



NMPP Alliance

Transnet Limited

New Multi Product Pipeline (NMPP) Project

Revised Environmental
Management Plan (EMP) –
Trunkline and Facilities

2684358-J-A00-EN-RP-005

REV 5 – Issued for Use

NMPP Alliance



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Management Plan (CEMP) –
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Preamble

In Chapter 4 of the EIA, a description is provided of the complexities of integrating the environmental assessment and management (EA&M) process with the project development process. While the EA&M process seeks detailed, site-specific information at an early stage in the project development process, this information may only become available during preliminary and detailed design (which occurs at a later stage in the project development process). The absence of sufficient project information must not undermine the robustness of an EIA, and for this reason EIA practitioners focus strongly on sourcing that information that is required for good decision-making rather than necessarily sourcing all information.

In developing the Environmental Management Programme (EMP), the emphasis is to identify all environmental management requirements. The EMP is more demanding of detailed, site specific information than is the case for the EIA. However, in terms of the National Environmental Management Act (NEMA) regulations, the EMP must be developed and submitted at the same time as the EIA and must also be authorised before construction commences. In addition, there is sometimes a perception that in developing a project, detailed design is completed in its entirety before construction starts. In reality, in EPC projects, construction schedules demand that construction starts shortly after the start of detailed design which for most of the project runs in parallel and only slightly ahead of construction.

This means that detailed design is only completed at any time for those portions of the route that are about to be constructed with detailed information on further parts of the route only becoming available at a later stage when construction progresses to those points. This is a difficult issue to manage on a single site, but is compounded on a linear project such as the NMPP trunkline, where the EMP must be approved (in terms of the Regulations) at an early stage in the project development process, well before detailed design has commenced for other parts of the route. A further complexity is that given the uncertainty of the form of the detailed designs, Contractors are understandably reluctant to accept detailed prescription on what they must do to achieve a given environmental management objective.

Contractors often see prescription as undermining the design process, which incorporates a broader range of issues such as schedule, cost and other things. This does not mean that construction Contractors do not want to implement environmental management requirements, but they prefer an opportunity to develop the best possible approach to addressing the requirement. For example, if the requirement is to ensure that sediment loading in stormwater runoff from the construction site is prevented, then a prescription that an impoundment dam must be built forgoes other ways of meeting the same requirement such as stone gabions, velocity inhibitors, geo-fabrics and other. In these terms, Contractors would rather have

outcomes specified in the EMP than detailed prescription about what they must do to meet the outcomes.

Authorities on the other hand seek prescription because they need the reassurance that the environmental management requirements will be met. It is also often easier to determine whether a prescription (such as an impoundment dam) has been implemented rather than determining whether the outcome has been met (for example if there was a storm in the early hours of the morning). Unfortunately, an EMP that is too prescriptive limits opportunities for improved environmental management. For example, if the EMP prescribes watering three times a day to control dust, there are circumstances where the nature of the surface, low wind conditions and water scarcity require less watering than there is little point (and indeed even potentially negative consequences) of enforcing the watering three times a day requirement.

There will always be circumstances where a particular prescription simply does not work. This can occur for a variety of reasons, but a key driver is where site - specific conditions prove to be different to those that were anticipated. A highly prescriptive EMP does not provide for changes in approach where such circumstances occur. EMPs are often described as 'living' documents which can purportedly be updated and changed to adapt to the new conditions. The difficulty is that the EMP is approved once only by the authorities and there is no regulatory mechanism for an updated EMP to be approved. Even were such a regulatory provision to exist, the pace of construction on a pipeline project dictates that changes need to be made quickly and decisively – there simply cannot be a process of waiting for approval every time a change is needed.

It is for these various reasons that it is proposed here that the principle of adaptive environmental management be recognised and indeed authorised by DEAT as part of the authorisation of the EMP. Adaptive environmental management is an internationally recognised concept (see inter alia Roux, DJ, et al. 1999) that allows for, and indeed demands, that environmental management approaches be changed where they are proving to be ineffective. Adaptive environmental management does not mean a 'trial and error' approach it simply means that if there are better ways of achieving the same objective, or indeed improving the outcome, then these better ways should be allowed to be implemented without being viewed as a contravention of the conditions of authorisation.

The principle of adaptive environmental management must not give carte blanche to proponents and their contractors to change things as they see fit. Consequently, it is proposed that certain specialist supervisory personnel have limited authoritative powers to make decisions "in the field", in response to specific conditions encountered. For this reason it is proposed that the following procedure must be implemented wherever adaptive management principles are utilised:

- Senior qualified environmental personnel must be employed by Transnet on site, which have both the competence and credibility to interpret the recommendations of the EIA and principles specified in the EMP. This would imply Transnet's ECOs be afforded the authority to amend specific mitigation measures or requirements in the EMP in response to situations where they are not applicable or sufficient, provided that these changes are informed by an appropriately qualified and experienced specialist consultant when necessary. To this end the contractor's ELOs will be in constant communication with the appointed Transnet ECOs to ensure that situations are dealt with as soon as is possible;
- Such personnel must be issued a mandate, in writing by the project proponent, to provide guidance and instructions to the Contractors.
- An adaptive environmental management register must be developed for the project by the Contractor;
- Wherever a change from what is presented in the EMP is required, these changes must be detailed in the register including location, date, scope and cause of the condition encountered and reasons for the change;
- A clear statement of the required outcome must be detailed in the register (e.g. to meet a water quality limit, improve rehabilitation and so forth);
- Evidence must be provided and included in the register to show how the required outcome has been met (e.g. presentation of a data record, photographic evidence and so forth);
- The register must be available for audits and if, in the opinion of the authorities conducting the audit, the change resulted in a deterioration rather than an improvement, a compliance notice must be issued; and,
- The adaptive management register must be transmitted weekly via email to the Independent Environmental Auditor and ECO's, as well being presented and discussed at the Environmental Management Committee (EMC) or other similar bodies that may be established as part of the conditions of the authorisation.

References

Roux, DJ, et al. 1999. Adaptive assessment and management of riverine ecosystems: the Crocodile/Elands River case study. *Water SA*, vol. 25(4), pp 501-511; and,

Glossary, abbreviations and acronyms

Applicant / Owner	Transnet
Bids	Formal proposals by prospective service providers for different components of the design and construction of the project
Cement laden water	Water containing cement or concrete arising from the Contractor's activities
CTR EMS	Contractors' Environmental Management System
Contaminated water	Means water contaminated by the Contractor's activities such as with hazardous substances, hydrocarbons, paints, solvents and runoff from plant, workshop or personnel wash areas but excludes water containing cement/ concrete or silt.
dBa	A-weighted sound pressure level
DE	Design Engineer
DEAT	The National Department of Environmental Affairs and Tourism
DWAF	The Department of Water Affairs and Forestry – both national office and their various regional offices, which are divided across the country on the basis of water catchment areas.
ECA	Environment Conservation Act (Act 73 of 1989)
ECO	Environmental Control Officer
EIA	Environmental Impact Assessment as contemplated in GN R385 of 21 April 2006 ("GN R 385") of the National Environmental Management Act (107 of 1998).
EIR	Environmental Impact Report
EMC	Environmental Monitoring Committee
EO	Environmental Officer (Contractor)
EMI	Environmental Management Inspector ("Green Scorpion")– from DEAT and Provincial Environmental Departments
EMP	Environmental Management Plan
Environment	The Environment is defined in terms of the National Environmental Management Act (Act 107 of 1998) as the surroundings within which humans exist and that are made up of: The land, water and atmosphere of the earth: Micro-organisms Plant and animal life Any part or combination of the first three items and the inter-relationships between them The physical, chemical, aesthetic and cultural properties and conditions of the foregoing that influence human health and wellbeing.
Environmental Authorisation	Previously referred to as a Record of Decision (RoD). This constitutes the approval or dismissal of project as issued by the relevant environmental authority
EPCM	Engineering, procurement and construction management - viz. the 'managing' contractor
Fauna	All living biological creatures, usually capable of motion, including insects and predominantly of protein-based consistency.
Fence	A physical barrier in the form of posts and barbed wire or any other concrete construction, ("palisade"- type fencing included), constructed with the purpose of keeping humans and animals within or out of defined boundaries.

Fine	A monetary penalty against the Contractor by the PM as per request from the ECO.
Flood line	The line or mark to which a flood could rise, every 50 (1:50 year flood line), or 100 (1:100 year flood line) years
Flora	All living plants, grasses, shrubs, trees, etc., usually incapable of easy natural motion and capable of photosynthesis.
HSE	Health, safety and environment
I&AP	Interested and Affected Parties
IEA	Independent Environmental Auditor
Induction Training	Training provided to all new employees prior to them being allowed on site
ISO 14001	The environmental management systems standard of the International Standards Organisation
JPCCT	Jameson Park Community Commonage Trust
Key Indicators	Variables that provide a measure (indication) of environmental management performance
LLM	Lesedi Local Municipality
LLO	Landowner Liaison Officer
MPRDA	The Mineral and Petroleum Resources Development Act (Act 28 of 2002)
NEMA	National Environmental Management Act (Act 107 of 1998)
NGO	Non Government Organisation
NHRA	National Heritage Resources Act (Act 25 of 1999)
Non-compliance	Failure to comply with the requirements of the EMP
NWA	National Water Act (Act 36 of 1998)
PM	Project Manager
Potentially hazardous substance	Is a substance, which can have a deleterious effect on the environment. Hazardous Chemical Substances are defined in the Regulations for Hazardous Chemical Substances published in terms of the Occupational Health and Safety Act.
PPE	Personal Protective Equipment
Putrescible Waste	Waste that decomposes
RE	Resident Engineer
RoW	Construction Right of Way
SABS	South African Bureau of Standards
SAHRA	South African Heritage Resource Agency
Silt laden water	Water containing sand and silt arising from the Contractor's activities and/or as a result of natural run-off.
SMME	Small, micro and medium enterprises

Solid waste	All solid waste, including construction debris, chemical waste, excess cement/concrete, wrapping materials, timber, tins, cans, drums, wire, nails, food and domestic waste (e.g. plastic packets and wrappers)
Spot Fine	A fine against a labourer by the PM as per request from the ECO. This fine should be used for the labourers' benefit.
Stormwater	Rainfall run-off from the site.
Swale	A depression between slopes that provides for drainage
TLB	Tractor, Load & Backhoe
Topsoil	The layer of soil covering the earth which provides a suitable environment for the germination of seed; allows the penetration of water; is a source of micro-organisms, plant nutrients and in some cases seed; and is not of a depth of more than 0,5 metres or such depth as the Minister may prescribe for a specific prospecting or exploration area or mining area.
Trunkline	For the purposes of this EMP this refers to the NMPP Project for the section between Durban and Jameson Park including the associated infrastructure such as terminals, pump stations, block valves, cathodic protection etc.
Vegetation	Any and all forms of plants, see also Fauna
Wastewater	Water containing cement washings, oil, fuel or other contaminants.
Wetland	A low lying area where the land is saturated with water, either permanently or temporarily and as characterised by specific indicator plant species and soil types
WUL	Water Use License (DWAF)

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1 Environmental Management Framework

1.1 Introduction

The purpose of this Environmental Management Plan (EMP) is to ensure that the environment is properly considered during the design, construction, operations and decommissioning of the NMPP Trunkline and that negative impacts are minimised or prevented and positive impacts enhanced. At the same time the EMP provides a logical extension of the Environmental Impact Assessment (EIA) and ensures that recommendations contained in the EIA are implemented, and that the project does not deviate from the environmental profile that formed the basis of the assessment.

