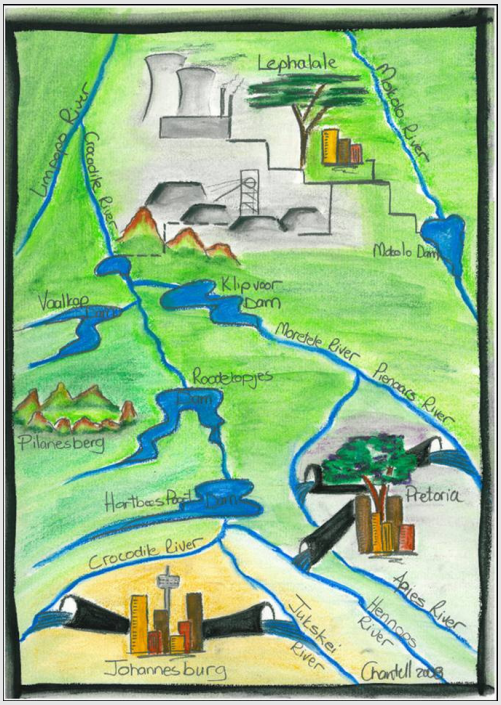
water affairs
Department:
Water Affairs
REPUBLIC OF SOUTH AFRICA

MOKOLO AND CROCODILE RIVER (WEST) WATER AUGMENTATION PROJECT (MCWAP)

Phase 1: Augment Supply from Mokolo Dam



ENVIRONMENTAL MANAGEMENT PLAN

DRAFT

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LIST OF ACRONYMS

Acronym	Description
DEA	Department of Environmental Affairs
DWA	Department of Water Affairs
EAP	Environmental Assessment Practitioner
ECO	Environmental Control Officer
EIA	Environmental Impact Assessment
EMC	Environmental Monitoring Committee
EMP	Environmental Management Plan
EMPR	Environmental Management Programme Report
EMS	Environmental Management System
I&AP	Interested and Affected Party
LIHRA	Limpopo Heritage Resources Authority
MCWAP	Mokolo Crocodile (West) Water Augmentation Project
PSP	Professional Service Provider
TCTA	Trans-Caledon Tunnel Authority

DEFINITIONS

Auditing

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

Catchment

All the land area from mountaintop to seashore, which is drained by a single river and its tributaries.

Debushing

Clearing of the site of bush and undergrowth vegetation, but not including the removal of tree stumps.

Environment

The surroundings in which humans exist and which comprise:

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

Environmental Aspect

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

Environmental Authorisation

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

Environmental Awareness Training Course

A presentation given to the Contractor and its Sub-Contractors to raise environmental awareness and ensure that all staff, Contractor(s)s and Sub-Contractors are familiar with or made aware of the contents of the environmental authorisation and the EMP.

Environmental Feature

Elements and attributes of the biophysical, economic and social environment.

Environmental Impact

The change to the environment resulting from an environmental aspect (an activity) on the environment, whether desirable or undesirable. An impact may be the direct or indirect consequence of an activity.

Environmental Impact Assessment (EIA)

The process of examining the environmental effects of a development in terms of the National Environmental Management Act (Act 107 of 1998) and the Environmental Impact Assessment (EIA) Regulations (Government Notice No. R385, R386 and R387).

Environmental Management Plan (EMP)

A detailed plan of action prepared to ensure that recommendations for enhancing positive impacts and/or limiting or preventing negative environmental impacts are implemented during the life-cycle of a project.

Environmental Objective

Overall environmental goal pertaining to the management of environmental features.

Environmental Performance Certificate

The certificate issued by the Environmental Control Officer at the end of a Contract confirming that all environmental specifications applicable to the Contractor have been met.

Environmental Specification

Instructions and guidance for specific construction activities designed to help prevent, reduce and/or control the potential environmental implications of these activities.

Environmental Target

Performance requirement that arises from the environmental objectives and that needs to be set and met in order to achieve those objectives.

Evaporation

The change by which any substance (such as water) is converted from a liquid state into and carried off in vapour.

Floodplain

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

Groundwater

Subsurface water in the zone in which permeable rocks, and often the overlying soil, are saturated under pressure equal to or greater than atmospheric.

Heritage Resource

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

Landscape

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

Monitoring

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

Natural Vegetation

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

Overburden

The soil overlying desirable material extracted during borrowing or quarrying.

Pollution

Any change in the environment caused by substances, radioactive or other waves, or noise, odours, dust or heat, emitted from any activity, including the storage or treatment of waste or substances, construction and the provision of services, whether engaged in by any person or an organ of state, where that change has an adverse effect on human health or well-being or on the composition, resilience and productivity of natural or managed ecosystems, or on materials useful to people, or will have such an effect in the future.

Progressive Reinstatement

Reinstatement of disturbed areas to topsoil profile on an ongoing basis immediately after selected construction activities (e.g. backfilling of a trench) are completed. This allows for passive rehabilitation (i.e. natural recolonisation by vegetation) to commence.

Protected Plants

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

Red Data Species

Plant and animal species officially listed in the Red Data Lists as being rare, endangered or threatened.

Rehabilitation

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

Riparian Vegetation

Vegetation occurring on the banks of a river or a stream (i.e. vegetation fringing a water body).

Runoff

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

Sensitive environmental features

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

Subsoil

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

Topsoil

This is defined as the A horizon of the soil profile. Topsoil is the upper layer of soil from which plants obtain their nutrients for growth. It is often darker in colour, due to the organic (humic) fraction, but regardless of the fertility appearance, structure, agriculture potential, this profile constitutes the topsoil.

Transplanting

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

Veld

Unimproved areas of natural vegetation.

Wastewater

Means water contaminated by the project activities.

Watercourse

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

Waterlogged

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

Weeds and Invader Plants

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

Wetland

A seasonally, temporarily or permanently wet area, often exhibiting a specific vegetation community, for example, sedges, rushes, reeds, hydrophilic grasses, ground-covers and trees.

1. INTRODUCTION

Large parts of the Mokolo River catchment area are located on the Waterberg coalfields where, according to preliminary estimates, almost half of South Africa's in-situ coal reserves are situated. As such, the Waterberg has long been considered the country's major coal resource for the future, especially once the current mining areas in the Witbank-Highveld coalfields of the Mpumalanga province have been depleted. As a result, major developments are planned for the Lephalale area, which include:

- Construction of Eskom's Medupi Power Station (presently underway);
- Development of further Eskom power stations;
- Possible development of power stations by Independent Power Producers;
- Extension of the Exxaro mining operations and further mines;
- Possible petrochemical industries to be developed around the coal field further west of Lephalale;
- Possible exploitation of gas; and
- Accelerated growth in the population in the area.

As a direct result of the above developments, the demand for water in the Lephalale area will significantly increase over the next 20 years.

Due to the limited availability of water in the Lephalale area, the Department of Water Affairs (DWA) commissioned a feasibility study of the Mokolo Crocodile (West) Water Augmentation Project (MCWAP) to establish how the future water demands could be met. The phases for the proposed infrastructure for transferring water from the Mokolo Dam and Crocodile River (West) are tabulated below.

Table 1: MCWAP Components

Component	Brief Overview
Phase 1	An underground pipeline parallel to the existing pipeline, to augment the supply from Mokolo Dam. This is to supply in the growing water requirement and also to supply more water for the interim period until a transfer pipeline from the Crocodile River (West) can be implemented. The system will utilise the available yield from Mokolo Dam. Phase 1 consists of the following: • Rising main from Mokolo Dam to Wolvenfontein balancing dam; • Gravity line from Wolvenfontein to Matimba Power Station; • Gravity line from Matimba Power Station to Steenbokpan; and • Break pressure tank at Rietspruitnek.
Phase 2	Transfer scheme from the Crocodile River (West) at Vlieëpoort near Thabazimbi to the Lephalale area via a system consisting of: • A weir and abstraction infrastructure, including a balancing dam, desilting woks, and a high lift pumpstation at Vlieëpoort (near Thabazimbi); • Transfer system (approximately 100 km of underground pipeline): consisting of various alternative pipeline routes; • A Break Pressure Reservoir; • An Operational Reservoir; and a • Delivery system, consisting of alternative routes for a gravity pipeline (underground) running from the Operational Reservoir to the Steenbokpan area, connecting to the Phase 1 works.
De-bottlenecking	De-bottlenecking of the existing pipeline that stretches from Mokolo Dam to Lephalale, which belongs to Exxaro. This entails the construction of the first 9km of the proposed underground gravity pipeline (for Phase 1) from Wolvenfontein balancing dam, with interconnections to the existing pipeline. The intention of the de-bottlenecking is to improve the hydraulic gradient at Rietspruitnek, where the existing pipeline passes over a high point.

This document serves as the Environmental Management Plan (EMP) for the MCWAP Phase 1 component. Note that this EMP is to be updated to incorporate any conditions stipulated in the environmental authorisation (should it be granted) and it should also take cognisance of further discussions with stakeholders affected by the proposed project.

2. OBJECTIVES OF THE EMP

The EMP provides performance criteria required to address potential environmental impacts during the life-cycle of a project (i.e. pre-construction, construction, operation and decommissioning phases). This Report must be read in conjunction with the MCWAP Phase 1 Environmental Impact Assessment (EIA) Report.

According to Lochner (2005), the objectives of the EMP include the following:

- Ensuring adherence with regulatory authority stipulations and guidelines (local, provincial, national and/or international);

- Ensuring sufficient provision of resources on the project budget so that the scale of EMP-related activities is consistent with the significance of project impacts;
- Verifying environmental performance through information on impacts as they occur;
- Responding to changes in project implementation not considered in the EIA;
- Responding to unforeseen events; and
- Providing feedback for continual improvement in environmental performance.

3. SCOPE OF THE EMP

The scope of the MCWAP Phase 1 EMP is as follows:

- Establish management objectives during the project life-cycle in order to enhance benefits and minimise adverse environmental impacts;
- Provide targets for management objectives, in terms of desired performance;
- Describe actions required to achieve management objectives;
- Outline institutional structures and roles required to implement the EMP; and
- Provide legislative framework.

Note that the MCWAP is to be implemented in accordance with a TCTA ISO 14001 aligned Environmental Management System (EMS).

4. ENVIRONMENTAL ASSESSMENT PRACTITIONERS

Nemai Consulting was appointed by DWA as the independent Environmental Assessment Practitioner (EAP) to undertake the environmental assessment for MCWAP. The members of Nemai Consulting that were involved with compiling the MCWAP Phase 1 EMP are provided below.

Table 2: Person involved with compiling MCWAP Phase 1 EMP

Name	Qualifications	Experience
Mr D. Henning	MSc (Aquatic Science)	9 years experience. Prepared EMPs and acted as the ECO on various projects, including: • 80km bulk water pipeline from Randfontein to Rustenburg; • Fish barrier on the Mooi River upstream of Spring Grove Dam; • Johannesburg Water sanitation and water supply projects for 2003/2004 and 2004/2005 financial years.
Ms. S. van Eden	BA. Hons (Geography and Environmental Management)	5 years experience. Prepared EMPs for various projects, including: • Golf Estate Development in Randfontein; • Micro Community Development in the Cradle of Humankind; • Railway line and related infrastructure at the Port of Richards Bay.
Mr S. Pienaar	BSc Hons (Environmental Management)	4 years experience. Prepared EMPs and acted as the ECO on various projects, including: • Northern Waste Water Treatment Works, Unit 5 Expansion; • Zandspruit pumpstation and rising main; • Olievenhoutbosch Extension 37, bulk services and reticulation; • Rehabilitation of Derelict Asbestos Mines in North West and Northern Cape Provinces.

