on the backfilled trenches for rehabilitation purposes. ◊ Soil conservation measures such as berms, gabions and mats should be used on-site to help reduce erosion. ◊ Topsoil stockpile should be weed free ◊ Litter should be removed from the stockpiled topsoil.	**CONTRACTOR, ENGINEER AND ECO**	Conserve and protect topsoil from erosion and deterioration	Frequency Weekly
MANAGEMENT ACTION		ECO audit check list, photographs			

ASPECT	POSSIBLE IMPACT	MITIGATION PLAN	RESPONSIBLE PERSON (S)	OBJECTIVES	MONITORING ACTION AND FREQUENCY

Topography	Disturbing the natural topography	◊ The natural ground levels within the servitude are to be retained. ◊ Trenches, soil dumps and other working areas should be rounded-off to ensure the disturbed area(s) blend in with the natural environment and the possibility of erosion is minimized. ◊ All the excavations should be backfilled to avoid being used as illegal dumping sites. ◊ Rehabilitation by covering the disturbed areas should hasten the succession process and minimize potential erosion. ◊ It is recommended the identified locally unique rocky outcrop area must be adequately buffered out of the proposed development footprint area if practically possible.	**CONTRACTOR, ENGINEER AND ECO**	Minimize the disturbance of topography	Frequency Duration of the project
MANAGEMENT ACTION		ECO audit check list			
Land Use	Impact on current land use	◊ The land use will not be change significantly, the development will be compatible with the surrounding land use on completion of the construction phase and farming lands for sunflower and maize shall be available within the surrounding area.	**CONTRACTOR, ENGINEER AND ECO**	Avoid impacts on current land use	Frequency Weekly

ASPECT	POSSIBLE IMPACT	MITIGATION PLAN	RESPONSIBLE PERSON (S)	OBJECTIVES	MONITORING ACTION AND FREQUENCY
MANAGEMENT OUTCOME		ECO Audit Report, Safety Audit report and Complaints Register			
Air Quality	Nuisance and reduction in visibility	◊ Occasional wetting of the access routes and construction site must be done by means of a water tanker pipe to keep the dust down and vehicles should drive at 40km/h speed.	**CONTRACTOR, ENGINEER AND ECO**	To avoid dust from excavated materials and unnecessary visual impact caused by site operations	Frequency Twice a week
Noise	Nuisance	◊ Construction should be limited to normal working days and office hours from 08h00 to 17h00. ◊ Ensure that employees and staff conduct themselves in an acceptable manner while on site, both during work hours and after hours. ◊ Limit working hours of noisy equipment to daylight hours, ◊ Fit silencers to equipment.	**CONTRACTOR, ENGINEER AND ECO**	To avoid excessive noise generation from site operations	Frequency Duration of Contract
Solid Waste	Littering/ Pollution	◊ All waste should be appropriately separated, contained and disposed be removed from the site to Nketoana solid waste site during the construction period. ◊ Reduction, reuse and recycling of waste should be introduced. ◊ Illegal dumping should be forbidden. ◊ Toolbox talks should include a component of waste management.	**CONTRACTOR, ENGINEER AND ECO**	Provide facilities for appropriate collection and disposal of sewage	Frequency Weekly

		◊ No dumping of builders rubble earth or other materials within the servitude area ◊ Good housekeeping practices.			
Sewerage	Pollution of the receiving environment.	◊ Adequate sanitation facilities i.e. 15 employees per facility should be provided. ◊ The toilets should be located at least 50m from the construction site. ◊ They should be kept clean and hygienic regularly to ensure that they are usable. ◊ Effluent must not be discharged into natural environment and bush-toileting is prohibited.	**CONTRACTOR, ENGINEER AND ECO**	Provide facilities for sanitation	Frequency Weekly
Cement mixing	Pollution of soils, surface and groundwater	◊ Mixing of cement should be done at specifically selected areas on mortar boards or similar structures to contain surface run-off. ◊ Cleaning of cement mixing equipment should be done on proper cleaning trays. ◊ No cement or cement containers should be left lying around.	**CONTRACTOR, ENGINEER AND ECO**	Avoid polluting soil and groundwater	Frequency Weekly
Water Supply	Source of potable water during the construction phase.	◊ Potable water must be available at the camp site and construction site in clearly marked containers.	**CONTRACTOR, ENGINEER AND ECO**	Water supply must be available	Frequency Weekly