Specific objectives of the EMP are to:

- Summarise the range of potential adverse impacts that have been identified throughout the Environmental Impact Assessment (EIA) process of the project;
- Identify a range of mitigation measures that could reduce the potential adverse effects that the project has to acceptable or minimal levels;
- Detail specific actions, tasks and responses that are or may be required in response to incidents to ensure that environmental impact is minimised and mitigated;
- Where appropriate, specify timeframes within which required actions must take place and identify the required outcome or result of specific measures;
- Identify measures that could optimise the potential beneficial impacts of the project;
- Create a management structure and process through which the concerns of Interested and Affected Parties (I&APs) can be captured or documented and adequately addressed;
- Establish a process for the monitoring and auditing of environmental impacts and assessing the success of mitigation measures employed;
- Ensure that the construction process and operational phase of the project occur within the boundaries and parameters of acceptable practice that have been established;
- Specify actions and practices that will ensure good public relations and safe working conditions.

In order to ensure that these objectives have been properly planned for and integrated with project implementation, the format of the ISO 14001 Environmental Management Systems (EMS) standard has been used to provide a framework for the EMP. The use of this framework ensures that the environmental management requirements on the project are

properly planned for, implementation is effective, and, most importantly perhaps, that the environmental management function is always reviewed in a spirit of continuous improvement. In addition the use of the ISO 14001 EMS standard means that the EMP can be easily extended into a formalised EMS should this be required.

1.1.1 The Structure of the EMP

The EMP has been structured on the major components of the ISO 14001 Environmental Management Systems standard. These components are presented in Figure 1-1 together with a brief written description of what is required for each component in the sections that follow.

1.1.2 Environmental Policy

The importance of an environmental policy lies in the fact that it is principally the organisation itself that defines how it will give effect to environmental management. While there are several sources of specific environmental management and performance requirements including the EIA and other regulatory requirements, it is up to an organisation to define how it will address and manage all these requirements, as well as others that may be identified by the organisation.

1.1.3 Planning

Planning requires the characterisation of the various environmental aspects and related potential impacts that can result from the organisation's activities and defining mitigation to prevent or reduce negative impacts and enhance the benefits. In the case of the NMPP Trunkline the major potential impacts have been characterised through the Environmental Impact Assessment (EIA) process. The EIA is the key (but not exclusive) source of identified impacts and the resultant environmental management requirements that must be implemented during the execution of the project.

1.1.4 Implementation

Implementation is the key to the success of the EMP and arguably one of the most difficult components to achieve. Implementation is the process of ensuring that the planning is effectively implemented and as such is based on a clear delineation of responsibilities, an effective structure for implementation and 'management controls'.

Structure and responsibilities define the key roles that need to be fulfilled in the implementation of the project and the environmental management responsibilities of those roles. These include dedicated environmental management personnel as well as general project personnel because everyone on the project has a role to play in ensuring effective environmental management. Management controls serve to ensure that there is a robust mechanism for implementation of the environmental management requirements.

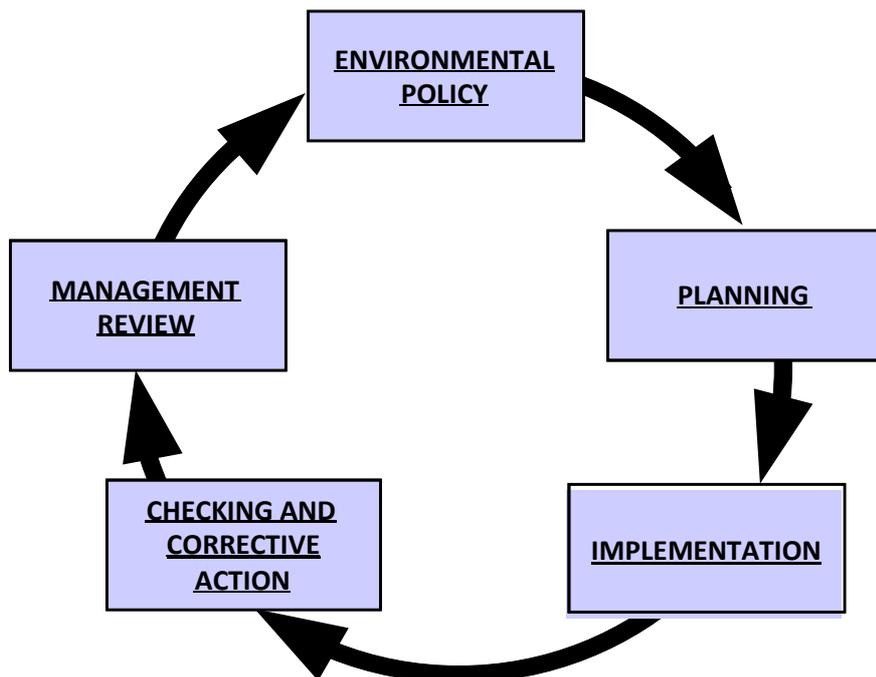


FIGURE 1-1: Schematic illustration of the environmental management philosophy presented in this document.

**ISO refers to 'Implementation and Operation'. By operation is meant the 'operationalisation' of planning control measures. Because the project involves distinct phases, which include 'construction' & 'operation', the ISO definition of 'operation' not used here since it causes confusion.*

1.1.5 Checking and preventative corrective action

Checking and corrective action is the process of gathering information on environmental management performance, reviewing that information and deciding on the necessary corrective and preventative actions that are required in response.

1.1.6 Management Review

The final component of the EMP is a formal management review. The review must occur regularly and serves for senior project management to review the environmental

management performance during the preceding period and to propose measures for continually improving that performance.

1.2 Environmental Policy

The Contractor and EPCM will produce an Environmental Policy which is aligned with the Transnet Corporate Responsibilities and Policies.

This Policy will be communicated to all Project personnel and made available to the public.

1.3 Planning

1.3.1 Overview

Planning serves to ensure that all the environmental management requirements that must be implemented for the NMPP Trunkline are identified and mechanisms defined for their implementation. The EIA plays a critical role in highlighting the environmental management requirements which derive from the recommendations for mitigation of impacts presented in the EIA specialist reports as well as legal requirements. The specialist assessments are based in turn on assessing the environmental aspects and impacts of the different project phases of the NMPP and these derive from the facilities and the activities associated with each project phase. In this section, the NMPP is briefly presented together with the facilities and activities associated with each project phase. Thereafter, the environmental management requirements that derive from the EIA are presented. The planning component of the environmental management philosophy is presented schematically in Figure 1-2.

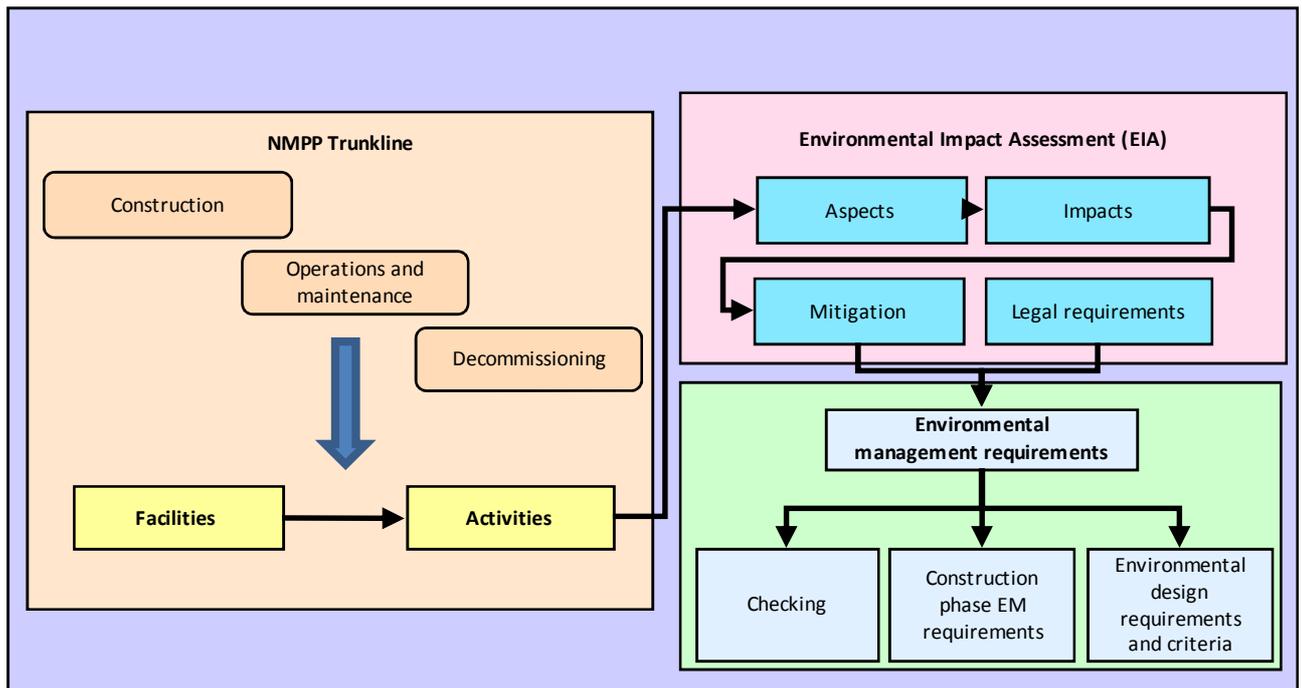


FIGURE 1-2: Schematic illustration of the planning component of the environmental management philosophy.

1.3.2 The NMPP Project

Transnet’s proposed NMPP project is designed to efficiently transport refined fuels (93 and 95 octane petrol, low and high sulphur diesel and aviation / jet fuel) from Durban to inland South Africa. The project consists of:

- A new 24 inch multi-products liquid fuel pipeline (“trunk line”) including eight pump stations along the route from Durban, KwaZulu-Natal to Jameson Park near Heidelberg in Gauteng. The pipeline will be buried for its entire length;
- A coastal fuel terminal to accumulate the fuels prior to their delivery into the pipeline.
- An inland fuel terminal at Jameson Park near Heidelberg, to accumulate fuels received from the trunk lines, prior to distribution into the inland pipeline network.

1.3.3 Project Phases

Design phase

The design process has three major components namely:

- Conceptual design – during which the broad principles of what needs to be established are defined;

- Basic design; and,
- Detailed design

In terms of design the broad principles of what needs to be built are established as conceptual design which are subsequently further detailed through the basic design and detailed design processes. What is constructed is taken directly from the detailed design. It is important to recognise that it is economically important to get the physical construction started as soon as possible after the completion of the design and what this means is that the design process and the construction process run in parallel albeit with a lag between the two.

Construction phase

The construction phase entails a set of activities required for the physical building of the Trunkline and associated infrastructure including;

- Establishment of lay-down areas;
- Construction of temporary facilities;
- Surveying and staking the construction right of way (RoW);
- Removing trees, boulders and debris from the construction RoW;
- Preparing a level working surface for construction equipment;
- Topsoil stripping and stockpiling;
- Pipe transportation;
- Trench excavation;
- Pipe bending;
- Welding, weld quality testing, weld blast cleaning and coating;
- Pipe laying;
- Trench backfilling;
- Reinstatement;
- Hydro-testing; and,
- Pipeline cleaning, gauging and drying.

Special Construction Techniques are employed where difficult or restricted terrain is encountered. These include the following:

- Open-cut river and stream crossings;

- Directional drilling;
- Road, railway line and driveway crossings;
- Other linear infrastructure crossings (pipelines, cables, irrigation systems);
- Tightly spaced or highly populated areas;
- Agricultural areas and significant natural features.

In addition to the establishment of the pipeline, pump stations and terminals, the following temporary facilities will be established:

- Construction camps;
- Access roads;
- Fencing; and,
- Borrow pits.