5. ENVIRONMENTAL ACTIVITIES, ASPECTS AND IMPACTS

5.1 Project Components

5.1.1 Abstraction Pump Station at Mokolo Dam

A new pump station will be constructed at the Mokolo Dam directly downstream of the existing pump station but at a higher level to ensure that the pump station is not flooded under the Probable Maximum Flood event. The new station will take water directly from

Mokolo Dam via one suction pipeline connected to both outlet pipes from the dam, giving 100% standby capacity for the outlet works.

5.1.2 Pipeline

The philosophy employed in selecting the route of the new rising main was to remain alongside existing linear infrastructure (e.g. roads, existing Exxaro pipeline) and farm boundaries where the environment has already been disturbed, thus minimising the potential environmental impacts.

The pipeline specifications are presented in the table to follow.

Table 3: MCWAP Phase 1 Pipeline Specifications

Pipe diameter	:	Up to 2400 mm
Pipe material	:	Steel pipes with welded joints. Pipes to be lined and coated to safeguard against rusting (and associated impacts on water quality) and lengthen their lifespan.
Installation	:	• Underground, with a minimum cover above the pipe of 1.0m. • Access/valve chambers will be located at approximately 500 m intervals along the route. It will be concrete structures protruding slightly above natural ground level.
Servitude Width	:	Typically up to 40 m to allow for future expansion.
Servitude Conditions	:	• Permanent access to the pipeline servitude will be required after construction. • Pipeline markers (concrete posts) will be installed at changes in direction and at regular intervals along the route • Farming activities (stock and crop farming) can continue within the servitude area after construction, taking cognisance of the need for permanent access to the pipeline servitude.

The following facilities and structures normally associated with pipelines will be installed en-route:

- Air valves;
- Scour valves;
- Pipe access points;
- Road crossings;
- River crossings;

- Cathodic protection system;
- AC-mitigating system;
- Protective measures required to curb surge in a pipeline such as, reflux valves, surge tank(s);
- Any bulk off-takes that may be agreed on by DWA; and
- Farmers off-takes (directly impacted landowners only) following negotiations with DWA.

The methodology for the installation of the pipeline is as follows:

1. Pegging of route;
2. Marking of protected trees;
3. Remove topsoil in construction area and stockpile separately for later re-instatement;
4. Excavate pipe trench;
5. Install and compact pipe bedding;
6. Install pipe sections by means of side booms (special cranes) and weld joints;
7. Repair field joints and backfill and compact pipe trench in layers;
8. Construct valve and access chambers;
9. Re-shape the impacted area to its original topography and replace stripped topsoil;
10. Install final Cathodic Protection measures; and
11. Install pipeline markers.

Watercourse crossings will generally consist of pipe sections encased in concrete in accordance with the relevant DWA criteria. The typical construction methodology for a river crossing is as follows:

- An earthen berm (coffer dam) and temporary bypass canal is constructed to divert the water around the construction site.
- The trench is excavated across the dry river channel
- A concrete bedding is constructed first, followed by the installation and restraining of the pipe to prevent flotation. Encasement is completed by the construction of further concrete lifts.
- Once the concrete has set, the temporary coffer dam is removed and the bypass canal backfilled to re-instate the flow.

- The impacted area is re-shaped to its original topography.
- The disturbed area is rehabilitated.
- If erosion of the disturbed river banks is a concern, suitable measures will be implemented to ensure the stabilisation of the river structure.

5.1.3 Break Pressure Tank at Rietspruitnek

A Break Pressure Tank with storage capacity between 3000 m^3 and 5000m^3 may be required for the optimum hydraulic solution at Rietspruitnek, on the Farm Fancy 556LQ. It is envisaged that this structure, if required, will be a water retaining, reinforced concrete structure (tank diameter 25m-35m, height 5 -10m) with a flat concrete roof.

5.2 Project Life-cycle Approach

During its lifecycle, projects journey through four distinctive phases, as presented in **Figure 1**.

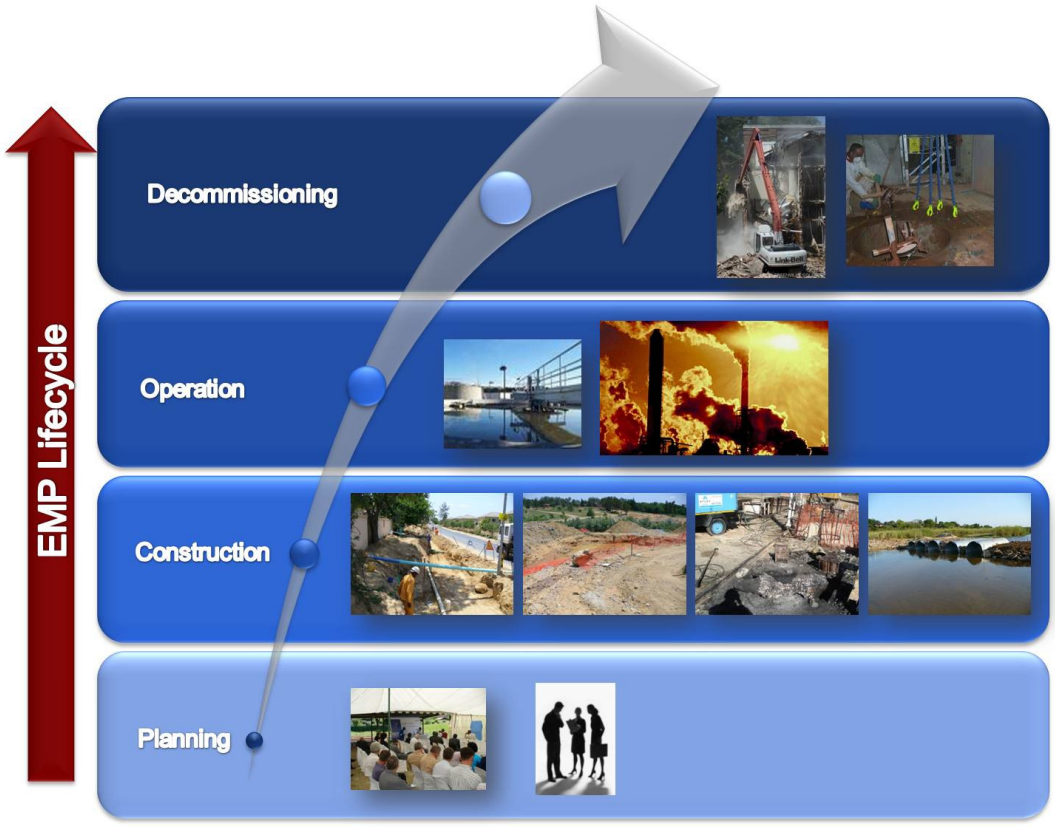

Figure 1: Four Generic Phases of a Project Lifecycle

Likewise, the activities, aspects, impacts and management measures to follow for MCWAP Phase 1 are categorised under the following main sections:

- Pre-construction;
- Construction;
- Operation; and
- Decommissioning.

5.3 Project Activities

In order to understand the impacts related to the project's components it is necessary to unpack the associated activities required to implement the project, as shown below:

Pre-construction
Project Activities
• Detailed engineering design
• Detailed geotechnical investigations
• Geophysical investigations
• Survey and mark construction servitude
• Survey and map topography for determination of post-construction landscape, rehabilitation and shaping
• Survey river cross-sections for post-construction river bank reinstatement
• Possible removal of trees within construction servitude
• Arrangements with individual landowners and/or land users
• Procurement process for Contractors

Construction
Project Activities
• Environmental awareness creation
• Ongoing consultation with affected parties
• Site clearing
• Site establishment

• Prepare access
• Fencing arrangements
• Establish construction camps
• Storage and handling of material
• Construction employment
• Diverting utilities
• Building
• Blasting
• Mixing of concrete
• Cut and cover activities
• Concrete work
• Spoil material generation and management
• Refuelling
• Wastewater management
• Create and manage borrow pits
• Management of topsoil
• Waste management
• Management of flora
• Management of fauna
• River crossings
• Managing construction sites

Operation
Project Activities
• Access arrangements and requirements
• Routine maintenance inspections
• Pipeline scouring
• Repair and maintenance works
• Ongoing consultation with directly affected parties

5.4 Environmental Aspects

Environmental aspects are regarded as those components of an organisation's activities, products and services that are likely to interact with the environment. The following environmental aspects have been identified for MCWAP Phase 1, which are linked to the project activities:

Pre-construction
Environmental Aspects
• Construction site planning and layout
• Management of geotechnical investigations

Construction
Environmental Aspects
• Environmental awareness creation
• Ongoing consultation with affected parties
• Site clearing
• Site establishment
• Management of access
• Fencing arrangements
• Disruptions to existing services
• Management of topsoil
• Management of trenching
• Management of storage and handling of material
• Management of storage and handling of hazardous material
• Management of borrow pits and quarries
• Management of blasting
• Management of workshop and equipment maintenance
• Management of labour force
• Management of ablution facilities
• Management of construction camp and eating areas
• Management of waste

• Management of water
• Management of pollution generation potential
• Management of flora
• Management of fauna
• Management of watercourses
• Management of archaeological and cultural features
• Management of reinstatement and rehabilitation

Operation
Environmental Aspects
• Management of access, routine maintenance and maintenance works
• Management of leaks
• Management of pipeline scouring

Decommissioning
Environmental Aspects
• Management of structures
• Management of vegetation

5.5 Sensitive Environmental Features

Cognisance must be taken of the following sensitive environmental features that should be afforded additional care and protection:

- Steep areas encountered along the pipeline route include the section on the Farm Witbank 647LQ and at Rietspruitnek on the Farm Fancy 556LQ. Measures to prevent erosion would need to be adopted for these areas.
- Watercourse crossing, namely at the Mokolo River (tributary only), Rietspruit (tributary and main stem), Kutangspruit (tributary and main stem) and Sandloop River (tributary and main stem), could adversely affect resource quality (i.e. flow, water quality, habitat and aquatic biota).
- For groundwater resources, care must be taken when blasting in close proximity to boreholes.

- Apart from the areas adjacent to existing linear disturbances, the vegetation along the Phase 1 pipeline route has a high conservation priority, especially on game farms. Important flora species along the route include *Acacia erioloba*, *Adansonia digitata, Boscia albitrunca*, *Combretum imberbe*, *Sclerocarya birrea* subsp. *caffra*. Maintaining floral biodiversity by managing exotic species is also crucial.
- Animals on game farms require specific measures to ensure that risks and disturbances are adequately managed.
- Special care should be exercised to minimise traffic disruptions along the R510 road, access road to Mokolo Dam, the new road around the Medupi power station in the already degraded area and other lower order roads which are situated alongside to the pipeline route.
- Informal dwellings in Steenbokpan in the area that belongs to the Phumolong Community Trust.
- Heritage resources identified along pipeline route include:
  - Main Route -
    - Cemetery on the Farm Goedgedacht;
    - Farm house on the Farm Goedgedacht;
    - Hennie de Lange's Kafee Theunispan; and
    - Steenbokpan Bosveld Drankwinkel.

5.6 Environmental Impacts

Environmental impacts are the change to the environment resulting from an environmental aspect, whether desirable or undesirable. Significant environmental impacts associated with MCWAP Phase 1 are shown in **Table 4**.

Table 4: Significant environmental impacts associated with MCWAP Phase 1

CONSTRUCTION PHASE	
Feature	**Impact**
Watercourses	• The pipeline crossings of the Mokolo River (tributary only), Rietspruit (tributary and main stem), Kutangspruit (tributary and main stem) and Sandloop River (tributary and main stem) could lead to the alteration of the structure (i.e. bed and banks), damage to the riparian habitat, lead to increased siltation (water quality deterioration) and adversely affect aquatic biota (e.g. clogging of gills, influence movement).