ASPECT	POSSIBLE IMPACT	MITIGATION PLAN	RESPONSIBLE PERSON (S)	OBJECTIVES	FREQUENCY
Power Supply	Safety Impacts	◊ Limit the power supply cables & ensure the safety of the workers and neighbouring residents. ◊ All health and safety laws and regulations should be adhered. ◊ No stockpiling of construction material within the pipeline servitude. ◊ Ground clearance has to be maintained as it is within the servitude. ◊ No construction or excavation shall be executed within 10 meters of the pipeline route. ◊ Should there be a need to operate mechanical equipment, including mechanical excavators in the vicinity of the pipeline servitude, permission should be sought from the contractor or resident Engineer.	**CONTRACTOR, ENGINEER AND ECO**	Avoid health and safety impacts	Frequency Weekly
Energy Efficiency	Saving of fossil fuels	◊ Manual labour should be used as much as possible rather than machinery to conserve fossil fuels.	**CONTRACTOR, ENGINEER AND ECO**	Saving of fossil fuels by means of using labour intensive work.	Frequency Weekly

ASPECT	POSSIBLE IMPACT	MITIGATION PLAN	RESPONSIBLE PERSON (S)	OBJECTIVES	MONITORING ACTION AND FREQUENCY
Stormwater	Contamination of stormwater	◊ Stormwater must be diverted from the construction works. ◊ Stormwater control works must be constructed, operated and maintained in a sustainable manner throughout the project. ◊ Construct and operate the necessary collection facilities and storm water management systems such as diversion berms, ditches, drains, oil separation sumps, gross water ways etc. to prevent contamination of any water. ◊ Stormwater leaving the construction site must in no way be contaminated by any substance produced, stored, dumped or spilled on site. ◊ Washing areas should be designated and contaminated water channeled through an existing system. ◊ No contaminated water should be allowed to run freely into the drainage channels. ◊ The construction footprint through the watercourse and drainage lines must be rehabilitated as soon as	**CONTRACTOR, ENGINEER AND ECO**	Avoid contamination of storm water	Frequency Weekly

		practically possible after construction to ensure the continuation of flow and ecological integrity.			
Soil erosion	Erosion	◊ Exposure of bare ground should be minimized and topsoil stripping limited to the development footprint excluding open spaces and this should be cordoned off. ◊ Ensure correct drainage of areas. ◊ No stockpiling should be allowed within the protective buffer zone of drainage lines and seasonal streams. ◊ All the areas disturbed during construction work needs to be landscaped to a standard similar or better than before on completion of the works before replacement of topsoil. ◊ Make use of geotextiles within disturbed areas of steeper topography to avoid erosion through surface water runoff. ◊ Avoid steep-cut banks of watercourses or drainage lines ◊ Correct site reinstatement and landscaping following any disturbances will abate channel and gulley formation.	**CONTRACTOR, ENGINEER AND ECO**	Prevent soil Erosion	Frequency Weekly

Traffic Impact	Safety/ Traffic Impacts	◊ The vehicle construction should limit speed to 40km/h and also be considerate of the surrounding land users. ◊ Only drivers with valid licenses should be allowed to drive the construction vehicles.	**CONTRACTOR, ENGINEER, ECO AND TRAFFIC OFFICER**	Minimize the disruption of road users	frequency Weekly
Fire Hazard	Risk of veld fires	◊ No open fires are permitted in the construction site, except under strictly controlled conditions subject to the National Veld and Forest Act, (Act No. 101 of 1998). ◊ The contractors and labourers should be informed and advised on the associated risks, dangers and damage of property caused by accidental fires and how to prevent them. ◊ Fire extinguishers should be made available at the construction site, and the labourers should be informed of their location and shown how to use them. ◊ Restrict smoking activities to demarcated smoking activities.	**CONTRACTOR, ENGINEER AND ECO**	Prevent veld fires.	Frequency Weekly
Vehicle Servicing Areas	Pollution	◊ Vehicle servicing should be done at the identified camp depot on impermeable surfaces to minimize the likelihood of petrochemical spills on soil. In the case of	**CONTRACTOR, ENGINEER AND ECO**	Prevent soil Erosion	Frequency Weekly