Operations phase

Operations consist of:

- Product dispatch;
- Inspections;
- Maintenance of pipeline and associated infrastructure;
- Maintenance of servitude.

De-commissioning phase

In the event that the pipeline is decommissioned the following activities would take place, subject to an appropriate environmental investigation:

- Removal of all petroleum products from the pipeline;
- Test integrity of pipeline;
- Fill pipeline with water;
- Maintain cathodic protection;
- Monitor pipeline for leaks and repair.

1.3.4 Environmental Management Requirements

On the basis of the impacts identified and assessed in the EIA, mitigation is presented to minimise or prevent negative impacts and to enhance potential benefits. The mitigation and other recommendations contained in the EIA are collectively referred to here as environmental management requirements. These environmental management requirements include, but are not necessarily limited to the management of:

- Geology and soils (including borrow pits, seismicity, blasting, dolomite and erosion);
- Fauna, flora and habitat (including areas of special sensitivity / conservation value, threatened species, and agricultural areas and activities);
- Water (including surface water features, river and wetland crossings, ground and surface water pollution and hydrology and stormwater);
- Air and noise (including air quality and dust);
- General construction activities (including construction access and traffic, vegetation clearing, topsoil and subsoil, borrow areas, stone and rock waste, waste management, reinstatement, construction right of way and gates and fences);
- The social environment (including archaeological sites and graves, employment, land owner and occupier relations, complaints, community health management and visual impact);
- Recruitment (including promotion of local labour and skills development and training);
- Transportation management (including pedestrian safety, traffic disruption minimisation and abnormal loads);
- Water conservation;
- Ongoing management and maintenance of construction impacts (including warranty of re-vegetation, vegetation maintenance and repair and replacement);
- Emergency and Response (including emergency preparedness and fire prevention and management);
- Materials handling and storage (including leak and spill management and spill remediation and recovery);
- Conditions of authorisation.

These various requirements apply to different project phases, different sections of the project, different facilities, different activities and in some circumstances to the entire project. It is therefore important to structure the environmental management requirements in such a way that they are properly understood, correctly allocated to the component of the project to

which they apply, and that they are effectively implemented during the execution of the project. To this end, and in recognition of the way in which the project will be executed, the environmental management categories have been categorised into environmental design requirements and criteria, construction phase requirements, and checking. Each of these categories is described in more detail in the following section.

Environmental design requirements and criteria

There is a range of environmental management requirements that apply directly to the physical infrastructure that will be created namely the pipeline, terminals and pump stations. Examples of these requirements include vapour recovery at the terminals, noise limitations and others. The mechanism implementing these requirements is ensuring that the requirements are recognised by, and feed into, the design process. In this manner, the environmental management requirements are incorporated in the design and are thus included in the facilities that are constructed. This first category of environmental management requirements is thus environmental design requirements and criteria that must be incorporated in the design of the pipeline.

Construction phase environmental management requirements

The construction phase sees the construction of the pipeline according to the detailed design that is developed. However, in the construction process, there are a range of activities and temporary (construction) facilities that are not directly addressed in the design process. Examples of these activities and temporary facilities include refuelling and servicing of machinery, construction camps, temporary access roads and so forth. There is obviously a range of environmental management requirements that apply thus to the construction phase, that are not incorporated in the design process and these requirements thus form the second category of requirements.

1.3.5 Checking

Checking refers to the mechanisms that serve to check the efficacy of implementation of the environmental management requirements and the outcomes of the environmental management function. These mechanisms include monitoring of selected environmental variables, audits (both internal and external) and inspections. Specific requirements that emerge from the EIA are thus captured in this section.

1.3.6 Legal Requirements

All project activities must adhere to and comply with all South African legislation and regulations and this requirement must also be included in the Contractors' conditions. Should there be changes in legislation and/or regulations then actions will be taken to incorporate

such changes and to pass these requirements on to the Contractors. Specific legislation that must be complied with includes, but is not necessarily limited to:

- Animal Protection Act, 1962 (Act 71 of 1962)
- Atmospheric Pollution Prevention Act, 1965 (Act 45 of 1965)
- Conservation of Agricultural Resources Act, 1983 (Act 43 of 1983)
- Constitution of South Africa (Act 108 of 1996)
- Environmental Conservation Act, 1989 (Act 73 of 1989)
- Hazardous Substances Act (Act 15 of 1973)
- Mine Health and Safety Act, 1996 (Act 29 of 1996)
- Mineral and Petroleum Resources Development Act, 2002 (Act 28 of 2002)
- Municipal Structures Act, 1998 (Act 117 of 1998)
- Municipal Systems Act, 2000 (Act 32 of 2000)
- National Environmental Management Act, 1998 (Act No. 107 of 1998)
- National Environmental Management: Air Quality Act, 2004 (Act 39 of 2004)
- National Environmental Management: Air Quality Act, 2004 (Act 39 of 2004)
- National Environmental Management: Waste Act, 2008 (Act 59 of 2008)
- National Forests Act (Act No 84 of 1998)
- National Heritage Resources Act, 1999 (Act 25 of 1999)
- National Monuments Act, 1969 (Act 28 of 1969).
- National Parks Act, 1976 (Act 57 of 1976)
- National Veld and Forest Fire Act, 1998 (Act 101 of 1998)
- National Water Act, 1998 (Act 36 of 1998)
- Occupational Health and Safety Act, 1993 (Act 85 of 1993)
- Protected Species – Provincial Ordinances

Standards and Specific Legal Requirements

Specific guidelines and policy requirements include:

- American Society of Mechanical Engineers (ASME) B31.4 Pipeline Transportation
- American Society for Testing Materials (ASTM)
- American Petroleum Institute (API)
- National Association of Corrosion Engineers (NACE)
- National Fire Protection Association (NFPA) standards
- International Standards Organization (ISO) 9000/2000 Quality Systems
- South African standards, codes and regulations, which include:
- South African Occupational Health and Safety Act (OHASA) Act 85 of 1993
- South African National Standard (SANS) 10089 (pertaining to the petroleum industry)
- Petroleum Pipelines Act, Act 60 of 2003
- National Key Points Act, Act 102 of 1980

Development Frameworks

On different parts of the alignment various development frameworks will also apply such as Metropolitan Open Space Systems (MOSS), Integrated Development Plans (IDP) and Spatial Development Frameworks (SDF). These requirements must also be **considered where possible** in the project implementation process during construction.

1.3.7 Objectives and Targets

In order to ensure that environmental management performance follows from the environmental policy and planning, objectives and targets must be developed and prescribed which provide the basis for monitoring of that performance. Objectives and targets must be specified for both leading indicators (i.e. the implementation of the requirements of the EMP) and lagging indicators (environmental performance monitoring).

1.4 Implementation

1.4.1 Overview

Effective implementation of the planning described in the previous section is dependent on ensuring that the environmental management requirements are integrated into the process by which the NMPP Trunkline will be built. Much of what is presented in this section is geared towards meeting that requirement. This is supplemented by the detailing of the responsibilities of the various role players that may have either a direct or an indirect role to play in terms of environmental management together with training and awareness programmes that will be implemented during the execution of the project. The implementation component of the environmental management philosophy is presented in Figure 1-3.

1.4.2 Integration with the Construction Process

The most effective way of ensuring implementation of the environmental management requirements is by integrating those requirements into the construction process. The greater the degree of integration with the construction process the greater the probability that the environmental management requirement will be implemented. For this reason it is necessary to describe key elements of the construction process before presenting how the integration of the environmental management requirements will be effected on the NMPP Trunkline Project.

1.4.3 Management of the Construction Process

The construction management structure is shown schematically in Figure 1-4. It is made up of the project owners (Transnet Pipelines), an engineering, procurement and construction management (EPCM) contractor (the NMPP Alliance), made up of a joint between ARUP and Worley Parsons) principal contractors and a host of sub-contractors. The EPCM contractor also has a design function where conceptual and detailed designs are prepared for construction. The EPCM acts as an agent for the project owners in managing the implementation of the project and ultimately to deliver a functioning trunkline to the project owners at the end of the project period.

The EPCM defines a scope of work for the principal contractors, and facilitates the process of identifying and appointing the contractor. The EPCM then manages the principal contractors in delivering on the scope of work including an ongoing process of developing detailed designs for construction by the principal contractors. The principal contractors will in turn appoint a range of sub-contractors for the completion of various functions within the defined scope of work.

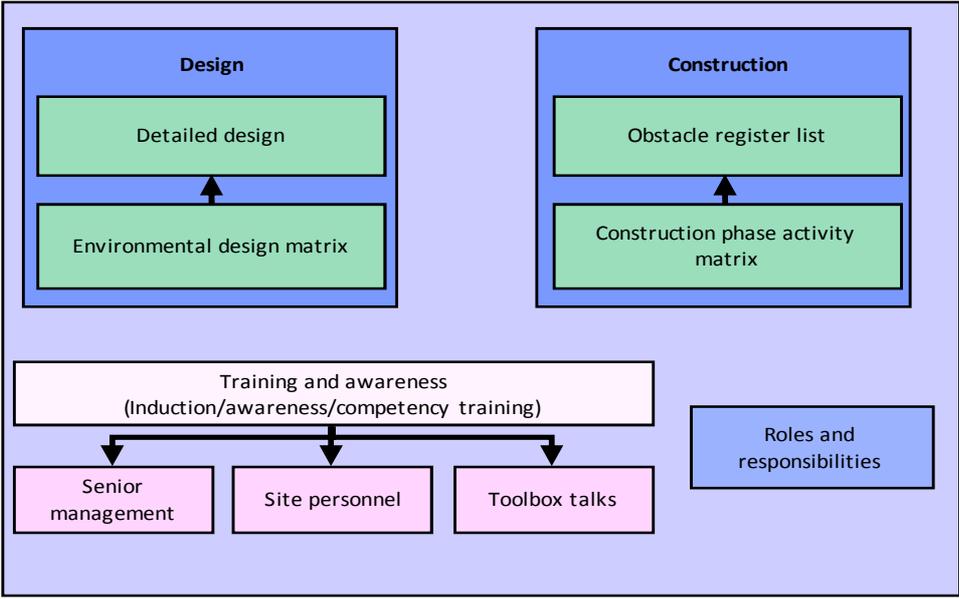


FIGURE 1-3: Schematic illustration of implementation and operation of the environmental management philosophy.

The design process

The design process is the ideal mechanism for translating the environmental management requirements into instructions to contractors. As described previously, the environmental management requirements have been divided into different categories including environmental design criteria.