Soil	• Erosion on steep slopes. • Loss of topsoil. • Impacts associated with the establishment of borrow pits. • Blasting-related impacts. • Impacts associated with the disposal of large quantity of spoil material.
Geohydrology	• Disturbance of the aquifer from blasting
Flora	• Damage to / removal of protected trees and medicinal plants. • Damage to riparian vegetation at river crossings. • Encroachment by exotic species, with subsequent loss of biodiversity.
Fauna	• Poaching. • Obstruction of movement. • Preventing access to watering points. • Harm from construction activities. • Loss of animals due to improper access control.
Air	• Impacts associated with the dust from use of dirt roads, transportation of fill and spoil material and from bare areas.
Noise	• Impacts associated with the noise emanating from construction activities (e.g. vehicle movement, trenching, generators).
Aesthetics	• Impacts to visual quality of the area through poor housekeeping and construction-related activities.
Safety and Security	• Impacts associated with trench collapse. • Impacts associated with the uncontrolled access. • Criminal activities associated with construction.
Waste	• Impacts associated with the use of veld for ablution purposes. • Land, air and water pollution through poor waste management practises.
Construction camp	• Impacts associated with the siting of construction camp – visually obtrusive, vegetation clearing, poaching, security. • Impacts associated with the improper storage of material.
Socio-economic aspects	• Damages to property, including structures, fencing, gates, animals. • Impacts associated with the establishment of temporary construction servitude. • Loss of income (e.g. temporary loss of agricultural land, influence to eco-tourism activities) due to construction-related activities. • Impacts associated with the influx of job seekers. • Use of local labourers and suppliers, as far as possible (positive impact). • Damage to property and risk to residents of the Phumolong Community Trust.
Heritage	• Damage to heritage resources.
Infrastructure and Services	• Damage to existing river crossings at the Rietspruit main stem and eastern tributary. • Influence to traffic along roads (particularly R510, access road to Mokolo Dam, and new road around Medupi). • Damage to dirt road to Wolvenfontein through use by heavy vehicles. • Traffic disruptions due to use of R510 and major road network by trucks delivering pipe material.

OPERATIONAL PHASE	
Feature	**Impact**
Watercourses	• Impacts associated with the de-stabilisation of encased pipeline at river crossing or tie-ins at riverbanks. • Erosion during scouring.
Flora	• Spreading of exotic vegetation and associated loss of biodiversity.
Fauna	• Obstruction of movement of aquatic biota at river crossings.
Socio-economic aspects	• Impacts associated with the potential restriction or curtailment of water use downstream of the Mokolo Dam. • Impacts associated with land use restrictions as a result of registration of permanent servitude / extension of existing Exxaro pipeline servitude.
Aesthetics	• Visual impacts associated with aboveground infrastructure (i.e. access/valve chambers at approximately 500m intervals along the route; pipeline markers; Break Pressure Tank).
Infrastructure and Services	• Continual use of maintenance road will lead to erosion and damage to road surface.
Operation & Maintenance	• Construction-related impacts for any maintenance related work to pipeline infrastructure.
Watercourses	• Should the encased pipeline crossings be removed, the characteristics of the watercourse (i.e. flow, habitat, water quality and aquatic biota) could potentially be adversely affected.
Aesthetics	• Impacts to visual quality of the area during the demolition of aboveground structures.
Waste	• Improper disposal of waste material generated during the demolition of structures.
Agricultural Potential	• Impacts associated with land use restrictions within servitude. • Agro-economical impact. • Possible impacts to food security.

6. ENVIRONMENTAL LEGAL FRAMEWORK

Construction will be undertaken according to recognised best industry practices and will include measures prescribed within this EMP. This EMP shall form part of the contract documents, and informs the Contractor about his duties in the fulfilment of the project objectives, with particular reference to the mitigation of environmental impacts caused by construction activities associated with the project. The Contractor will note that obligations imposed by the EMP are legally binding in terms of environmental legislation.

All project activities must comply with all relevant South African legislation and regulations. All environmental statutory requirements should be included in the

Contractors' conditions. Specific legislation that must be complied with includes, but is not necessarily limited to:

- Constitution of the Republic of South Africa, (No. 108 of 1996);
- National Environmental Management Act (No. 107 of 1998);
- National Environmental Management Protected Areas Act (No. 57 of 2003);
- Environmental Conservation Act (No. 73 of 1989);
- National Water Act (No. 36 of 1998);
- Animal Protection Act (No. 71 of 1962);
- Atmospheric Pollution Prevention Act (No. 45 of 1965);
- Conservation of Agricultural Resources Act (No. 43 of 1983);
- Constitution of South Africa (No. 108 of 1996);
- Hazardous Substances Act (No. 15 of 1973);
- Mineral and Petroleum Resources Development Act (No. 28 of 2002);
- National Environmental Management: Biodiversity Act (No. 10 of 2004);
- National Environmental Management: Waste Act (No. 59 of 2008);
- National Heritage Resources Act (No. 25 of 1999);
- National Veld and Forest Fire Act (No. 101 of 1998);
- Occupational Health and Safety Act (No. 85 of 1993);
- Limpopo Environmental Management Act (No. 7 of 2003); and
- Explosives Act (No. 15 of 2003).

The following authorisations will be required for MCWAP Phase 1:

1. Approval required from DEA for listed activities associated with the project. Scoping and EIA conducted under National Environmental Management Act (No. 107 of 1998), in accordance with the EIA Regulations (GN No. R385, R386 and R387 of 21 April 2006).
2. Permit to be obtained under National Forests Act (No. 84 of 1998) if protected trees are to be cut, disturbed, damaged, destroyed or removed.
3. Permit to be obtained from Limpopo Heritage Resources Authority (LIHRA) under the National Heritage Resources Act (No. 25 of 1999) if heritage resources are to be impacted on.

4. Environmental Management Programme to be submitted for approval to DMR for burrow pits, under the Minerals and Petroleum Resources Development Act (No. 28 of 2002).
5. Blasting permits are required from DMR in accordance with the Explosives Act (No. 26 of 1956).
6. All wastes (general and hazardous) generated during the construction may only be disposed of at appropriately licensed sites in terms of National Environmental Management: Waste Act (No. 59 of 2008).
7. Hazardous substances must be stored and handled in accordance with the appropriate legislation and standards, which may include the Hazardous Substances Act, the Occupational Health and Safety Act, relevant associated Regulations, and applicable SABS and international standards.
8. Should portable sewage treatment works be required, based on the available capacity of the Paarl Sewage Treatment Works at the time of construction, then the necessary authorisation must be sought in terms of the National Water Act (No. 36 of 1998) and NEMA, if applicable.
9. Construction Regulations (2003) published under the Occupational Health and Safety Act (No. 85 of 1993) apply to construction activities including “the moving of earth, clearing of land, the making of an excavation, piling, or any similar type of work”. A “health and safety plan” which addresses hazards identified, and includes safe work procedures to mitigate, reduce or control the hazards identified, is required under this Act.

7. AGREEMENTS & NEGOTIATIONS

7.1 Between Developer and DEA

DWA, through the Trans-Caledon Tunnel Authority (TCTA) as its implementing agent, must supply the Department of Environmental Affairs (DEA) with the following legal agreements and information before construction commences:

- An agreement stating that TCTA knows and understands the contents of the EMP and that he / she is able and shall comply with all legislation pertaining to the nature of the work to be undertaken and all things incidental thereto.
- TCTA must agree to provide DEA with the names and contact details of the persons who will be responsible for ensuring and monitoring of compliance to the EMP, before construction commences.
- TCTA will provide DEA with details on the construction timeframes including a detailed description of the phasing of the project.

7.2 Between TCTA, the Engineer and Landowner

- The negotiations with the landowners for the registration of the servitude will be undertaken by TCTA. The land rights acquisition strategy will adhere to all statutory requirements, as per the Promotion of Administrative Justice Act (No. 99 of 2000), the Expropriation Act (No. 63 of 1975) and the National Water Act (No. 36 of 1998). Further compensation for actual loss claims will be dealt with on a case by case basis.
- Permission and the right for the establishment of a Contractor's Camp on private land. A written contractual agreement regarding the specific terms and conditions of the use of the land, should be developed between the landowner and TCTA. The Contractor may not commence with any activities related to Contractor's Camp establishment, prior to the signing of the contractual agreement by the landowner.
- TCTA and the Engineer must negotiate with the landowners and adjacent landowners for permission and the right to make use of access roads / private roads during the construction and operational phases. Negotiations should include details on who will

be responsible for the maintenance and repair of access roads damaged during construction and operation, and details on the timeframes in which repairs should take place. A written contractual agreement regarding the specific terms and conditions of the use, maintenance and repair of the roads should be developed between the landowner, TCTA and the Engineer. No construction related vehicles may make use of access roads or private roads prior to the signing of the contractual agreement by the landowner.

- The landowner should formally request information regarding the construction programme and details on the preparation of the site for construction, as well as details on the construction activities which will be undertaken on the landowner's property, prior to the commencement of construction activities. The construction activity details could include the following:
  a) Layout plan showing the exact location of the proposed pipeline, the width of the construction and final servitude, the location of the air valves, scour valves and pipe access points;
  b) Activities involved in the preparation of the site to commence with construction activities, and the timeframe in which this will be undertaken;
  c) Details on the temporary fencing which will be erected on site during the construction phase, e.g. fencing alongside the construction servitude or trenches, around construction camp sites, and temporary perimeter fences;
  d) Details on repairs and re-construction of permanent fencing which was damaged or removed during the construction activities. This should include details on the materials which will be used and proposed construction timeframe;
  e) Details on how fencing will be maintained, frequency of inspections, and the response timeframe for the repair of damaged fencing;

  These matters need to be agreed upon upfront by the Engineer and TCTA in the form of a baseline survey and questionnaire to identify special conditions and needs to be met.

  An agreement between the landowner and TCTA and the Engineer should be signed as proof that the landowner agrees to all the above and that rehabilitation will be undertaken to the satisfaction of the landowner.

No formal agreements between the landowners and the Contractor will be allowed without the approval of the Engineer and acceptance of TCTA.

7.3 Between DWA and Registered Water Users

- Matters pertaining to compensation for water use restrictions (if applicable) to be discussed with registered water users.

7.4 Between DWA and Landowners

- Negotiations for off-take points from the new MCWAP Phase 1 pipeline for stock watering and domestic use purposes.

7.5 General Information to be supplied to the Landowner

1. TCTA will make copies of the approved Construction EMP available to any landowner, on request.
2. The following matters need to be agreed upon upfront by the Engineer and TCTA in the form of a baseline survey and questionnaire to identify special conditions and needs to be met:
    a. Water reticulation pipelines associated with the current off-take points from the existing pipeline. Measures should be put in place to protect these pipelines.
    b. Measures required to manage risks associated with working on farms where hunting activities are undertaken.
    c. Existing infrastructure that could potentially be affected by the project.
    d. Access arrangements for the Contractor and the landowners.
    e. Landowner access to firebreak roads.
    f. Vegetation of importance.
    g. Fencing requirements and standards for construction and permanent servitudes.

8. ORGANISATIONAL STRUCTURE

The institutional and staffing arrangements for MCWAP are presented below.