		accidents polluted soil should be appropriately treated or taken away to an appropriate site. ◊ Used spares must be collected and disposed of in the correct manner. Oils must be drained into a suitable container, transferred to a larger storage container, and then supplied to oil recycling companies. ◊ Oil may under no circumstances be disposed off into the sewer lines, storm water system, stream, or the ground. ◊ All construction equipment and vehicles will be cleaned before entering the site to reduce chances of spreading weeds and non-native species.			
Areas of Palaeontological, Cultural and/or Historical Importance	Disturbance of important scientific artefacts	◊ Should fossil material be discovered later, it must be appropriately protected, and the discovery reported to a palaeontologist for the removal thereof as per SAHRA legislation. ◊ Should any human skeletal remains be found during excavations, work must stop in the area. The findings should	**CONTRACTOR, ENGINEER AND ECO**	Prevent disturbance of historical scientific artefacts.	Frequency Duration of the Contract

		be reported immediately to SAHRA. ◊ Heritage protocol for incidental finds outlined in the Heritage Impact Assessment report should be followed.			

ASPECT	POSSIBLE IMPACT	MITIGATION PLAN	RESPONSIBLE PERSON	OBJECTIVES	MONITORING ACTIONS AND FREQUENCY
3. POST CONSTRUCTION PHASE					
Aesthetic view of the area	Aesthetic pollution	◊ The site must be clear of litter and all waste and builders' rubble must be removed and disposed to the Leratswana or Lindley landfill site. ◊ All stockpiles must be removed to spoil or handled as directed by the engineers. ◊ Spoil heaps should be flattened to the similar adjacent ground, to prevent soil erosion, thus encouraging natural revegetation. ◊ All excavations should be backfilled, levelled properly and compacted. ◊ All surfaces hardened due to construction must be ripped and material imported thereon be removed. ◊ The original site topography should be restored where as much as possible. ◊ All disturbed areas should be revegetated with indigenous grass to ensure progressive plant succession. Topsoil should be applied at cleared	**CONTRACTOR, ENGINEER AND ECO**	Prevent pollution	Frequency Once off

		area and where material was stockpiled for this purposed. ◊ A final audit must be completed before the contractor may leave the site to ensure that all requirements were adhered to. ◊ A meeting must be held between the stakeholders to ensure that the site has been restored to a satisfactory condition. ◊ The contractor should rehabilitate the site when construction is completed, thus a detailed rehabilitation plan should be provided by the contractor.			

ASPECT	POSSIBLE IMPACT	MITIGATION PLAN	RESPONSIBLE PERSON	OBJECTIVES	FREQUENCY
4. OPERATION PHASE					
Waste management	Littering	◊ All excavations should be backfilled ◊ Illegal dumping should be prohibited. ◊ Transfer station should be established for storing of general waste.	**CONTRACTOR AND RESIDENT ENGINEER**	Prevent littering	Frequency Weekly
Water Supply	Water scarcity as a result of the development	◊ The municipality will supply water to the area. ◊ The area will have communal taps within 200m radius.	**MUNICIPALITY**	Water supply security for the construction labourers	Frequency During Operation
Stormwater	Management of storm water systems	◊ Management of all storm water systems to keep them in working condition, ◊ Storm water handling to be done according to prevent erosion.	**CONTRACTOR AND RESIDENT ENGINEER**	Prevent soil erosion	Frequency Yearly before rainy season
Sewerage	Contamination of groundwater resources	◊ The development will be serviced chemical toilets. ◊ The contractor should have an agreement with the service provider as to ensure that the toilets are emptied in a place allocated for such purpose	**CONTRACTOR AND RESIDENT ENGINEER**	Prevent pollution	Frequency During Operation

6 AUDIT AND MONITORING

Compliance monitoring provides useful information for determining environmental performance for the duration of the project. Information gained can also be used to determine how effective mitigation plans might be in achieving objectives of the EMPr, the corrective actions undertaken are adequate and whether any modifications are required. The resident engineer (project manager) should monitor overall aspects of the project, e.g. labour issues and complaints raised by the community, so they can be addressed thoroughly involving the Project Steering Committee. A designated Environmental officer should be on site for the duration of the project to ensure that the conditions of the EA and EMPr are adhered to. The ECO should monitor construction activities at least once a month and the monthly reports should be compiled and presented to the PSC for discussion if need be. It is highlighted that regular meetings between the resident engineer, site manager and ECO should be held to ensure that anticipated environmental impacts are within predicted levels, e.g. noise generation and the implementation of the EMPr is effective.

APPENDIX A

CV OF THE ENVIRONMENTAL ASSESSMENT PRACTITIONER