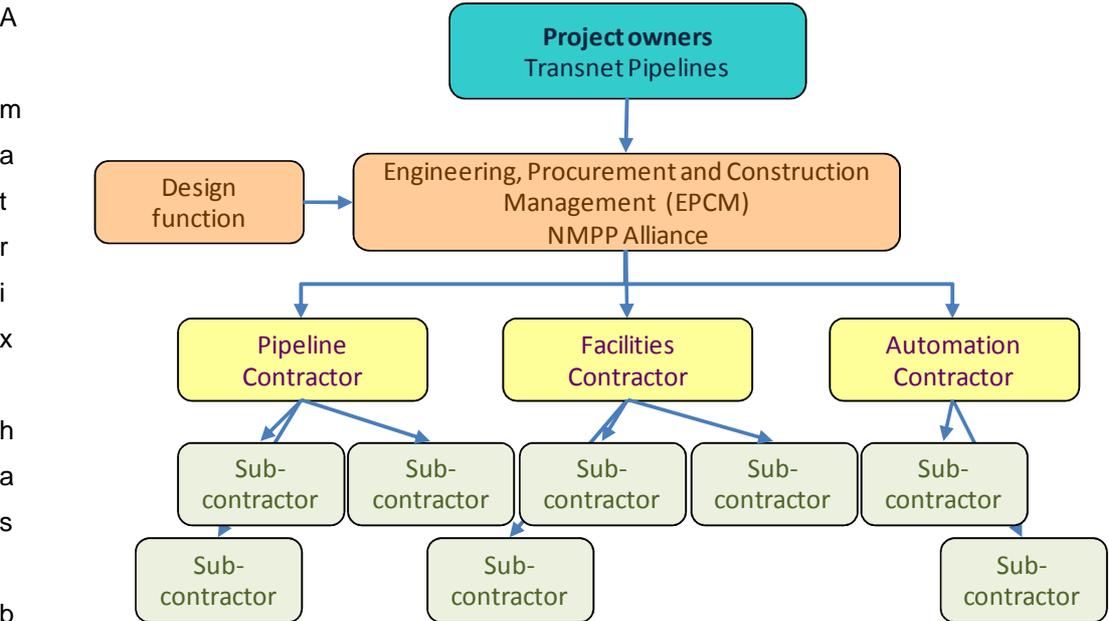


FIGURE 1-4: Schematic presentation of the management structure that will be used for the execution of the NMPP Trunkline project. .

n developed to link all the environmental design criteria identified during the planning process to the various facilities that will be established for the NMPP Trunkline. As the conceptual and detailed design is developed the environmental design requirements and criteria must be incorporated. The purpose of the matrix is to provide a clear reference system whereby a design engineer can easily source the environmental requirements that must be included in the design without having to work through the entire EMP. At the same time a review process must also be established to ensure that the detailed designs do in fact contain the environmental design requirements and criteria and that review process must be formally recorded and signed off as part of the design review process.

The construction process

On the basis of the designs that are prepared by the EPCM and in response to the defined scope of work and engineering and construction specifications, the contractors will physically construct the project.

A key mechanism used by the pipeline contractor in the construction process is the Pre-Construction Survey whereby the contractor defines all the tasks that will need to be completed along the different sections of the route. The Pre-Construction Survey could contain direct engineering challenges such as traversing services, difficult geology and so forth, but can also be environmentally related obstacles such as river or wetland crossings.

Design requirements of the pipeline will be presented in the Engineering Alignment Sheets issued to the contractor from the EPCM. Detail requirements such as the listing of all the temporary facilities that will be established will be identified by the contractor according to accepted method statements. Typical drawings issued to the contractor will indicate the various construction activities that will take place such as topsoil stripping, clearing and grubbing, trench excavations and so forth.

A review function must also be established to ensure that the contractor has understood and provided for the environmental management requirements. This can be checked against the Pre-Construction Survey or in the method statements that will be submitted by the contractor to the EPCM for the establishment of temporary facilities. In a similar vein a physical inspection regime must also be established to ensure that the physical construction of the facilities and pipeline infrastructure accords with the environmental management requirements.

1.4.4 Management Controls

Procedures

Although many of the environmental management requirements will be the responsibility of individual contractors, there is a range of environmental management requirements that are the direct responsibility of the EPCM. In order to ensure that these responsibilities are understood and effectively implemented during the execution of the project a range of procedures will be developed that will be managed by the EPCM and Contractor. The following procedures will be developed in support of the implementation of the EMP:

- Requirements of the EPCM in implementing the EMP;
- Audits and inspections;
- Monitoring;
- Recording, logging and reporting incidents;
- Corrective and preventive action;
- Review and approval of the Contractor's EMP (CEMP);
- Environmental awareness;
- HIV/AIDS awareness;
- Fire control and emergency preparedness;
- Materials handling and storage
- Leak and spill management;
- Recruitment and labour;
- SMME development;
- Engineering/design environmental review; and,
- Management review.

Note that the content of these procedures will be drawn to a large extent from the content of the EMP, but with more detailed elaboration of specific implementation requirements.

Contractor management

The most critical element of environmental management on any construction project is ensuring that contractors know what they have to do and then checking that they implement those requirements effectively in the execution of their construction activities. It is extremely

important to recognise that only contractors do any physical construction work on site so that anything that is required must be translated into instructions to contractors.

From an environmental management point of view the main contractor is compelled to submit its detailed Environmental Management System (EMS) documentation, procedures and method statements to the EPCM for acceptance. Contractors are required to detail in their procedures and method statements what their activities are and how they will manage those activities to ensure that the various environmental management requirements are met.

An important philosophy in managing contractors is to ensure that they take ownership of the environmental requirements and one of the ways in which this is promoted is through ensuring that they develop and implement their own procedures and method statements.

All of the environmental management requirements that the owner must uphold, and that are contained in this EMP are presented as contract conditions that are legally enforceable in terms of the contract concluded between the owner and the contractor.

The contract conditions that will be issued will stipulate the requirements for each contractor to develop their own procedures and method statements, the contractor will not be allowed to mobilise until such time as the procedures and / or method statements has been accepted by the EPCM.

1.4.5 Roles and Responsibilities

Effective environmental management during the design and construction of the NMPP Trunkline will be critically dependent on a number of project personnel. The purpose of this section is to define roles for personnel and to detail concomitant responsibilities in the execution of the EMP. Before doing so it is also necessary to define the various organisations that are responsible for implementing the project together with the environmental management responsibilities each carries. Please see Figure 1-4 for a more general description of the relationship between these organisations.

1.4.5.1 Transnet Pipelines

Transnet Limited, through their operating division Transnet Pipelines is the 'owner' of the project and as such the environmental authorisation and subsequent operational environmental permits will be issued in the name of Transnet Limited. Transnet Pipelines is thus responsible for ensuring that all the conditions of the environmental authorisation are fully implemented and are the overall custodians of the various environmental management requirements that need to be implemented.

Key Role Players (Transnet pipelines)

Environmental Manager (Transnet)

The Main responsibility of the Transnet Environmental Manager during operations will be to report to Transnet Management on the progress in terms of compliance of the Environmental Management Plan Requirements

Environmental Control Officers (ECOs)

Reporting to the Environmental Manager.

The ECOs will be appointed by Transnet prior to the start of the site preparation and construction phase. Due to the physical extent and complexity of the project and the fact that construction will simultaneously take place in multiple locations, Transnet will be required to appoint a sufficient number of ECOs to adequately and efficiently monitor all areas of construction.

An ECO must be appointed to monitor construction at each of the Terminal complexes, with additional ECOs to be appointed to monitor construction of the pipeline and pump stations.

The Environmental Manager and Project Manager must determine the appropriate number of ECO's required during review of the project schedule presented by the contractor. If at any point during the project it becomes apparent that the number of ECO's is not sufficient, additional ECO's must be appointed for the duration of the remainder of the project. The number of ECO's may be reduced once construction has reached a substantial level of completion.

The appointed ECO's must be sufficiently qualified with a degree in environmental practice or equivalent from a recognised University or Technikon (or recognised equivalent), and a further post-graduate degree in environmental practice or equivalent, from a University or Technikon (or recognised equivalent) in order to understand and perform all tasks required. The ECO's must also be able to effectively communicate and deal with the Contractor as well as affected landowners and members of the public. The resumes of all ECO's to work on the project have to be accepted by Transnet prior to appointment.

It is advisable that an Independent Managing Environmental Consultant / ECO is appointed by the applicant in order to manage all ECO's on site, since it is anticipated that not all ECO's might have appropriate site experience.

This Managing Environmental Consultant / ECO will have a degree in environmental practice or equivalent from a recognised University or Technikon (or recognised equivalent), and a further post-graduate degree in environmental practice or equivalent, from a University or Technikon (or recognised equivalent). Furthermore the Managing Environmental Consultant / ECO shall have a minimum of five years working experience in the field of Environmental Management and in particular have relevant experience as an environmental site officer.

The role of the ECOs is to support the successful implementation of the EMP through:

- Investigating and reporting on major environmental incidents;
- Auditing the implementation of the EMP
- Overseeing the execution of the activities described in the EMP.
- Maintaining and managing the monitoring programme.
- Participating in the Environmental Management Committee (EMC)
- Providing liaison on environmental issues between all other parties, i.e. the Contractor, Project Manager, Resident Engineer, Landowners and Authorities.
- Full familiarisation with the findings and conditions of the EMP and Environmental Authorisation, including any potential amendments or additions to these documents. Having a good working knowledge of all relevant environmental policies, legislation, guidelines and standards.
- Ensuring that all Contractors/ Contractor environmental personnel/sub-Contractors/employees are fully aware of their environmental responsibilities. This will take the form of an initial environmental awareness-training program in which requirements of this document will be explained, as well as follow-up or additional training sessions as required.
- Monitoring the actions of the above parties to ensure that the developer and/or Contractor are adhering to all stipulations of the EMP.
- Conducting site meetings and inspections at regular intervals as stated within the EMP and / or Environmental Authorisation as well as on a case-by-case basis as the conditions of the project may determine. The findings should be documented as part of the site meeting minutes.

- Submitting EMP compliance reports at regular intervals as determined by the EMP and / or Environmental Authorisation and submit these to the Contractor for appropriate and timorous action if required. Copies of the reports will also be submitted to the Project Manager and relevant authorities and any other parties determined by the Environmental Authorisation. The reports must be thorough yet concise, logically structured and understandable.
- Regular liaison with the Construction team, Environmental Officers (Contractor), Land Liaison Officers (LLO's) and Project Manager to ensure that all relevant information is reliably communicated between parties.
- Regular liaison with all Interested and Affected Parties (I&AP) including all landowners.
- Conducting a post construction environmental audit to ensure that all conditions in the EMP have been adhered to.

1.4.5.2 The NMPP Alliance (EPCM)

The NMPP Alliance is a joint venture between Arup and Worley-Parsons and fulfils the role of Engineering, Procurement and Construction Management (EPCM). In other words the EPCM is the managing contractor that takes the requirements of the client and translates these requirements into designs, procures the necessary equipment and services and manages the construction process. The EPCM will be accountable for environmental management during the construction phase and are thus responsible for implementing the EMP under the custodianship of Transnet Pipelines. The EPCM is the representative of Transnet Pipelines during the Engineering and Construction Phase.

Amongst other responsibilities the EPCM must:

- Maintain a register which keeps a record of all incidents which occur on the site, which relate to any aspect of the EMP. These include but are not limited to the following:
 - Health and safety incidents;
 - Incidents relating to safety and security of the site and construction camps;
 - Public complaints and incidents involving third parties;
 - Incidents involving hazardous materials or substances; and,
- Ensure that amicable relations with all third parties, including affected landowners and other I&APs are maintained and minimise the disruption and inconvenience suffered by these individuals as a result of construction activities.

Key role-players (EPCM)

Project Manager (PM)

The PM will be responsible for the overall management and overseeing of the contract, from initiation to completion of construction. As such the PM is the ultimate custodian of all elements of the project, from design, construction and commissioning through to operations and ultimately de-commissioning. In these terms the PM is, inter alia, the ultimate custodian of all environmental management requirements and legal obligations for the project. In response to these requirements the PM:

- Will be expected to be familiar with and ensure adherence to the conditions of the EMP and Environmental Authorisation, including any potential amendments or additions to the document;
- Will be responsible for monitoring the site activities, both directly and through appointed agents, in order to ensure compliance;
- Must ensure that sufficient resources are available to the other role players to efficiently perform their tasks in terms of the EMP;
- Must appoint the independent ECOs to ensure strict adherence to the EMP;
- Will be responsible for conducting internal audits of the construction process and conditions on site and compare these with the EMP and will ultimately be responsible for ensuring that remedial steps are taken where non-compliance occurs;
- Will, in consultation with any members of the Project Consultant Team and/or Environmental Manager and/or ECOs as the case may be, be responsible for the approval of the Emergency Response Plan and Fire Prevention and Management Plan;
- Will liaise with the Contractor to obtain the contact details and particulars of the Landowner Liaison Officers and Environmental Liaison Officers. He will submit this information, together with the details of the appointed Environmental Control Officers, Environmental Manager and Approved Inspection Authority (see separate Items below) to DEAT, as well as all relevant provincial and local authorities.