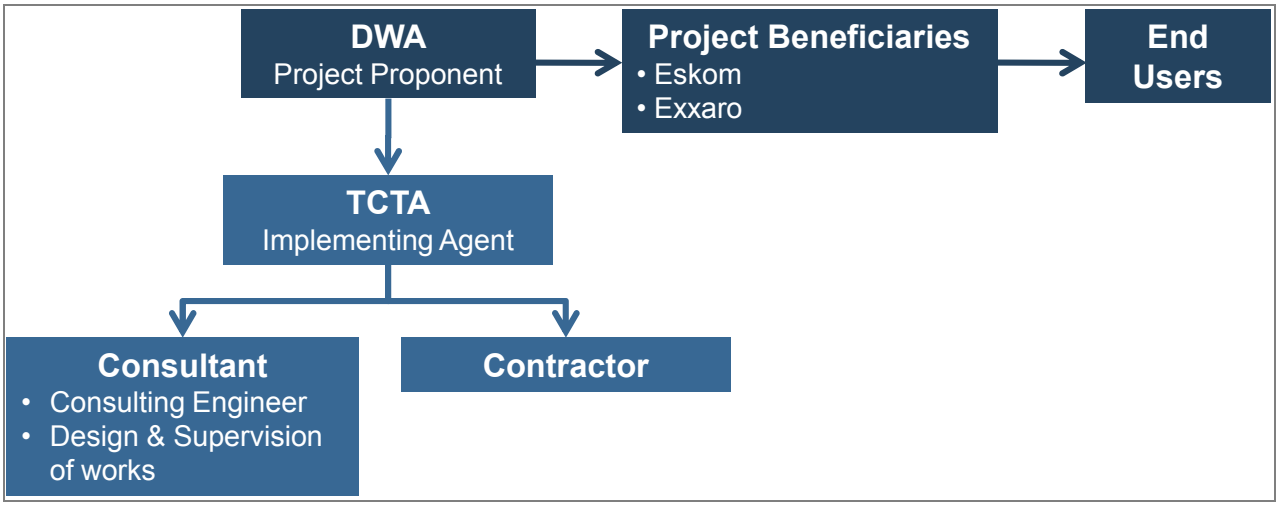

Figure 2: Generic Project Institutional Arrangements

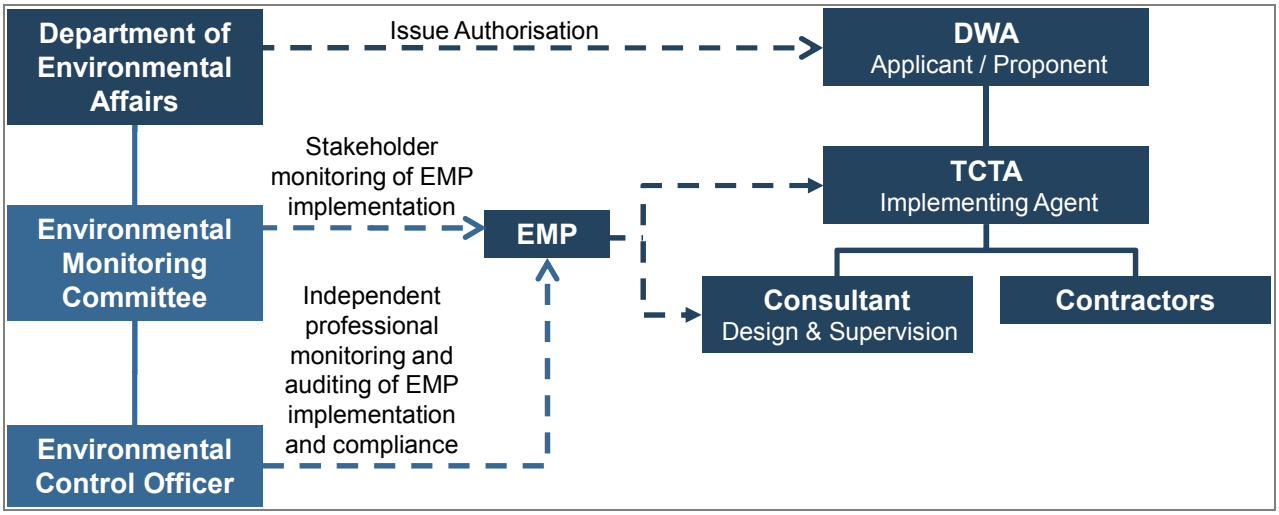

Figure 3: Institutional Arrangements: Lines of Accountability

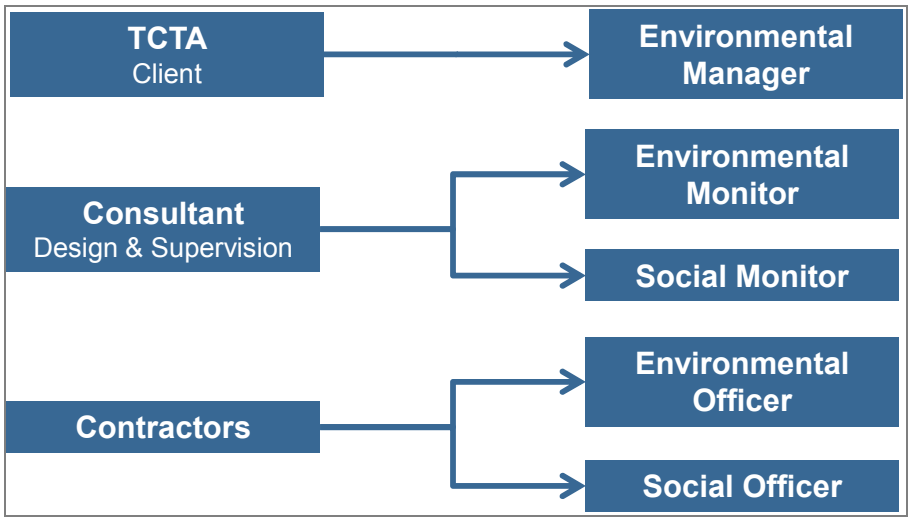

Figure 4: Staffing Arrangements: Implementation of the EMP and Contract Specifications

The following role-players will be responsible for the implementation of the EMP.

8.1 Project Proponent

DWA will be the Project Proponent for all components of the work related to MCWAP, and the TCTA will act as the implementing agent for the scheme. Ultimately, the liability associated with environmental non-compliance rests with the Project Proponent.

8.2 Environmental Monitoring Committee

An Environmental Monitoring Committee (EMC) must be established before commencement of any construction activities. This EMC must report to the Director-General of DEA. The role of the EMC is to monitor compliance with the specific conditions of the environmental authorisation and the EMP.

8.3 Environmental Control Officer

The Environmental Control Officer (ECO) is an independent representative, who acts on as the EMC monitoring representative for the conducting of independent audits and performing a secretariat function for the EMC.

The ECO will undertake weekly inspections of the site and at least 6 monthly full compliance auditing against the EMP and environmental authorisation. The inspection reports will be made available to TCTA for their action. The monthly reports will be submitted to TCTA and the Department for their records. The Audit reports will also be made available to the relevant authorities.

8.4 TCTA Environmental Manager

The TCTA Environmental Manager will be on site and the responsibilities of this party will include the following:

- Overseeing of all environmental matters and compliance with all environmental requirements and authorisations.
- Act as the interface between the ECO, EMC and the other project role players.
- Maintain an overall register of issues, incidents and complaints and ensure that all of these are closed out in good time.

8.5 Consultant's Environmental Monitor

The Consultant's Environmental Monitor will be on site and the responsibilities of this party will include the following:

- Monitoring of compliance with the EMP and the Project Specification.
- Make recommendations on how to best apply the environmental requirements on site and advise the Chief Resident Engineer on the site instructions required to facilitate effective environmental compliance.

- Participate in the quality management system by issuing non-conformances when there are areas of the project environmental requirements that are not being met.

8.6 Contractor's Environmental Officer

The Contractor's Environmental Officer will be on site and the responsibilities of this party will include the following:

- Aiding the Contractor to comply with all the project environmental requirements.
- Facilitating environmental activities and environmental awareness training of all persons on site.
- Exercise an internal compliance management system on behalf of the Contractor.

9. PROJECT SPECIFICATIONS

TCTA is ultimately responsible for MCWAP's environmental compliance during the implementation of the project.

The Construction EMP focuses more on performance criteria for environmental compliance, whereas the detail on how the project is to meet these performance criteria is provided in the project specification in the form of minimum standards and measures to be implemented by the Contractor. The Contractor shall provide detailed method statements on how the performance criteria will be met, through the application of the specification. These methods are to be reviewed and approved by the Engineer to ensure that they are adequate.

The ECO will monitor only the compliance in terms of the EMP and environmental authorisation. The TCTA Environmental Manager and the Engineer's Environmental Manager will be responsible for compliance monitoring of the specification requirements as these are contractually binding on the Contractor and other project participants.

10. MONITORING

As mentioned, the independent ECO will conduct weekly inspections of the site and at least 6-monthly full compliance auditing against the EMP and environmental authorisation. The inspection reports will be made available to TCTA's Environmental Manager for management response and then be provided to the EMC, and the monthly reports to TCTA and DEA for their records. The ECO Will produce inspection reports after each site visit in addition to a monthly report.

The Consultant's Environmental Monitor will monitor compliance with the EMP and the Project Specification.

The representatives of the Engineer and Contractor are required to keep a daily report for their on site management reference.

The following registers are to be maintained and kept on site at all times:

- A daily site diary;
- A non-conformance register;
- A public complaints register; and
- A register of audits.

11. MANAGEMENT OF ENVIRONMENTAL IMPACTS

The framework for the subsequent management measures consists of the following:

- Management objectives – i.e. desired outcome of management measures for mitigating negative impacts and enhancing the positive impacts related to project activities and aspects (i.e. risk sources);
- Targets – i.e. level of performance to accomplish management objectives; and
- Management actions – i.e. practical actions aimed at achieving management objectives and targets.

11.1 Pre-construction

General requirements during the pre-construction phase include the following:

- Design to consider and incorporate environmental requirements.
- Define and communicate roles and responsibilities for the implementation of the EMP.
- Conduct appropriate environmental baseline studies.
- All test pits created as part of geotechnical investigations are to be filled and rehabilitated.
- Undertake negotiations and confirm arrangements with individual landowners and/or land users regarding:
  - Possible loss of access;
  - Existing structures and infrastructure (including temporary and permanent water management structures and infrastructure);
  - Fencing and gate dimensions for traversing servitude;
  - Traversing patterns of game and/livestock over servitude;
  - Access to game and/livestock drinking points;
  - Security; and
  - Opening and closing of gates and access to private property.
- Ensure that all buildings, assets and structures within the servitude are identified and recorded.

- Determining and documenting the road conditions for all identified haul roads.
- Develop and implements an environmental awareness programme.
- Notify landowners and make arrangements for possible interruption of water supply from existing Exxaro pipeline.

Specific management measures related to the identified environmental aspects follow.

11.1.1 Construction Site Planning and Layout

Management Objective:

Planning and layout of construction site to ensure protection of sensitive environmental features.

Target:

No impacts to sensitive environmental features as a result of construction site planning and layout.

Management Actions:

- Identify sensitive environmental features where special care needs to be taken and implement suitable mitigation measures to safeguard these features (e.g. barricading).
- Identify protected plants and trees. Any protected plants or trees in proximity to the construction servitude that will remain, should be marked clearly and must not be disturbed, defaced, destroyed or removed, unless otherwise specified by TCTA's delegated party and the Engineer. Acquire the necessary permits under the National Forests Act (No. 84 of 1998) if avoidance of protected trees is not possible.
- Possible further phases of heritage site investigation and safeguarding of heritage sites.
- Undertake necessary relocation of residents of the Phumolong Community Trust, where their dwellings encroach upon the construction servitude.

11.1.2 Managing geotechnical investigations

Management Objective:

Manage environmental impacts associated with detailed geotechnical investigations.

Target:

1. No deviations from agreements made with individual landowners and/or land users.
2. No damage to sensitive environmental features (e.g. marked and barricaded heritage resources, protected trees, watercourses, structures and infrastructure).
3. Rehabilitation of test pits.

Management Actions:

- Suitable access arrangements to be made in accordance with agreements.
- Safe operation of plant and equipment required for geotechnical investigations.
- Adequate management of domestic and construction waste.
- Implement measures to mitigate soil erosion, loss of vegetation and pollution.
- Prevent damage to sensitive environmental features.
- Landscape and rehabilitate test pits.

11.2 Construction

11.2.1 Environmental Awareness Creation

Management Objective:

Ensure that the Contractor, construction workers and site personnel are aware of the relevant provisions of the EMP, sensitive environmental features and agreements made with individual landowners and/or land users.

Target:

1. No deviations from agreements made with individual landowners and/or land users.

2. All construction workers and employees to have completed appropriate environmental training.
3. A record of environmental training undertaken to be kept on site.

Management Actions:

- TCTA and the Engineer will be responsible for the necessary arrangements for the environmental training.
- The Contractor must arrange, through TCTA and the Engineer that all of his employees and those of his sub-contractor go through the project specific environmental awareness training courses before the commencement of construction and as and when new staff or sub-contractors are brought on site.
- The environmental training is compulsory for all employees and structured in accordance with their relevant rank, level and responsibility, as well as the Environmental Specification as they apply to the works and site.

11.2.2 Ongoing consultation with affected parties

Management Objective:

- Establish and maintain a record of all complaints and claims against the project and ensure that these are timeously and effectively verified and responded to.
- Adhere to agreements made with individual landowners and/or land users regarding communication.

Target:

1. All complaints and claims will be acknowledged within 21 days of receipt, unless additional information and / or clarification are required.
2. No deviations from agreements made with individual landowners and/or land users.

Management Actions:

- Establish processes and procedures to effectively verify and address complaints and claims received.

- Complaints or liaisons with landowners with regard to environmental aspects, compensation or disturbance to activities or animals, must be recorded, reported to the correct person and a record of the response is to be entered in the complaints register.
- Establish lines of communications with landowners. Provide relevant contact details to landowners for queries / raising of issues or complaints.
- Advise landowners on duration of construction period on their properties. Notify landowners of any deviations from these periods.

11.2.3 Site clearing

Management Objective:

- Manage environmental impacts associated with site clearing.
- Ensure that only areas that are specifically required for construction are cleared.

Target:

No damage to sensitive environmental features outside of construction servitude, including marked and barricaded heritage resources, protected trees, watercourses, structures and infrastructure.

Management Actions:

- Restrict site clearing activities to construction servitude.
- Maintain barricading around sensitive environmental features.
- Avoid any disturbance to demarcated sensitive environmental features.
- Where practicable, transplant protected flora species to other designated positions. Important flora species along the route include (but is not limited to) *Acacia erioloba*, *Adansonia digitata, Boscia albitrunca*, *Combretum imberbe*, *Sclerocarya birrea* subsp. *caffra*. All planting work is to be undertaken by a competent person, making use of the appropriate equipment.

11.2.4 Site establishment

Management Objective:

Minimise environmental impacts associated with site establishment.

Target:

1. No deviations from agreements made with individual landowners and/or land users.
2. No damage to sensitive environmental features outside construction footprint during site establishment.
3. No damage to sensitive environmental features during establishment of construction camp.
4. Site layout endorsed by TCTA and the Engineer.
5. No access or encroachment into no-go areas.
6. No justifiable complaints regarding general disturbance and nuisance received from the surrounding landowners.

Management Actions:

- Locate construction camp in area where sensitive environmental features will not be impacted on.
- Contractor to produce a site plan for the approval of TCTA and the Engineer prior to the establishment of the site, which aims to identify construction activities, facilities and structures in relation to sensitive environmental features. This plan will serve as a spatial tool that facilitates the execution of the construction phase with due consideration of sensitive environmental features. The plan must show the following (as relevant):
  - Buildings and structures;
  - Contractors' accommodation;
  - Contractors' camp and lay down areas;
  - Site offices;
  - Site laboratories;
  - Batching plants;

  - Crusher plants;
  - Roads and access routes;
  - Gates and fences;
  - Essential services (permanent and temporary water, electricity and sewage);
  - Rubble and waste rock storage and disposal sites;
  - Solid waste storage and disposal sites;
  - Site toilets and ablutions;
  - Hazardous waste storage and disposal sites;
  - Firebreaks;
  - Borrow areas;
  - Excavations and trenches;
  - Cut and fill areas;
  - Topsoil stockpiles;
  - Spoil areas;
  - Construction materials stores;
  - Vehicle and equipment stores;
  - Workshops;
  - Wash bays;
  - Fuel stores;
  - Hazardous substance stores;
  - Sensitive environmental features; and
  - Any other activities, facilities and structures deemed relevant.
- Positioning of the construction camp and lay-down area should aim to minimise visual impacts.
- Maintain barricading around sensitive environmental features until the cessation of construction works.
- Provide sufficient notification for landowners / land users and make suitable arrangements for possible interruption of water supply from the Exxaro pipeline.
- Construction camp and construction servitude should be fenced and access control should be exercised.
- Control the movement of all vehicles and plant (including suppliers), such that they remain on designated routes and comply with relevant agreements.

- Ensure noise levels are within their lawfully acceptable limits as per South African National Standards (SANS): 10103 (2003) South African National Noise Standard.
- Minimise disturbance from lighting of the construction camp and site. For example, limit the height from which floodlights are fixed, identifying zones and directions of high and low lighting requirements with the focus of the lights being inward, rather than outward, avoid directing the light towards the direction from where it would be most visible, unless otherwise requested by the community, without compromising safety.

11.2.5 Management of access

Management Objective:

- Ensure that all construction vehicles use only dedicated access routes to construction sites.
- Ensure that landowners / land users and their employees have reasonable access to the land during construction.
- Ensure proper access control.
- Protect and maintain existing gates.
- Adhere to agreements made with individual landowners and/or land users regarding access.

Target:

1. No reports of construction vehicles using other unauthorised routes.
2. No reports or complaints that access to private properties have been denied.
3. No deviations from agreements made with individual landowners and/or land users regarding access.

Management Actions:

- Site plan to detail all access/haul roads.
- Access roads shall be capable of accommodating the type of vehicles and/or mechanical plant using the routes.

- Any changes to the routes shown on the site plan need to be approved by TCTA and the Engineer.
- Any clearing for access or haul roads outside the demarcated works area shall only be undertaken after approval from TCTA and the Engineer.
- Make provision for landowners to access their properties.
- Make provision for landowners to access firebreak roads.
- Speed limits to be strictly adhered to.
- The movement of any vehicles and/or personnel outside of designated working areas will not be permitted.
- Access roads to be maintained in a suitable condition.
- Suitable erosion protective measures to be implemented for access roads during the construction phase.
- Damage to the existing access roads as a result of construction activities will be repaired to the satisfaction of TCTA and the Engineer, and in accordance with agreements with landowners (where relevant).
- Ensure that central service nodes such as schools, clinics, water sources, places of worship, etc. remain easily and safely accessible.
- Traffic safety measures (e.g. traffic warning signs, flagmen) to be implemented.
- Proper access control to be maintained to protect game and livestock, in accordance with agreements with landowners (where relevant).
- Specific traffic management measures to be implemented (especially for sections alongside the R510) for the following:
    - Warning Area - area of the construction works that is used to alert motorists of impending temporary conditions that will require particular care.
    - Transition Area - area in which the motorist is required to take an action. This action can be in instances where the is a shift of position on the roadway without a reduction in the number of lanes (diversion), merge of two lanes into one (lane drop), crossing of the central median (crossover), or entering a detour that is completely separate from the construction works.
    - Stabilising Area - allows traffic flow to stabilise after negotiating a transition area, and before reaching another change of condition.

- Buffer Zone - represents the limiting form of a stabilising area. It is normally used between a transition area and the actual work area.
- Work Area - active construction area.
- Termination Area - involves the return of traffic to normal flow conditions.

11.2.6 Fencing arrangements

Management Objective:

- Protect and maintain existing fences.
- Fencing arrangements to adequately protect livestock and game animals from construction activities.
- Adhere to agreements made with individual landowners and/or land users regarding fencing.
- Minimise disturbance to animals on game farms.

Target:

1. No deviations from agreements made with individual landowners and/or land users regarding fencing.
2. No direct harm to livestock and game animals due to inadequate fencing arrangements.
3. Disturbed or damaged fencing to be reinstated / replaced to meet pre-existing conditions.

Management Actions:

- Any damaged fencing is to be replaced to meet pre-existing conditions.
- All fences erected for construction purposes (e.g. fences around camp sites, fencing around trenches, etc.) should be inspected on a daily basis to detect whether any damage has occurred, and should be repaired immediately, to prevent animals from escaping, to prevent easy access for poaching, and intrusion by predators.
- On farms or in areas where livestock / game occur, erect fences according to appropriate specifications (depending on the type on animals that occur on the farms)

for the construction camps and construction servitude to protect animals from construction-related activities.

- Fences on game farms should be constructed to meet the following requirements:
  - The fence should be straight and vertical;
  - All the straining posts should be firmly and vertically anchored;
  - All the posts should extend to the same height above ground level by corresponding to the terrain form;
  - The straining posts and droppers should not be too far apart – the closer they are, the firmer the fence;
  - Each wire strand should be firmly attached to the standards or line posts at a specific height above ground level and should be a certain distance apart from each other;
  - The droppers should be neatly and evenly spaced between the standards. The wire strands should be firmly attached to maintain the proper space between the strands and to prevent vertical movement;
  - Fences should never be constructed of inferior quality material. Therefore, fencing material with the SABS mark should be used; and
  - Comply with appropriate ordinance for the Limpopo province with regards to the accommodation of relevant large mammal species.
- The height on fences on game farms should be constructed depending on the type of animals that occurs on the farm. Wild animals are grouped into various categories on the basis of their potential to move over, under or through fences. The following fence-crossing groups can be distinguished:
  - Animals that jump over fences (e.g. kudu, impala, eland and waterbuck);
  - Animals that crawl underneath or through fences (e.g. ungulates like the warthog, bushpig, duiker, steenbok, klipspringer, gemsbok, sable antelope, red hartebeest and tsessebe, and predators such as jackals, caracal, cheetah, leopard and lion);
  - Animals that break fences (e.g. buffalo, white and black rhinoceroses, giraffe and waterbuck, and also eland, blue wildebeest, and sable antelope bulls); and
  - Animals that usually do not jump over fences (e.g. blesbok, steenbok, duiker).
- Where necessary, electrified fences on game farms should be erected according to appropriate specifications depending on the type of animals that occur on the

property. Safety precautions should be implemented for electrified fences. All electrified fences should comply with minimum safety standards.

- Fences to be constructed over dongas or streams should meet specific requirements as fences over such features can become insecure and lead to the escape of valuable animal or provide access to predators.
- Where necessary, game screens should be erected to minimise construction-related impacts (e.g. noise) to animals on game farms.

11.2.7 Disruption of existing services

Management Objective:

- Minimise disturbance to existing services.
- Adhere to agreements made with individual landowners and/or land users regarding existing services.

Target:

1. Compliance with requirements of service providers.
2. No justifiable complaints from landowners / land users regarding unknown disturbance of services.
3. No deviations from agreements made with individual landowners and/or land users regarding existing services.

Management Actions:

- Identify and record existing services, including reticulation.
- Conform to requirements of relevant service providers (e.g. Telkom, Eskom, water, sewerage, roads) and Exxaro (for existing pipeline) when working within servitudes of existing services.
- Immediately notify service providers of disturbance to services. Rectify disturbance to services, in consultation with service providers. Maintain a record of all disturbances and remedial actions on site.
- Notify landowners of any disruptions to essential services.

- Deviate landowners' existing services (e.g. reticulation, irrigation lines), where possible, to accommodate construction avidities.

11.2.8 Management of topsoil

Management Objective:

- Ensure suitable removal, storage, transportation of topsoil for reuse during rehabilitation.

Target:

1. >95% of recovered topsoil from disturbed areas to be stored for future use.
2. No visual evidence of erosion from topsoil stockpiles.
3. No visual evidence of erosion from areas where topsoil has been reinstated.

Management Actions:

- Determine the average depth of the topsoil prior to excavations
- Remove topsoil from areas to be affected by construction activities.
- Prevent mixing of topsoil with subsoil.
- Topsoil to be adequately protected from contamination from construction activities and material.
- Protect stored topsoil from compaction.
- Wind and water erosion-control measures to be implemented to prevent loss of topsoil.
- Following the construction phase, the topsoil should be placed as the final soil layer prior to seeding.