Environmental Manager (EM) (EPCM)

Reports to the Project Manager.

The role of the Environmental Manager is to ensure that all environmental management requirements are recognised and effectively implemented during the execution of the Project.

Specific requirements include to:

- Plan and direct the implementation of the Environmental Management Programme;
- Ensure that all the construction procedures and method statements comply with the environmental requirements in this EMP;
- Manage scheduled external audits and inspections on contractors performance on site, with subsequent report back to management;
- Coordinate and oversee the activities of the ECOs;
- Ensure that information is effectively communicated and distributed between all parties;
- Be aware of the environmental issues relating to the project and regularly meet with the ECOs to keep abreast of current events. Should an ECO not be able to respond to a specific query from the Contractor or Contractors environmental personnel or a landowner, the matter must be referred to the Environmental Manager who will take whatever actions are deemed necessary.

Design Engineer

The design engineer is the consultant responsible for the initial design of the project prior to construction commencing. The design engineer is not normally available on site during the construction period, but will be consulted throughout the construction period of the project regarding any issues that fall outside the scope of responsibility of the resident engineer.

Servitude Negotiators

The EPCM will appoint dedicated Servitude Negotiators whose responsibility it will be to liaise on an ongoing basis with all landowners in terms of servitude negotiations and keep them informed of progress and next steps of construction.

The Servitude Negotiators will act as the primary contact affected landowners and will facilitate all negotiations between the Contractor and landowners. It will be the responsibility of the Servitude Negotiators to keep landowners updated and informed of all activities and decisions relating to construction that may affect them and shall ensure that relevant contact

details of the Contractor and ECOs are available in order for landowners to make contact if required;

Approved Inspection Authority (AIA)

An AIA will be appointed by Transnet Pipelines in terms of the Occupational Health and Safety Act (Act 85 of 1993) as well as the API 1104 Code and all relevant national and international quality standards. It will be the responsibility of the AIA to check whether the installations conform to the relevant designs and specifications, as well as the general quality of materials used and construction workmanship. The AIA will provide assessments and recommendations to Transnet as well as the relevant authorities in this regard. The project is to be assessed by an AIA group to ensure quality and compliance.

1.4.5.3 Individual contractors

Three principal contractors will be appointed for the construction of the NMPP Trunkline namely:

- The pipeline contractor;
- The facilities (terminals and pump stations) contractor; and,
- Automation contractor.

The principal contractors will also appoint a number of sub-contractors.

Key role-players (Contractor)

Environmental Manager (EM) (Contractor)

The role of the Environmental Manager is to ensure that all environmental management requirements are recognised and effectively implemented during the execution of the Project.

Specific requirements include to:

- Ensure the implementation of the Environmental Management Programme;
- Development of all the relevant construction procedures and method statements in order to comply with the environmental requirements in this EMP;
- Ensure that contractors on site develop, implement and monitor the environmental management plan, construction procedures and method statements;

- Manage scheduled internal audits and inspections on contractors performance on site, with subsequent report back to management;
- Ensure that information is effectively communicated and distributed between all parties;
- Be aware of the environmental issues relating to the project and regularly meet with the ECOs to keep abreast of current events. Should an ECO not be able to respond to a specific query from the Contractor or Contractors environmental personnel or a landowner, the matter must be referred to the Environmental Manager who will take whatever actions are deemed necessary.

Contractor Environmental Officers (EOs)

The EOs will be appointed by the Contractor to monitor the activities on the site on a daily basis against the EMP conditions. The EOs will liaise on a daily basis with the ECOs on site and will report back to the ECOs on any significant occurrences during all site inspections and site meetings. The EOs will keep the ECOs informed of the contractors planned construction within areas of environmental concern such as wetlands, heritage sites and other sensitive areas. All communication between these parties in this regard will be confirmed in writing via email. The EOs must further immediately report any major incidents or occurrences to the ECOs to ensure immediate remedial action. Each construction site section must have an appointed EO who will be present on site whenever any construction activities are taking place.

Construction Manager (CM)

The role of the CM is to ensure that all contractors on site abide by the requirements of the EMP and that the plant and pipeline is constructed in such a manner that meets all specified contractual and legal environmental requirements.

Site Engineers

The role of the Site Engineers is to ensure that environmental requirements and restraints are passed on to the design engineers and to check that the plant and pipeline is designed to meet all specified environmental parameters and to contractual and legal requirements. A resident engineer acts as a direct, on-site resource for all technical aspects related to the project. He/she is available on the construction site at all times, overseeing all phases of the construction activities. The resident engineer will issue site instructions with regard to minor technical or procedural issues and where significant technical constraints or issues are encountered must liaise with the project design engineer.

1.4.5.4 General

Community / Land Liaison Officers (CLOs / LLO's)

In addition, the Contractor and EPCM will appoint dedicated CLOs / LLO's whose responsibility it will be to liaise on an ongoing basis with landowners and affected parties and keep them informed of progress and next steps of construction.

The CLOs / LLO's must be able to communicate with affected parties in all languages commonly spoken in a specific area and must have good interpersonal skills and communication ability. A sufficient number of CLOs / LLO's must be appointed by the Contractor and EPCM to ensure that all landowners are timeously consulted and informed of any events that may affect them. The CLOs / LLO's must have a good understanding of the project and all construction procedures and the environmental factors and impacts that may occur as a result of construction. Where a CLO / LLO is not able to answer a specific query from a landowner, the matter must be referred to the relevant ECO or otherwise Environmental Manager to resolve in the event that the issue is related to the EMP or environment.

The CLO / LLO will act as a primary contact with I&APs. It will be the responsibility of the CLO / LLO to keep I&APs updated and informed of all activities and decisions relating to construction that may affect them and shall ensure that relevant contact details of the Contractor and ECOs are available in order for I&APs to make contact if required;

1.4.5.5 Training and awareness

All employees will receive suitable environmental training, to ensure they are aware of their responsibilities and are competent to carry out their work in an environmentally acceptable manner. The Main Contractor will lead all environmental training programmes as required by the EMP. Sub-Contractors are compelled through their contract conditions to follow all requirements of the EMP, where the necessary training to their workforce will be essential to ensure that this requirement is met.

The Contractor must ensure that all of his construction staff receive basic training related to environmental matters, as well as acceptable conduct, storage and handling of chemicals and potentially hazardous substances, waste management, and prevention of pollution of natural resources. The Contractor must also ensure foremen and managing site personal receive detailed training with regards to the requirements of the EMP.

Training must be given or otherwise facilitated by the Contractor EO and all staff must be aware of where detailed information relating to any aspect of the EMP or environmental requirements can be obtained.

It is the responsibility of the Contractor to ensure that he is fully familiar with the requirements of this EMP. Should the Contractor require any information or explanation regarding any aspect relating to the EMP it will be his responsibility to contact the ECO for advice. In addition the following personnel will receive specific environmental training:

Informal training of all staff on site is also required on an on-going basis through informal discussions, on-site supervision and through facilitation of day to day activities. This responsibility falls within all that received basic or specialized training.

If it is found through formal reporting structures, informal site inspections and observations of day to day activities that certain training was inadequate, the contractor must ensure that such training is reviewed and revised if necessary and that all staff relevant to such areas are re-trained in order to ensure compliance to this EMP.

Higher level of training for senior management on all relevant environmental issues will be conducted by the Main Contractor. The focus will fall on legislation, EMP philosophy, structure and reporting requirements, permit procedures, application requirements and general environmental management activities.

Individual employees play an essential role in that they are directly involved in the physical construction activities and thus need to understand the limitation, restrictions and/or other environmental requirements in implementing their day to day tasks. It is important to note, however, that individual employees involved in construction activities will principally be under the direct supervision of the contractors.

All general workers will receive induction training which will be presented by the Contractor Health and Safety Manager Representatives. The induction training will include an environmental management component which will be presented where possible by the Contractor Environmental Representatives. The induction training is still to be developed but will address the following themes:

- General introduction to environment management;
- Why environmental management is required on the project;
- Roles and responsibilities of individuals on the project; and.

- Specific issues that need to be managed:
 - Dust;
 - Fire control;
 - Materials handling and storage;
 - Leaks and spills prevention;
 - Noise;
 - Waste;
 - Fauna and flora;
 - Waste water;
 - Transportation; and,
 - Water conservation.
 - Sensitive areas (wetlands, heritage sites etc.)

1.4.5.6 Toolbox talks and awareness campaigns

All workers will receive weekly toolbox talks that will be presented by individual contractors and facilitated by the Contractor EO on specific environmental topics that are relevant to their activities. These toolbox talks will be supplemented by site wide environmental awareness campaigns that will be run by the Main Contractor to promote sensitivity to and understanding of given environmental management issues.

Themes for tool box talks are to be developed but at this stage include:

- What is the environment;
- Why does it need to be protected;
- Environmental aspects and impacts of the NMPP Trunkline construction;
- What can individuals do;
- Water conservation;
- Managing litter;
- Use of ablutions;
- Spillage prevention and reporting;

- Environmentally sensitive areas;
- Careful driving (dangers of speeding, use of defined access routes);
- Not interfere with local inhabitants;
- Condom use; and,

Contractors Environmental Management requirements

1.5 Checking, Preventative and Corrective Action

1.5.1 Overview

Checking and preventative and corrective action is based on a process of gathering information on both leading and lagging indicators, reviewing this information in a systematic manner and making decisions on the basis of the performance reflected by the indicators. Preventative and corrective action can be initiated whenever it is appropriate to do so, for example during an inspection a non-compliance can be communicated to the contractor for immediate action on a major or serious issue, but as a minimum the environmental management performance of the project will be reviewed on a monthly basis and corrective and preventative actions formally documented and implemented. In this section the various mechanisms used to gather information and to take action in response to that information are presented and described. Checking and preventative and corrective action is illustrated schematically in Figure 1-5.

This component consists of four key activities including:

- Monitoring of selected environmental quality variables;
- Daily inspections of the site and activities across the site;
- Formalised audits on individual contractors as well as specific activities where these are identified as being problematic; and,
- Reporting on a monthly basis as an input to the review and management process.

1.5.2 Monitoring

A series of environmental variables that are to be monitored during the Construction phase of the project are listed below. The specific monitoring requirements are described in greater detail in Section 2 and 3. Monitoring results will be presented monthly and compared to the

objectives and targets stated in the EMP. Where the target values are not being met, further mitigation will be pursued.

The following parameters are to be monitored on an ongoing basis during the construction phase by the Contractor:

Parameter	Frequency	Responsibility
Water Monitoring		
Water Supply for Camps	Monthly Quantitative Assessment and Water Quality Testing	CTR / EO
Sewage Waste Water	Monthly Quantitative Assessment and Water Quality Testing	CTR / EO
Waste Water from Oil / waste water separators	Weekly Visual Inspections / 3 Monthly Lab Analysis	CTR / EO
Water Discharge	Before and During Construction / Weekly Lab Analysis	CTR / EO
Water Quality of water course crossings	Before and During Construction / Weekly Lab Analysis	CTR / EO
Water Supply	Quantitative / Water Abstraction Records	CTR / EO
Dust Monitoring		
Dust Control	Visual Inspection / Daily	CTR / EO
Dust Fallout	Visual Inspection / Daily	CTR / EO
Blasting		
Vibration	Once During Actual Blasting	CTR / EO
Noise	During Actual Blasting	CTR / EO
Construction Activities		
Noise	Before and During Work / At least once a month	CTR / EO

It should be noted that Noise and Vibration monitoring during blasting and other construction activities will only be conducted in areas of close proximity of dwellings, housing or within towns / cities. There is a further requirement to monitor noise and vibration in areas where sensitive receptors are present such as for example areas where sensitive threatened species occur such as the Oribi.