11.2.9 Management of trenching

Management Objective:

- Minimise environmental impacts associated with trenching and pipeline construction.

Target:

1. No damage to sensitive environmental features outside construction servitude during trenching and pipeline construction.

Management Actions:

- Construction activities to remain within the construction servitude.
- Subsoil and overburden should be stockpiled separately to be returned for backfilling in the correct soil horizon order.
- Suitable barricading to be erected around open trenches.
- Divert runoff away from pipeline trench, where necessary.
- Trench walls are to be stabilised using battering, shoring and bracing or similar techniques depending on the stability of the trench sides.
- Inspect open trenches at least daily basis to ensure that animals have not become trapped. Such animals will be removed and released. Special equipment for handling of venomous snakes should be available on site to ensure safe removal.
- Trench lengths will be kept as short as practically possible.
- Filing of trenches to make provision for subsidence.
- Installation of other pipeline related infrastructure such as the Cathodic Protection System, scour valves, air valves, etc. should where possible, be synchronised such that the trench needs to be rehabilitated only once (without subsequent disturbance).

11.2.10 Management of storage and handling of non-hazardous material

Management Objective:

- Effective and safe management of materials on site, in order to minimise the impact of non-hazardous materials on the environment.

Target:

1. No pollution due to handling, use and storage of non-hazardous material.

Management Actions:

- Materials to be suitably stored to prevent environmental contamination and visual impacts. Storage requirements to be determined based on chemical qualities of material.
- Where required, stored material to be protected from rain and run-off to avoid environmental contamination.
- Materials to be appropriately transported to avoid environmental contamination. Loose loads (e.g. sand, stone chip, refuse, paper and cement) to be covered.
- Suitable remedial measures, depending on the nature of the contaminant and the receiving environment, to be instituted for spillages.
- Materials to be suitably used to prevent environmental contamination.

11.2.11 Management of storage and handling of hazardous material

Management Objective:

- Ensure the protection of the natural environment and the safety of personnel on site, by the correct management and handling of hazardous substances.

Target:

1. No pollution due to handling, use and storage of hazardous material.

Management Actions:

- Storage and use of hazardous materials will be strictly controlled to prevent environmental contamination.
- Staff that will be handling hazardous materials must be trained to do so.
- Any hazardous materials (apart from fuel) must be stored within a lockable store with a sealed floor.
- All storage tanks containing hazardous materials must be placed in bunded containment areas with impermeable surfaces. The bunded area must be able to contain 110% of the total volume of the stored hazardous material.

- Material Safety Data Sheets (MSDS) which contain the necessary information pertaining to a specific hazardous substance must be present for all hazardous materials stored on the site.
- In the event of spillages of hazardous substances the appropriate clean up and disposal measures are to be implemented.
- Hazardous materials will be disposed of at registered sites or handed to registered hazardous waste disposal facilities for disposal / recycling.
- TCTA and the Engineer must be notified of any pollution incidents associated with hazardous materials.

11.2.12 Management of borrow pits and quarries

Management Objective:

- Minimise environmental impacts associated with borrow pits and quarries.

Target:

1. Compliance with approved EMPR.

Management Actions:

- All borrow pits to be created, operated and rehabilitated in accordance with the EMPR, as authorised by the Department of Mineral Resources.
- For new pits, remove, stockpile and preserve topsoil for re-use during rehabilitation.
- Implement suitable stormwater management measures at borrow pits / quarries.
- Manage dangerous conditions (e.g. steep slopes, loose and unstable material).
- Subject to approval by TCTA and the Engineer, certain borrow pits and / or quarries may be utilised for the disposal of spoil material and inert building rubble.

11.2.13 Management of blasting

Management Objective:

- Minimise environmental impacts associated with blasting.

Target:

1. Compliance with blasting-related legislation and standards.
2. No blasting-related damage to private property, animals or existing services.

Management Actions:

- Prior to commencing with blasting activities, the blasting Contractor should submit a Method Statements which should comply with all relevant SABS standards and health and safety standards for all methods of blasting mitigation to the Engineer for approval.
- The Contractor shall employ industry standard methods to control the impact of blasting and limit the risk of damage to buildings and structures by reducing blast vibrations induced in the rock mass, eliminating fly rock and limiting air-blast and noise to acceptable levels.
- Blast mats should be used wherever fly-rock may result in damage to any infrastructure, including existing pipeline, R510 road buildings, access roads, power lines, etc. or where it could result in death or injury of animals, or where damage could be caused to sensitive environmental features.
- Strict control of blasting to protect game animals.
- Blasting operations should be controlled to ensure sound pressure levels are kept below the generally accepted 'no damage' level of 140 decibels.
- Where blasting is anticipated in close proximity to boreholes, the landowner should be consulted with and mitigation measures to be implemented should be discussed. Mitigation measures should include:
    - Pump testing of boreholes prior to blasting to determine yields, in order to determine the impact of blasting activities on borehole yields.

- Implement special methods to limit potential damage to boreholes in areas where blasting will take place.
- Implementation of controlled blasting or mechanical excavation techniques in areas where normal blasting techniques could potentially damage or destroy boreholes. No uncontrolled blasting is to be allowed, as all blasts are to be properly planned and controlled to achieve the desired rock breaking for the trench type required.
- Implementing standard monitoring practices for monitoring of blast shock. This includes borehole testing before blasting and thereafter once the shock waves have dissipated and the soils have settled properly. This is to identify any resulting damage.

- A register should be kept on site in which all complaints regarding damage to property as a result of blasting should be documented. The photographic survey should be used as a benchmark to determine whether blasting caused damage to infrastructure.
- Waste rock from blasting activities which is not used to backfill the trench, should be removed from site to an approved location on completion of construction activities.
- No blasting activities may be undertaken on game farms when animals that are under quarantine may be affected.

11.2.14 *Management of workshop and equipment maintenance*

Management Objective:

- Minimise environmental impacts associated with workshops and equipment maintenance.

Target:

1. No environmental contamination associated with workshops and equipment maintenance.

Management Actions:

- Maintenance of equipment and vehicles will be performed in such a manner so as to avoid any environmental contamination (e.g. use of drip trays).
- No washing of plant may occur on the construction site.
- Drip trays will be provided for the stationary plant and for the "parked" plant.
- All vehicles and equipment will be kept in good working order and serviced regularly. Leaking equipment will be repaired immediately or removed from the site.
- Suitable storage and disposal of hydraulic fluids and other vehicle oils.

11.2.15 *Management of labour force*

Management Objective:

- Ensure suitable management of labour force to prevent security-related issues or disturbance to landowners.
- Optimise use of local labourers.

Target:

1. No complaints from landowners regarding trespassing or misconduct by construction workers.
2. All unskilled labour to be sourced from local communities.

Management Actions:

- Prevent trespassing of construction workers on private property.
- Construction workers to clearly identifiable.
- Machine / vehicle operators shall receive clear instructions to remain within demarcated access routes and construction areas.
- Designated smoking areas should be provided, with special bins for discarding of cigarette butts.
- Establish a 'labour and employment desk'.
- Create opportunities for the employment of women.

- Where possible use labour-intensive methods of construction.
- Use local labour as far as possible.
- Develop a community labour agreement with targets for employment and for progression.
- Training of labour to benefit individuals beyond completion of the project.
- Go beyond the minimum wage rate and invest in local staff.

11.2.16 *Management of ablution facilities*

Management Objective:

- Minimise environmental impacts associated with ablution facilities.

Target:

1. No environmental contamination associated with ablution facilities.
2. Minimise visual impact associated with ablution facilities.

Management Actions:

- Provide sufficient ablution facilities (e.g. mobile / portable / VIP toilets), at the Construction Camps and along construction sites, which conform to all relevant health and safety standards and codes.
- No pit latrines, french drain systems or soak away systems shall be allowed and toilets may not be situated within 100 meters of any water body or within the 1:100 year flood line.
- A sufficient number of toilets shall be provided to accommodate the number of personnel working in any given area. Toilets may not be further than 100m from any working area. Toilet facilities supplied by the Contractor for the workers shall occur at a maximum ratio of 1 toilet per 15 workers.
- All temporary / portable / mobile toilets shall be secured to the ground to prevent them from toppling over due to wind or any other cause.
- Ensure utilisation, maintenance and management of toilet, wash and waste facilities.
- The entrances to the toilets will be adequately screened from public view.

- These facilities will be maintained in a hygienic state and serviced regularly.
- Toilet paper will be provided.
- The Contractor will ensure that no spillage occurs when the toilets are cleaned or emptied and that a licensed service provider removes the contents from site. Disposal of such waste is only acceptable at a licensed waste disposal facility.
- Should shower facilities be provided for use by staff staying on site, the following controls must be imposed:
  - Positioning of the shower, and specifically its discharge point, will be carried out to ensure that erosion and build up of detergents does not occur.
  - All discharge from the shower and other washing facilities must be managed to prevent environmental contamination.
  - Use of the shower facilities must be limited to staff or authorised persons only.

11.2.17 *Management of construction camp and eating areas*

Management Objective:

- Minimise environmental impacts associated with construction camp and eating areas.

Target:

1. No environmental contamination associated with construction camp and eating areas.
2. Minimise visual impact associated with construction camp and eating areas.

Management Actions:

- Open uncontrolled fires will be forbidden at the site camp. Rather, 'contained' cooking mechanisms will be used (e.g. gas stoves or an enclosed braai facility).
- The cooking area will be positioned such that no vegetation is in close proximity thereto, including overhanging trees. An area around the cooking area will be cleared such that any escaping embers will not start an uncontrolled fire.
- Eating areas will be designated and demarcated.
- The feeding, or leaving of food for animals, is strictly prohibited.
- Sufficient vermin / weatherproof bins will be present in this area for all waste material.

- Dish washing facilities will be provided. These may be very basic, but a process must be put in place to ensure that wastewater is disposed of appropriately.

11.2.18 *Management of visual aspects*

Management Objective:

- Minimise impacts to the aesthetics / visual quality.
- Ensure that the visual appearance of the construction site is not an eyesore the adjacent areas.

Target:

1. No complaints regarding impacts to visual quality.

Management Actions:

- Advertising and lighting will be in accordance with relevant standards and will not constitute an eyesore / hazard to users of the road.
- Lighting will be sufficient to ensure security but will not constitute 'light pollution' to the surrounding areas.
- The site will be shielded /screened to minimise the visual impact, where practicable.

11.2.19 *Management of waste*

Management Objective:

- Minimise environmental impacts associated with waste.
- Apply waste management principles of prevent, minimise, recycle or re-use, with disposal as a last option.

Target:

1. No littering on construction site.
2. Clean and tidy construction site.
3. 100% record of all waste generated and disposed at waste disposal facilities.

4. Valid disposal certificates for all waste disposed.
5. Provision of adequate containers that are easily accessible and maintained.
6. Waste bins are removed and cleaned weekly.

Management Actions:

- All waste management must be in accordance with Minimum Requirements series.
- Vermin / weatherproof bins will be provided in sufficient numbers and capacity to store domestic waste. These bins must be kept closed to reduce odour build-up and emptied regularly to avoid overfilling and other associated nuisances.
- Where possible, waste must be separated at source (e.g. containers for glass, paper, metals, plastics, organic waste and hazardous wastes).
- Provide waste skips on site. These skips should be sufficient in number, the skip storage area should be kept clean, skips should be emptied and replaced before overflowing or spillage occurs.
- Ensure suitable housekeeping. .
- The Contractor will ensure that no burying, dumping or burning of waste materials, vegetation, litter or refuse occurs. All solid waste will be disposed of at suitable licensed disposal sites.
- Wastes should be removed during off-peak periods to minimise impacts on local traffic patterns.
- Ensure that solid waste is transported so as to avoid waste spills en-route.

11.2.20 *Management of water*

Management Objective:

- Minimise environmental impacts associated with water services for construction workers and stormwater.

Target:

1. No visual evidence of erosion caused by wastewater or stormwater practices.
2. No environmental contamination associated with wastewater or stormwater practices.

Management Actions:

- Water supply during the construction phase for construction activities will be obtained from the existing Exxaro pipeline, water tankers or other suitable sources. All connections to be approved by Engineer.
- Prevent leakages from pipes or taps.
- Manage stormwater from construction site to avoid environmental contamination and erosion.
- Prevent erosion on access roads due to construction traffic.

11.2.21 Management of pollution generation potential

Management Objective:

- Ensure that all possible causes of pollution are mitigated as far as possible to minimise impacts to the surrounding environment.

Target:

1. No complaints regarding pollution.
2. No measurable signs of pollution.

Management Actions:

- **Lights** -
  - Prior to construction the position and type of lighting will be planned to ensure unnecessary light pollution will be eliminated.
  - All lighting installed on site must not interfere with road traffic or lead to unacceptable light pollution to the surrounding community and natural environment (e.g. use of down-lighters).

- **Noise** -
  - The provisions of SABS 1200A will apply to all areas within audible distance of residents.
  - Working hours to be agreed upon by TCTA and the Engineer, so as to minimise disturbance to landowners.
  - No amplified music will be allowed on the site. The use of radios, tape recorders, compact disc players, television sets etc. will not be permitted unless at a level that does not serve as an intrusion to adjacent land-owners.
  - Construction activities generating output levels of 85 dB or more will be confined to the hours during normal working hours.
  - The Contractor will take preventative measures (e.g. screening, muffling, timing, pre-notification of affected parties) to minimise complaints regarding noise and vibration nuisances from sources such as power tools.
- **Dust** -
  - Appropriate dust suppression measures or temporary stabilising mechanisms to be used when dust generation is unavoidable (e.g. dampening with water, chemical soil binders, straw, brush packs, chipping), particularly during prolonged periods of dry weather. Dust suppression to be undertaken for all bare areas, including construction servitude, access roads, borrow pits, site yard, etc.
  - Speed limits to be strictly adhered to.
  - The Contractor will take preventative measures to minimise complaints regarding dust nuisances (e.g. screening, dust control, timing, pre-notification of affected parties).
- **Erosion** -
  - Protect areas of the construction site that are susceptible to erosion, e.g. steep sections along the pipeline route on the Farms Witbank 647LQ and Fancy 556LQ (at Rietspruitnek), through suitable measures (e.g. watering, planting, retaining structures, commercial anti-erosion compounds).
  - Any erosion channels caused by construction activities to be suitably stabilised and rehabilitated.

- All efforts to prohibit ponding on surface and ensure stormwater runoff is channelled from the site must be made. The method used will be appropriate to the expected stormwater flows and the topography and geology of the site.

- **Soilcrete, Cement and Concrete Batching** -
  - Cement /soilcrete mixing on an impervious layer (e.g. plastic or cement mixing pit).
  - Batching / mixing area will in a designated area, which will be kept clean at all times.
  - No batching / mixing activities will occur on a permeable surface.
  - Contaminated water will not be discharged to the environment.
  - Unused cement bags will be stored in an area not exposed to the weather and packed neatly to prevent hardening or leakage of cement.
  - Used cement bags will be stored so as to prevent windblown dust and potential water contamination. Used bags will be disposed of adequately.
  - Concrete transportation will not result in spillage.
  - Cleaning of equipment and flushing of mixers will not result in pollution, with all contaminated wash water entering the waste water collection system.
  - To prevent spillage onto roads, ready mix trucks will rinse off the delivery shoot into a suitable sump prior to leaving the site.
  - Suitable screening and containment will be in place to prevent windblown contamination from cement storage, mixing, loading and batching operations.
  - All contaminated water and fines from exposed aggregate finishes will be collected and stored in sumps for disposal at an approved waste disposal site.
  - All visible remains of excess concrete will be physically removed on completion of the plastering or concrete pouring and disposed off in an acceptable manner.

11.2.22 *Management of flora*

Management Objective:

- Preserve protected flora species outside of construction footprint.
- Control alien plants and noxious weeds.

Target:

1. Ongoing eradication of alien plants and noxious weeds.
2. No disturbance to protected flora species outside of construction footprint.

Management Actions:

- Ongoing identification of protected plants and trees. Any protected plants or trees in proximity to the construction servitude that will remain, should be marked clearly and must not be disturbed, defaced, destroyed or removed, unless otherwise specified by TCTA's delegated party and the Engineer. Acquire the necessary permits under the National Forests Act (No. 84 of 1998) if avoidance of protected trees is not possible.
- Remove alien plants and noxious weeds on the construction site. Eradication method to be approved by TCTA and the Engineer.
- Retain vegetation within the construction site, wherever possible.
- Where possible, transplant plant material to designated areas. Transplanting to be undertaken by specialist.
- No disturbance allowed to protected species outside of construction footprint.
- No construction equipment, vehicles or unauthorised personnel will be allowed onto areas that have been rehabilitated. Only persons / equipment required for maintenance thereof will be allowed to operate on rehabilitated areas.
- Removal of medicinal plants by construction workers will not be allowed.
- No trees to be felled for fuel purposes.
- All reseeding activities will be undertaken at the end of the dry season (middle to end September) to ensure optimal conditions for germination and rapid vegetation establishment.
- The rehabilitated and seeded areas must be harrowed after spreading the topsoil and fertilizer uniformly.
- Inspect rehabilitated area at three monthly intervals during the first and second growing season to determine the efficacy of rehabilitation measures.
- Take appropriate remedial action where vegetation establishment has not been successful or erosion is evident.

- Control of alien invasive species and noxious weeds in line with the requirements of the Conservation of Agricultural Resources Act will be undertaken. Strict control to prevent the establishment and spread of Sickle Bush should be implemented.
- Alien invasive plant material will be preferentially removed in entirety through mechanical means (e.g. chainsaw, bulldozer, hand-pulling of smaller specimens). Chemical control is only required as a last resort.
- Only indigenous vegetation is to be used for rehabilitation.
- Implement a monitoring programme for eradication of alien invasive plants and noxious weeds.

11.2.23 *Management of fauna*

Management Objective:

- Ensure the protection of animals, including livestock and game.
- Adhere to agreements made with individual landowners and/or land users regarding animals.

Target:

1. No direct harm to animals from construction activities.
2. No deviations from agreements made with individual landowners and/or land users regarding animals.

Management Actions:

Note:
Refer to sections on construction site planning and layout, site establishment, fencing arrangements and management of blasting for additional control measures for the protection of animals.

- Make allowance for migration of animals to watering points.
- Proper access control to be maintained.
- Stringent and dedicated control of poaching.

11.2.24 Management of watercourses

Management Objective:

- Ensure that the watercourses (including Mokolo River, Rietspruit, Kutangspruit and Sandloop) are protected and incur minimal negative impact to resource quality (i.e. flow, water quality, habitat and aquatic biota).

Target:

1. Unaltered downstream flow regime.
2. Downstream water quality to remain within acceptable ranges, as prescribed by Resource Water Quality Objectives, as far as practicable.
3. Riparian habitat to be rehabilitated to pre-construction state.
4. Ecological category not to be influenced by construction activities.

Management Actions:

- **Flow** -
  - Minimise construction footprint in wetland (e.g. pipeline to traverse watercourses perpendicularly).
  - The construction works areas should be narrower at watercourse, riparian habitat and wetland buffer crossings, where topsoil and excavated material should be stored outside of these areas.
  - Manage flow passing through running track to minimise disturbance to flow regime and to prevent erosion.
  - Prevent possible erosion caused by temporary instream diversion.
  - Remove diversion following pipeline installation and reinstate and rehabilitate affected works area.
  - Flow to remain unaltered following construction, except at riverbanks if stabilisation structures are required.
  - Construction camps to be located 50m from edge of riparian habitat / wetland buffer zone.

- **River morphology** -
  - Select most appropriate crossing point based on geotechnical conditions.
  - Select most appropriate crossing point based on sensitivity of riparian habitat (e.g. protected trees, large trees that afford bank stabilitation) and instream habitat, depending on technical feasibility.
  - Excavate trench across dry river channel.
  - Provide concrete bedding as stable foundation for the pipeline.
  - Ensure proper anchoring of pipeline to prevent flotation.
  - Encase pipeline with concrete.
  - Reinstate (shaping) and rehabilitate (indigenous riparian vegetation) affected areas. Install suitable buttressing to prevent future erosion, if required.
  - After filling in the trench, the affected area should be carefully reinstated to avoid channel formation through surface water favouring excavated areas. The bare soil should then be revegetated with species specific to the area.
- **Water quality** -
  - Temporary diversion and other dewatering techniques (e.g. pumping) to maintain a dry works area.
  - Where necessary, install instream silt traps during construction within the watercourse channel and along the riparian habitat. Instream silt traps are to be maintained and serviced on a regular basis. The style of silt trap will depend on materials used and the water movement patterns. If silt traps are not deemed feasible, other suitable measures need to be taken to limit the suspension of unnaturally high sediment volumes in the stream.
  - Implement suitable stormwater measures during construction to manage ingress of runoff into watercourses.
  - Ensure proper storage of material (including fuel, paint) that could cause water pollution. Ensure proper storage and careful handling of hazardous substances with spill prevention materials at hand.
  - Reduce sediment loads in water from dewatering operations. All dewatering should be done through temporary sediment traps constructed out of various geo-

textiles and hay bales. These are to be serviced regularly and removed when no longer in use. Materials can be re-used.

- In all areas where working with flowing water floating booms are to the installed across the stream flow downstream of the works.

- **Aquatic biota** –
  - Temporary diversion to allow for movement of aquatic fauna, as far as possible.
- Pans and wetlands -
  - A roadway through the wetland zones will have to be established in order to excavate a trench for the pipeline. A servitude roadway already exists due to the existing water pipeline along this route. Vehicular movement should be limited only to this roadway.
  - The soil that is removed during the excavations should be stored in the layers in which they were removed. The storage of this soil should also be done on a geotextile so as to not smother the vegetation and to allow for a quicker recovery of the affected vegetation. This is important as the area is regarded as being generally arid and the regeneration of vegetation is therefore slow.
  - Upon completion of the laying of the pipeline, the soil should be replaced in the trench in the layer order in which they were removed. It is important to realise that wetland functionality relies substantially on movement of soil water.
  - After filling in the trench, the affected area should be carefully reinstated to avoid channel formation through surface water favouring excavated areas. The bare soil should then be revegetated with species from the surrounding area – seeded or planted.
  - Undertake de-compaction of the area, depending on how long the area was active and how compacted the soils have become.
  - No dumping of any materials or storage of any equipment should be allowed within the wetland zones.
  - The construction area footprint should be maintained at a bare minimum to negate the potential ecological impacts.
  - Attempt to limit traffic to essential vehicles and plant were there area alternative access routes. Expedite construction activities in watercourse through forward planning of the works and the preparation of location-specific method statements.

11.2.25 Management of archaeological and cultural features

Management Objective:

- Ensure that archaeological and cultural resources or graves are protected.

Target:

1. No archaeological and cultural resources or graves to be damaged during construction.

Management Actions:

- Should remains and/or artefacts be discovered on the site during earthworks, all work will cease in the area affected and the Contractor will immediately inform TCTA and the Engineer.
- Should any heritage resources be exposed during excavation or be found on site, a registered heritage specialist must be called to site for inspection.
- Should any heritage resources be exposed during excavation or be found on site, the relevant heritage resource agency (i.e. Limpopo Heritage Resources Authority) must be informed about the finding.
- Under no circumstances may any heritage material be destroyed or removed from site.
- Should any remains be found on site that is potentially human remains, the South African Police Service should also be contacted.

11.2.26 Management of emergency procedures

Management Objective:

- Minimise environmental impacts associated with emergency procedures.