1.5.3 Inspections

Due to the transient nature of the Project phase, the greatest source of information is that sourced through ongoing visual inspection. This will be the function of firstly the contractors Environmental Officers and secondly the ECOs who will spend the bulk of their time on site monitoring compliance to the EMP and noting any activities that transgress the requirements specified in the EMP.

At the same time some potential impacts are difficult to monitor quantitatively, such as soil erosion and waste management. The ongoing inspections by the ECO's and EO's, provides valuable qualitative information on effects such as these so that action can be taken to mitigate against further potential effects.

These inspections must take place daily, weekly and monthly and must be adequately documented for record purposes. In addition, these reports must be sent via official communication channels to ECO's. In this way ECO's can evaluate the effectivity of the contractors EO's monitoring procedures and provide specific input as to aspects of the EMP or unforeseen issues on site that require additional attention.

1.5.4 Internal Audits

Two types of internal audits will be conducted by the Independent Environmental Auditor. These will be formal scheduled audits that follow a defined programme and that are continued across all the contractors that are on site. The second type of audit is where the monitoring data and the inspection reports highlight problems and the response will be to initiate an internal audit focussed on that specific problem area highlighted. The

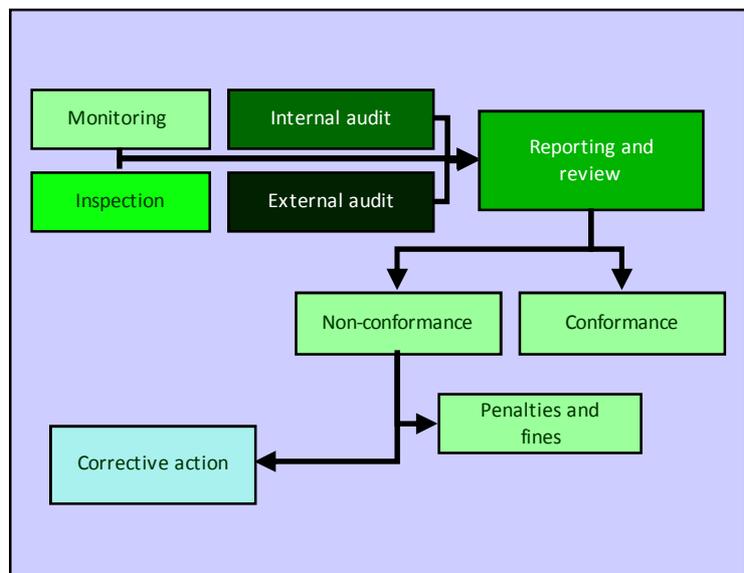


FIGURE 1-5: Schematic illustration indicating checking and preventative and corrective action within the environmental management philosophy.

purpose of the audit will be to ascertain the source of the problem and to define what action must be taken to prevent its recurrence.

1.5.5 Reporting

A bi-monthly environmental audit report will be prepared by the Independent Auditor and tabled in the Environmental Management Committee meeting. The report must include a description of at least the following:

- Incidents and complaints;
- Implementation of the EMP
 - Inspections
 - Audits
 - Approvals
- Key corrective actions.

A monthly environmental performance report will be prepared by the Contractor and also tabled in the Environmental Management Committee meeting. The report must include a description of at least the following:

- Incidents and complaints;
- Implementation of the EMP
 - Inspections
 - Audits
 - Approvals
- Performance against targets;
- Selected environmental monitoring results; and,
- Key corrective actions.

Note that compliance / non-compliance and incident records must be kept by the both the EPCM and Contractor and shall be made available on request from the authorities. These records should be made available to ECO's on request as they are present on site daily and can monitor the progress of corrective actions objectively as an independent party. It is particularly important that the ECO's are involved in the process of the close-out of open non-conformances.

1.5.6 Preventative and Corrective Action

Where preventative and corrective action is identified, this can be implemented as follows.

Verbal instruction

Verbal instructions are likely to be the most frequently used form of corrective action and are given in response to minor transgressions that are evident during routine site inspections. Verbal instructions are also used to create further awareness amongst contractors, as often the transgressions are a function of ignorance rather than vindictiveness.

If required verbal instructions are to be followed up by whomever issued them as written instructions as stipulated as per the contractual agreements.

Response times are at the discretion of the person/s that provided the verbal instruction and should be documented.

Written instructions

Written instructions will be given following site visits, audits or as result of discussion sessions with the contractor. These written instructions could be made electronic via for example email, meeting minutes, action registers etc. The written instructions will indicate the source or sources of the problems and proposed solutions to those problems. The implementation of these solutions will be assessed in a follow-up site visit, audit or discussion session and further written instructions issued if required.

Response times are at the discretion of the person/s that provided the written instruction and should be documented.

Project Management Instructions – PMI's

In cases where written instructions deem to be inadequately addressed or constitute a change of scope to the Contractor as per the signed contract, a PMI will be issued which must be resolved as specified in the PMI. The PMI will indicate the source or sources of the problems and proposed solutions to those problems. The Contractor will have to reply in writing as required by the contract to demonstrate implementation of the PMI if necessary.

Response times are at the discretion of the person/s that provided the written instruction and should be documented.

Contract notice

A contract notice is a more extreme form of written notice because it reflects the transgressions as a potential breach of contract. If there is not an adequate response to a contract notice then the next step can be to have the contractor removed from the site and the contract cancelled.

Response times are at the discretion of the person/s that provided the contract notice and should be documented.

Work stoppage

When, in the opinion of the Environmental Manager (Transnet), a construction activity will result in environmental damage, the Environmental Manager will formally advise the PM, who will in turn order the Contractor to halt the activity. The Contractor will keep written records of instructions received from the ECO and PM concerning environmental matters.

Only written instructions for stoppages that have been issued as per the contractual agreement and that have been signed off by the Project Manager will be considered a valid instruction to the Contractor.

1.5.7 Stakeholder Engagement

Throughout the project ongoing liaison should be maintained with authorities and communities alike to ensure that the following is effected:

- Timeous advanced warning of any project activities that may have some impact on surrounding communities;
- Ongoing feedback on the project and environmental performance; and,
- A continuous conduit is established whereby complaints can be lodged and speedily and efficiently resolved.

The public is to be kept informed with regard to the project in general and its environmental performance during the construction and operational phases. Mechanisms to facilitate communication between Transnet Pipelines and the public are to be established which include as a minimum:

Ad hoc consultation meetings

The public is to be kept informed with regard to environmental performance during the construction and operational phases of the project. The following two forums will be used as mechanisms to facilitate communication between Transnet and the public.

Focus Groups

Transnet has a communications department which is responsible for stakeholder engagement. This department will engage all willing and available NGOs, especially environmental NGOs.

Interested and Affected Parties (I&APs)

Community / Land Liaison Officers will engage in face to face meetings with the public. I&APs will be informed about the progress of the project at meetings that will be held at pre-determined venues.

Participation in the Environmental Monitoring Committee (EMC)

A procedure will be established by the EPCM in terms of the setting up and operation of an EMC.

1.5.8 Complaints

A complaints procedure will be developed by the EPCM.

The procedure will include the development for a complaints register that will be used to record and track all complaints that are received regarding the activities on the project. A dedicated telephone number and an email address will be established and advertised as a means of lodging complaints. Complaints will be addressed as per the procedure.

The nature of the complaint, the source, the turn-around time and the remedial action implemented will all be recorded in the complaints register. Complaints will be reviewed during Environmental Coordination Meetings as a performance indicator.

All complaints from the public should immediately be dealt with and recommendations or instructions will be issued through the Project Manager to the Contractor if required, as soon as is practical. In all cases the complaints procedure developed by the EPCM must be followed.

The Contractor is to take remedial action as soon as is practical to ensure that issues are dealt with timeously. Timeframes for rectification of non-compliance as specified by the Environmental Authorisation should be considered to be a minimum and where possible the Contractor must endeavour to respond sooner.

Compliance and record-keeping

Through an ongoing review of information from the inspections, audits, monitoring and incident reporting, non-compliances with the requirements of the EMP and conditions of authorisation, will be identified by the EPCM. Reporting thresholds will be as per the Environmental Authorisation conditions as specified by the authorities to ensure that non-compliances are identified and reported to the authorities timeously.

A register will also be kept of all non-compliances together with the responses received from the authorities. All records related to the implementation of the EMP (e.g. ECO diary, methods statements etc.) must be kept together in the site office in a safe but accessible manner. Records will be kept as per the Project Document Control Procedures, and should at any time be made available for scrutiny by any relevant authority if requested.

The EMP, including all annexure as well as the Environmental Authorisation must be kept on site at all times. Whenever additions or revisions to any of the above documentation are issued these must be issued to the Contractor immediately and must replace redundant versions. It is the responsibility of the Contractor to ensure that the relevant documents are kept on site and the responsibility of the EPCM to ensure that the Contractor is issued with the most updated and relevant documents. Furthermore the EMP will be included into the Contractual Clauses of the construction contract and will be made binding on all Contractors operating on or affecting the site.

The Contractor and ECO will keep written and photographic records of the site surroundings before, during and after construction on the site. The photos will be clearly annotated to include a description of the exact date and location when and where they were taken, as well as any specific issues that need to be highlighted. Note must be made of what party was responsible for damage caused to ensure liability for damage. The Contractor shall be held liable for all preventable damage to the environment and shall be responsible for the cost and implementation of all remedial actions to be taken.

1.6 Management Review

In keeping with the ISO 14001 requirements, a formal management review will be conducted regularly. The purpose of the review will be to critically examine what is working and what is not in respect of the EMP and its implementation and to decide on modifications to the EMP

as necessary. The process of management review is in keeping with the principle of continual improvement. Given the period of construction it is envisaged that a management review will take place at 6-monthly intervals. The management review requires the participation of the following as a minimum:

1.6.1 Contractor Representatives

- Environmental Manager
- Contractor Project Manager
- Environmental Officers
- Construction Manager

1.6.2 EPCM Representatives

- Project Manager
- Environmental Manager
- Construction Manager
- Independent Inspection Authority

1.6.3 Transnet Representatives

- Project Manager
- Environmental Manager
- Environmental Control Officers

1.6.4 Independents

- Independent Auditor.

A formal agenda is to be tabled and minutes kept of the meeting which must detail the continual improvement interventions decided in the management review.

The Management Review meeting will be organized and chaired by the EPCM.

1.7 Summary

The environmental management philosophy presented in this document is based on the ISO14001 Environmental Management Systems standard. The management philosophy is thus based on 5 key components namely policy, planning, implementation and operation, checking and corrective action and management review. Each of these individual components has been described in this section of the EMP. The overall environmental management philosophy is best presented schematically to show how all the components piece together. That schematic presentation is given in Figure 6. The report was prepared after almost seven months of public and authority consultation during the Scoping Phase of the EIA between Mid January and 7 July 2008. In accordance with Regulation 31 of the EIA Process Regulations, the National Department of Environmental Affairs and Tourism (DEAT) approved the Final Scoping Report and EIA Plan of Study on 8 August 2008. The Draft EIA and the Draft EMP were available for public review between 22 September 2008 and 27 October 2008. The Final EIA was submitted to DEAT on 6 November 2008. This EMP is considered the revised EMP which is to be submitted to the DEAT for review and approval during June 2009.

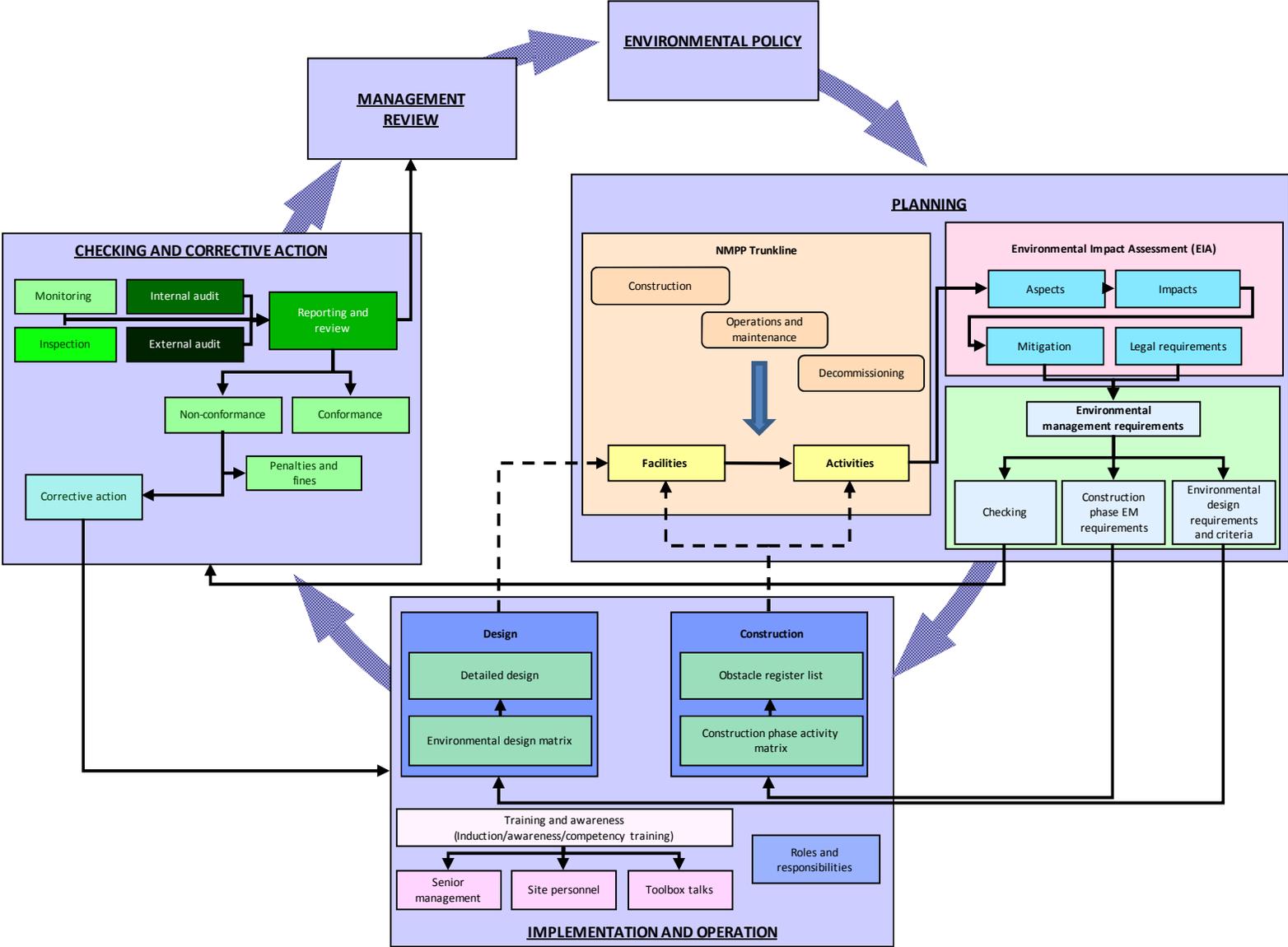


FIGURE 1-6: Schematic illustration indicating checking and preventative and corrective action within the environmental management philosophy.

2 Construction Phase

2.1 General Conduct and Site Management

2.1.1 Construction Camps

ITEM NO.	GENERAL/ SITE SPECIFIC	ENVIRONMENTAL DESIGN REQUIREMENTS AND CRITERIA	Main Responsibility	Support	Method Statement / Procedure
a	GEN	The landowner and Contractor must enter into a written contractual agreement regarding the specific terms and conditions of the use of the land and the Contractor may not erect any structure prior to a signed agreement having been reached. The chosen site, as well as a Method Statement for the establishment of the Construction Camp will then be submitted to the NMPP Alliance for approval.	CTR	EPCM	√
b	GEN	The Contractor shall ensure that Construction Camp site selection is done in consultation with local authorities, traditional leaders and the community to ensure that a mutually acceptable site is chosen.	CTR	ECO	
c	SS	Temporary Construction Camps must not be situated near remote areas that are likely to constitute important faunal refuges	CTR	ECO	
d	GEN	The Contractor shall not, regardless of the above provisions, locate campsites in any area in which vegetation is pristine, or that is from an environmental perspective deemed unsuitable for this purpose, nor within 100m of any watercourse, nor in any area that could cause nuisance or safety hazards to surrounding landowners, inhabitants or the general public. Prior to the commencement of construction, the Contractor shall also prepare documentation for each proposed campsite which contains, but is not limited to, details of: <ul style="list-style-type: none"> • site layout including access points and material storage areas; • topsoil management; • cuts and fills; • sewage treatment; • erosion control; • fencing; • general waste management; • provision for vehicle and plant servicing; • management of hazardous materials, • water supply; • management of veld fire risk; 	CTR	ECO EPCM	√

ITEM NO.	GENERAL/ SITE SPECIFIC	ENVIRONMENTAL DESIGN REQUIREMENTS AND CRITERIA	Main Responsibility	Support	Method Statement / Procedure
		<ul style="list-style-type: none"> rehabilitation. The documentation shall be submitted to the ECO and NMPP Alliance for acceptance prior to establishment on site.			
e	GEN	All Construction Camps are to be fenced off in such a manner that unlawful entry is prevented and access is controlled. Signage shall be erected at all access points in compliance with all applicable occupational health and safety requirements. All access points to the Construction Camp should be controlled by a guard or otherwise monitored, to prevent unlawful access.	CTR	EPCM	
f	GEN	The Contractor must minimise the footprint of the Construction Camp and ensure that vegetation is only cleared where absolutely necessary.	CTR	ECO	
g	GEN	Site activities that may result in nuisance (e.g. noise) to adjacent landowners must be located on the site in a way that serves to minimise the risk of such nuisance.	CTR		
h	GEN	Surface drainage measures must be established in the Construction Camps so as to prevent <ul style="list-style-type: none"> Ponding of water; Erosion as a result of accelerated runoff; and, Uncontrolled discharge of polluted runoff. Damage to Contractor Access Roads 	CTR	ECO	
i	GEN	Where the Construction Camp may be construed as a visual intrusion by adjacent landowners or users, sufficient visual screening must be erected around the perimeter of the camp. The screening shall be designed so as not to constitute a further visual intrusion.	CTR		√
j	GEN	A waste transition area must be established on site that is properly demarcated and fenced and provides for the segregation of different waste types (domestic waste, scrap metal, hazardous waste). The waste transition area must be covered (roofed) to prevent water ingress.	CTR		√
k	GEN	The waste transition area must be maximised in order to facilitate waste separation into recyclable and non-recyclable items. Recyclable items shall be further separated into glass, various plastics, paper and bio-degradable items. Recycling efforts shall be maximised to the greatest extent possible within the context of the project.	CTR		√
l	GEN	An area for the storage of hazardous materials must be established that conforms to the relevant safety requirements and that provides for spillage prevention and containment.	CTR		√
m	GEN	All Construction Camps shall be provided with portable fire extinguishing equipment, in accordance with all relevant legislation and must be readily accessible.	CTR		
n	GEN	Specific areas for the batching of concrete and mixing of other construction materials must be designated and bunded to prevent contamination of surface water and soil contamination, or otherwise be done on temporary liner materials which can be removed afterwards. This also applies for any work that is necessitated outside of the Construction Camp.	CTR		
o	GEN	Designated vehicle and construction machinery servicing areas must be established within the	CTR		

ITEM NO.	GENERAL/ SITE SPECIFIC	ENVIRONMENTAL DESIGN REQUIREMENTS AND CRITERIA	Main Responsibility	Support	Method Statement / Procedure
		Construction Camp and must be bunded and hard surfaced (concrete) to prevent surface water and soil contamination, or otherwise be done on temporary liner materials which can be removed afterwards. This also applies for any work that is necessitated outside of the Construction Camp.			
p	GEN	Temporary refuse collection and material storage areas shall take into consideration the prevailing wind direction, surface runoff patterns, topography and visual context and shall be so situated to cause the minimum of nuisance to adjacent properties.	CTR		
q	GEN	The Contractor shall ensure that adequate potable water provision is made to all Construction Camps and that all water-dependent sanitary requirements (washing, showering, etc) are adequately facilitated.	CTR		
r	GEN	The Contractor must provide sufficient ablution facilities, in the form of portable / VIP toilets, at the Construction Camps and along construction sites, and shall 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 surface water body or 1:100 year flood line. A sufficient number of toilets shall be provided to accommodate the number of personnel working in any given area.	CTR		
s	GEN	The Contractor shall ensure that adequate sanitation services in the form of showers are available to accommodate the amount of workers to be housed in the Construction Camps and shall ensure that these are provided with effective drainage facilities and systems.	CTR		
t	GEN	The Contractor must take preventative measures to reduce pressure on municipal service provision capacity. If services for a Construction Camp are to be sourced from the local municipality, the latter must be informed well in advance.	CTR		
u	GEN	Municipal water, or where required agreements with landowners should be reached with regards to their water use rights, shall be used for all activities such as washing of equipment or disposal of any type of waste, dust suppression, concrete mixing, compacting, etc. Necessary WUL shall be obtained from DWAF if required.	CTR		
v	GEN	Any discharge from the Construction Camps into municipal storm water systems shall comply with the applicable municipal and / or DWAF standards.	CTR		
w	GEN-	Monitoring points shall be established wherever so required by either municipal authorities or DWAF and water quality results shall be provided to these bodies upon request.	CTR	ECO	
x	GEN	The Contractor shall comply with all applicable laws, regulations, permit and approval conditions and requirements relevant to the storage, use, and proper disposal of hazardous materials.	CTR		
y	GEN	The Contractor shall manage all hazardous materials and wastes in a safe and responsible manner, and shall prevent contamination of soils, pollution of water and/or harm to people or animals as a result of the use of these materials.	CTR		