Target:

1. No site fires to be caused by construction activities and workers.

2. Approved emergency response procedures, where relevant.

Management Actions:

- **Fire** -
  - Proper emergency response procedure to be in place for dealing with fires.
  - In terms of the Atmospheric Pollution Prevention Act (APPA), burning of waste is not permitted.
  - Suitable precautions will be taken (e.g. suitable fire extinguishers, water bowsers, welding curtains) when working with welding or grinding equipment.
  - All fire control mechanisms (fire fighting equipment) will be routinely inspected by a qualified investigator for efficacy thereof and be approved by local fire services.
  - All staff on site will be made aware of general fire prevention and control methods, and the name of the responsible person to alert to the presence of a fire.
- **Accidental Leaks and Spillages** -
  - Proper emergency response procedure to be in place for dealing with spills and leaks.
  - Ensure that the necessary materials and equipment for dealing with spills and leaks are available on site, where practicable.
  - Remediation of the spill areas will be undertaken to the satisfaction of TCTA and the Engineer.
  - In the event of a hydrocarbon spill, the source of the spillage will be isolated and contained. The area will be cordoned off and secured. The Contractor will ensure that there is always a supply of an appropriate absorbent material readily available to absorb, breakdown and where possible, encapsulate a minor hydrocarbon spillage.

11.2.27 Management of health and safety

Management Objective:

- Provide a safe working environment to construction workers and the public.

Target:

1. Approved Health and Safety Plan
2. No incidents.
3. Compliance with the Occupational Health and Safety Act (Act No. 85 of 1993), Construction Regulations (2003) and other relevant regulations.

Management Actions:

- Contractor to submit an Health and Safety Plan, prepared in accordance with the Health and Safety Specification, for approval prior to the commencement of work.
- Fencing and barriers will be in place in accordance with the Occupational Health and Safety Act (Act No. 85 of 1993).
- Applicable notice boards and hazard warning notices will be put in place and secured. Night hazards will be indicated suitably (e.g. reflectors, lighting, traffic signage).
- Emergency contact details will be prominently displayed.
- Two-Way Radio Systems should be used where cell phone coverage is poor.
- All construction personal must be clearly identifiable. All employees must also be issued with employee cards for identification purposes.
- All workers will be supplied with the required Personal Protective Equipment as per the Occupational Health and Safety Act (Act No. 85 of 1993).

11.2.28 Management of reinstatement and rehabilitation

Management Objective:

- Adequate reinstatement and rehabilitation of construction site.

Target:

1. Complete site cleanup.
2. Reinstate and rehabilitate entire construction site.

Management Actions:

- **Removal of structures and infrastructure**
  - After the construction phase, the area must be rehabilitated by appropriate landscaping, levelling, topsoil dressing, land preparation, alien plant eradication and vegetation establishment.
  - Clear and completely remove from site all construction plant, equipment, storage containers, temporary fencing, temporary services, and fixtures.
  - Ensure that all access roads utilised during construction (which are not earmarked for closure and rehabilitation or operation phase) are returned to a usable state and/or a state no worse than prior to construction.
- **Inert waste and rubble**
  - Clear the site of all inert waste and rubble, including surplus rock, foundations and batching plant aggregates. After the material has been removed, the site shall be re-instated and rehabilitated.
  - Load and haul excess spoil and inert rubble to fill in borrow pits/dongas or to dump sites indicated/approved by TCTA and the Engineer.
  - Subject to approval by TCTA and the Engineer, certain borrow pits and/or quarries may be utilised for the disposal of waste rock and inert building rubble.
  - Remove from site all domestic waste and dispose of in the approved manner at a registered waste disposal site.
- **Hazardous waste and pollution control**
  - Remove from site all pollution containment structures.
  - Remove from site all temporary sanitary infrastructure and waste water disposal systems. Take care to avoid leaks, overflows and spills and dispose of any waste in the approved manner.
- **Final shaping**
  - Make safe all borrow pits, quarries and dangerous excavations by backfilling, grading and blasting as required.
  - In general, no slopes steeper than 1(V):3(H) are permitted, unless otherwise specified by TCTA and the Engineer. Steeper slopes require protection. New slopes must mimic the natural slopes and topography, where possible.

- Programme the backfill of excavations so that subsoil is deposited first, followed by the topsoil. Compact in layers for best results.
- Monitor backfilled areas for subsidence (as the backfill settles) and fill depressions using available material.
- Shape all disturbed areas to blend in with the surrounding landscape, where possible.
- Ensure that no excavated material or stockpiles are left on site and that all material remaining after backfill is landscaped to blend in with the surrounding landscape.

- **<u>Topsoil replacement and soil amelioration</u>**
  - Execute top soiling activity prior to the rainy season or any expected wet weather conditions.
  - Execute topsoil placement only after all construction work has ceased.
  - Replace and redistribute stockpiled topsoil together with herbaceous vegetation, overlying grass and other fine organic matter in all disturbed areas of the construction site, including temporary access routes and roads. Replace topsoil to the original depth.
  - Place topsoil in the same area from where it was stripped. If there is insufficient topsoil available from a particular soil zone to produce the minimum specified depth, topsoil of similar quality may be brought from other areas of similar quality.
  - The suitability of substitute material will be determined by means of a soil analysis addressing soil fraction, fertility, pH and drainage.
  - Do not use topsoil suspected to be contaminated with the seed of alien vegetation (e.g. black wattle). Alternatively, the soil is to be sprayed with specified herbicides.
  - Ensure that storm water run-off is not channelled alongside the gentle mounding, but that it is taken diagonally across it.
  - Shape remaining stockpiled topsoil not utilised elsewhere in an acceptable manner so as to blend in with the local surrounding area.
  - After topsoil placement is complete, spread available stripped vegetation randomly by hand over the top-soiled area.
  - In the event that no topsoil is available on site prior to construction, and thus no topsoil is available for rehabilitation, undertake suitable ameliorative action.

- **Ripping and scarifying**
  - Rip and/or scarify all areas following the application of topsoil to facilitate mixing of the upper most layers. Whether ripping and/or scarifying is necessary will be based on the site conditions immediately before these works begin.
  - Rip and/or scarify all disturbed (and other specified) areas of the construction site, including temporary access routes and roads, compacted during the execution of the works.
  - Rip and/or scarify along the contour to prevent the creation of down-slope channels.
  - Do not rip and/or scarify areas under wet conditions, as the soil will not break up.
- **Planting**
  - *Transplanted plants*
    - All planting work is to be undertaken by a suitably experienced personnel, making use of the appropriate equipment.
    - Transplanting entails the removal of plant material and replanting the same plants in another designated position.
    - Transplant trees and shrubs into designated positions.
    - Establish further specifications for transplanted plants.
  - *Nursery plants*
    - All planting work is to be undertaken by suitably experienced personnel, making use of the appropriate equipment.
    - Plant all trees, shrubs and individual plants in designated positions.
    - Planting should preferably be done during the rainy season.
    - After planting, each plant must be well watered, adding more soil upon settlement if necessary.
    - Establish further specifications for nursery plants.
  - *Seeds and seedlings*
    - All planting work is to be undertaken by suitably experienced personnel, making use of the appropriate equipment.
    - Tree seedling material should be fresh and of local origin. Resist using plants from far afield as they may not be best suited to local climatic or soil conditions.

  - Small seedlings are likely to transplant more successfully than will large ones. These should be potted and kept under nursery conditions until they are large enough to plant out.
  - Establish further specifications for seeds and seedlings.

- **Grassing**
  - Suitably trained personnel must undertake grassing by making use of the appropriate equipment and grass species as specified by the terrestrial ecologist.
  - Sodding may be done at any time of the year, but seeding must be done during the summer when the germination rate is better.
  - Hydroseeding with a winter mix will only be specified where regrassing is urgent, and cannot wait for the summer.
  - Establish further specifications for sods, runners and hand seeding.
- **Maintenance**
  - Monitor the re-growth of invasive vegetative material.
  - Cordon off areas that are under rehabilitation as no-go areas.
  - Revegetation must match the vegetation type, which previously existed, unless otherwise indicated by TCTA and the Engineer.
  - Control invasive plant species and noxious weeds by means of extraction, cutting or other approved methods.
  - For planted areas that have failed to establish, replace plants with the same species as originally specified.
  - Establish further specifications for maintenance.

11.3 PROJECT PHASE: OPERATION

Where relevant, all management actions to be carried forward from the construction phase to the operation phase. Specific management measures for the operation phase follow.

11.3.1 Management of access, routine maintenance and maintenance works

Management Objective:

- Ensure suitable management of environment during operation and maintenance activities.

Target:

1. No unacceptable environmental impacts.
2. Safeguarding of sensitive environmental features.
3. No complaints from landowners.
4. No encroachment of dwellings of the Phumolong Community Trust (Steenbokpan) onto permanent servitude.

Management Actions:

- The landowner should be notified that pipeline and servitude maintenance inspections will be undertaken, at least 10 working days prior to undertaking the inspection.
- Maintenance activities to be undertaken without causing any damage to access gates, access roads, fencing, any private property, reticulation or animals.
- All access gates should be closed and locked as per the instruction of the landowner.
- Should maintenance or repair work be required on site, the landowner should be notified well in advanced. Maintenance work should be undertaken as per the conditions as stipulated under the Pre-Construction and Construction Phase above.
- All roads and tracks used for maintenance inspections and maintenance works should be maintained and repaired where necessary.
- Suitable stormwater measures to be implemented for access roads and tracks.

- All vehicle traffic will be restricted to access roads and tracks only.
- On private farm roads, maintenance vehicles may not exceed a speed of 40km/h.
- Preventative measures to ensure that dwellings of the Phumolong Community Trust in Steenbokpan do no encroach onto permanent servitude.

11.3.2 Management of leaks

Management Objective:

- Ensure leaks are detected and repaired.

Target:

1. Timeous detection and repairing of leaks.

Management Actions:

- Routine inspection to include detection and timeous repairs of leaks.

11.3.3 Management of pipeline scouring

Management Objective:

- Prevent environmental impacts associated with scouring.

Target:

1. No visible signs of erosion channels caused by scouring.
2. No de-stabilisation of river morphology due to scouring.

Management Actions:

- Suitable erosion protection measures to be implemented to prevent erosion due to scouring.
- Manage impacts to water quality (e.g. sedimentation) of receiving watercourses due to scouring.

11.4 PROJECT PHASE: DECOMMISSIONING

Should the proposed pipeline and associated infrastructure be decommissioned, for whatever reason, a Decommissioning Plan must be compiled and the following basic rehabilitation conditions should be implemented and adhered to. In addition to all management measures described in the construction phase specific rehabilitation activities are required to address decommissioning of structures, soil, land capability, and vegetation establishment.

11.4.1 Management of structures

Management Objective:

- Prevent environmental impacts associated with decommissioning of project infrastructure.

Target:

1. No significant adverse environmental impacts associated with decommissioning of project infrastructure.
2. Approved decommissioning plan.

Management Actions:

- Undertake assessment of the end land use to determine which infrastructure will be removed or retained.
- Any specific requirements to prevent pollution during demolition of infrastructure will be identified prior to the commencement of the demolition and rehabilitation activities.
- Disposal requirements will be identified prior to the commencement of infrastructure removal and rehabilitation.
- Equipment, structures, and building material that can be reused will be identified prior to the commencement of rehabilitation activities.
- Scrap metal and equipment will be sold as scrap or disposed of at a suitably licensed facility.

11.4.2 Management of reinstatement and rehabilitation

Management measures for reinstatement and rehabilitation during the decommissioning phase coincide with the measures provided for the construction phase.

12. REFERENCES

Lochner, P. 2005. *Guideline for Environmental Management Plans*. CSIR Report No ENV-S-C 2005-053 H. Republic of South Africa, Provincial Government of the Western Cape, Department of Environmental Affairs & Development Planning, Cape Town.