ITEM NO.	GENERAL/ SITE SPECIFIC	ENVIRONMENTAL DESIGN REQUIREMENTS AND CRITERIA	Main Responsibility	Support	Method Statement / Procedure
z	GEN	All hazardous substances shall be stored in designated areas that are bunded and provided with a hard, impervious surface, as well as sufficient roof cover to prevent the ingress of water. All bunded areas will be provided with a catchment sump that drains to a separator unit that prevents runoff from entering and contaminating any adjacent areas. Bund walls must be of a sufficient height to contain at least 110% of the volume of any materials stored within the bunded area.	CTR		
aa	GEN	The hazardous materials storage area must be locked and access restricted to authorised personnel, and must be clearly marked as such.	CTR		
bb	GEN	The Contractor shall at all times have a skip on site for the disposal of hazardous waste and polluted soil, which will be cleaned regularly. Waste shall have a turnaround cycle that will ensure that the skips never exceed their maximum carrying capacity.	CTR		
cc	GEN	The Contractor shall not construct fixed fuel storage or service or refuel any vehicle or equipment within 100 metres of a watercourse or wetland, within a floodplain, or where there is the potential for spilled fuel to enter a watercourse.	CTR		
dd	GEN	The Contractor may not store in above ground containers a combined volume of fuel equal to or greater than 30 cubic meters on the site without the appropriate Environmental Authorisation. All fuel storage areas will be bunded to contain at least 110 % of the volume stored and will be provided with a hard impervious surface.	CTR		
ee	GEN	If a batching plant is necessary, run-off should be managed effectively to avoid contamination of any adjacent areas and must be contained within a bunded area.	CTR		
ff	GEN	The Contractor shall prepare Construction Camp Management Plan/s which is to be submitted to Transnet for approval.	CTR		
gg	GEN	The Contractor shall keep Construction Camps in a clean and tidy condition at all times.	CTR		
hh	GEN	The Construction Camps shall be maintained in accordance with the relevant procedures and documentation accepted by the EPCM and Transnet.	CTR		
ii	GEN	The Contractor shall maintain an effective waste management regime that ensures that there is adequate provision for waste disposal (in the form of bins), segregation and frequent removal (at least weekly) for permanent disposal at a licensed waste disposal facility.	CTR		
jj	GEN	The waste management regime must be supplemented by awareness raising and training amongst workers to ensure that the regime is properly implemented.	CTR	ECO	
kk	GEN	No permanent waste disposal shall be permitted at the campsites.	CTR		
ll	GEN	No fires will be allowed and the Contractor must make alternative arrangements for heating. LP Gas may be used, provided that all required safety measures are in place. The Contractor shall take specific measures to prevent the spread of veld fires, caused by activities at the campsites. These measures may include appropriate instruction of employees about fire risks and the construction of firebreaks around the site perimeter.	CTR		

ITEM NO.	GENERAL/ SITE SPECIFIC	ENVIRONMENTAL DESIGN REQUIREMENTS AND CRITERIA	Main Responsibility	Support	Method Statement / Procedure
mm	GEN / SS	For emergency repairs drip trays and or suitable absorbent material shall be placed under vehicles that must be repaired outside of the Construction Camp designated area, which shall be emptied in a suitable container and transported to the Construction Camp.	CTR		√
nn	GEN	All major spills as specified in the contractor emergency response procedure of any materials, chemicals, fuels or other potentially hazardous or pollutant substances must be cleaned immediately and the cause of the spill investigated. Preventative measures must be identified and submitted to the EPCM and ECO for information. Emergency response procedures to be followed and implemented	CTR	ECO	
oo	GEN	The Incident / Investigation reports from the Contractor will be submitted to the authorities if required by the EPCM and Transnet	EPCM	Transnet / ECO	
pp	GEN	Construction workers and site staff shall not be permitted to use any other open water body or natural water source adjacent to or within the designated site for the purposes of bathing, washing of clothing or for any construction or related activities without the necessary DWAF approval.	CTR		
qq	GEN + SS	The Contractor shall prepare a Hazardous Materials and Waste Management Plan for inclusion in the site specific Environmental Plans to be submitted to Transnet prior to establishment on site. This plan shall include, but shall not be limited to, measures to prevent: <ul style="list-style-type: none"> • contamination of soils; • pollution of water; • accidental fires; • risk/injury to people or animals. 	CTR		√
rr	GEN	The Contractor shall classify all hazardous materials to be used on site according to recognised Codes of Practice such as SABS Code 0228 for the Identification and Classification of Dangerous Substances and Goods and the Department of Water Affairs and Forestry <i>Minimum Requirements for the Handling, Classification and Disposal of Hazardous Waste</i> , and shall ensure that the handling, storage, transport and disposal of these materials meets the requirements of these Codes.	CTR		
ss	GEN	Material Safety Data Sheets (MSDS) Information and records of all materials stored must be available and strict control of the volumes stored and removed must be kept.	CTR		
tt	GEN	Staff must be trained in the hazards and required precautionary measures for dealing with these substances.	CTR		
uu	GEN	All Waste within the designated waste skips (hazardous or general) may only be disposed at a licensed disposal site to receive such materials. The Contractor shall keep written record of materials dumped and shall provide such proof to Transnet when requested.	CTR		√
vv	GEN	Concrete mixing must only take place within designated area, subject to suitable environmental protection measures.	CTR		

ITEM NO.	GENERAL/ SITE SPECIFIC	ENVIRONMENTAL DESIGN REQUIREMENTS AND CRITERIA	Main Responsibility	Support	Method Statement / Procedure
ww	GEN	The Contractor shall use ready mixed concrete wherever possible.	CTR		
xx	GEN	No vehicles transporting concrete to the site may be washed outside of designated and runoff-isolated areas, which shall be rehabilitated as soon as no longer in use.	CTR		
yy	GEN	Any soil that has been contaminated with concrete shall be removed and disposed of at a licensed disposal site.	CTR		
zz	GEN	The Contractor shall remove all waste concrete, building sand and gravel as far as possible from the Construction Right of Way as well as any other area where it may occur as a result of construction activities and dispose thereof at a licensed dumpsite. The Contractor shall repair any environmental damage caused in the process.	CTR		

2.1.2 Security

ITEM NO.	GENERAL/ SITE SPECIFIC	ENVIRONMENTAL MANAGEMENT REQUIREMENT	Main Responsibility	Support	Method Statement / Procedure
a	GEN	A third party security firm shall be appointed to oversee security and access control for the entire construction phase of the project. A Security Management Plan shall be submitted to Transnet for approval.	CTR	EPCM	√
b	GEN	The security management plan as well as conduct on site must be in accordance with all applicable legislation and standards, notwithstanding any of the requirements specified in this EMP.	CTR	EPCM	
c	GEN	Construction workers are not allowed to collect firewood from areas adjacent to the site and poaching is strictly prohibited.	CTR	EPCM	
d	GEN	Trespassing by any project personnel onto any adjacent property is strictly forbidden and offenders may be summarily disciplined.	CTR	EPCM	
e	GEN	Where an existing fence must be taken down due to its interference with construction activities, the relevant landowner must be informed beforehand and the affected area secured to ensure that security is not compromised. As soon as work is completed, the fence shall be reinstated to its original condition or better by the Contractor at no cost to the landowner.	CTR	EPCM	√

2.1.3 Construction Access

ITEM NO.	GENERAL/SITE SPECIFIC	MITIGATION MEASURES	Main Responsibility	Support	Method Statement / Procedure
a	GEN	The Contractor shall survey the limits of the Construction Right of Way for the pipeline construction and of any additional workspace areas required for construction and shall clearly demarcate the limits of the Construction Right of Way in such a manner (stakes, fencing etc) that it can clearly be identified. These stakes shall be preserved throughout the work under contract.	CTR	NMPP	
b	GEN	The Contractor will be responsible for the development of a Pre-Construction Survey Plan and will present this plan to Transnet for acceptance	CTR	ECO / NMPP	
c	SS	In areas defined by the alignment sheets, where sensitive areas or pristine habitat is affected, fencing or stakes painted in a conspicuous colour is required in order to protect these environments, The use of these measures must be discussed and agreed with the ECO's, in order to establish access control, protection of sensitive environments and protection of areas outside the Construction Right of Way (RoW).	CTR	ECO	
d	GEN	During the Survey of the Pipeline Route and Construction RoW, the ECOs and EO's (Contractor), with the assistance of any of the specialist project consultants if required, must conduct a pre-construction survey of the entire alignment prior to construction commencing. This survey shall be properly documented and photographed by the ECO's. As part of the inventory, wetlands and other environmentally significant areas must be physically pegged on site in such a manner that they are clearly visible. The inventory shall include specific records of, but not be limited to, the following: <ul style="list-style-type: none"> • Delineation of wetlands. • All areas that have specifically been earmarked or identified for "search and rescue" operations for certain species • Areas of untransformed grassland or pristine vegetation • Possible and confirmed graves and heritage sites • Any other environmental features as specified in the alignment sheets 	ECO	CTR	√
e	GEN + SS	In certain special cases, such as game farms, the Construction Right of Way will be fenced off by the Contractor during construction if required and will be negotiated with the land owner beforehand. This also applies in agricultural areas where cattle cannot realistically be relocated for the duration of construction. The fence to be erected must be securely anchored to the ground and be able to prevent animals from pushing it over.	CTR	EPCM	
f	GEN	In urban / high-density areas, or in any areas where the pipeline will pass close to human settlements in rural areas, community facilities, schools or other places where people will be at risk or where access control is deemed to be a problem, the Contractor shall also erect fencing for the duration of construction. Warning signage in English and all applicable local languages must be erected along the fencing, in clearly visible locations.	CTR	EPCM	√

ITEM NO.	GENERAL/SITE SPECIFIC	MITIGATION MEASURES	Main Responsibility	Support	Method Statement / Procedure
g	GEN	In all instances where fencing of the pipeline Construction Right of Way is required, the Contractor shall submit a Method Statement including the design specification of the fence to be used, for approval by Transnet and the affected landowner/s, prior to commencing.	CTR	EPCM	√
h	GEN	The width of the pipe line Construction Right of Way and working areas are indicated on the alignment sheets and will be issued to the Contractor for Construction.	EPCM	Transnet	
i	GEN	If the Contractor identify any areas where deviations of the pipeline route as stipulated in the alignment sheets is required, such deviation requests must be submitted to the Pipeline Engineering Department (Includes the Environmental Department) for Approval	CTR	EPCM	
j	GEN	If any deviations are identified as result of Land Liaison negotiations, such deviations must be communicated to the Pipeline Engineering Department (Includes the Environmental Department) for Approval.	EPCM		
k	Trunkline	In instances where physical constraints are imposed on the normal construction procedure, be it by existing buildings, services, residences, roads, dams and reservoirs, excessively restrictive terrain or any other significant permanent structures, the Contractor shall use “street works” whereby a reduced Construction Right of Way is used, as described in the Final EIA report, or any suitable variation thereof. The Contractor shall identify all areas where “street works” are to be employed and shall clearly and accurately demarcate such areas on a map. The contractor shall produce a Method Statement for the various methodologies proposed and shall receive written approval from the relevant engineers and ECO before commencing with construction.	CTR	EPCM	√
l	Terminals	The construction sites for the two Terminal complexes and eight Pump Stations shall be fully enclosed by a security fence, with the minimum amount of access points required for operations to occur effectively.	CTR	EPCM	
m	All	All access points to enclosed construction sites shall be controlled and a register of all persons entering and exiting shall be kept, which shall be controlled at the end of every day to ensure all persons not authorised to remain within the construction site have been vacated. Only authorised security personnel may be present on site after normal construction hours, except for emergency situations.	CTR	EPCM / ECO	
n	All	Access to and along any construction site shall be obtained - <ul style="list-style-type: none"> • on a public road; • on an existing private road or track with the consent of the relevant owner or occupier of land; • along the pipeline and Construction Right of Way; and • along a “specially approved route” as defined below. Access to and along the Construction Right of Way explicitly excludes access to land	CTR	EPCM / ECO	

ITEM NO.	GENERAL/SITE SPECIFIC	MITIGATION MEASURES	Main Responsibility	Support	Method Statement / Procedure
		other than the access routes referred to above, unless otherwise agreed to with the relevant landowner.			
o	GEN	In all areas where construction requires gravelling or other methods of improving existing roads or access points, the Contractor shall completely remove these materials after construction and prior to rehabilitation of the area. However where such improvements were effected on an adjacent landowner's property, the Contractor should leave them in place if the landowner so desires.	CTR	EPCM / ECO	
p	GEN	All damage to access roads or access points caused by the Contractor as a result of construction activities shall be repaired as soon as possible. This includes the removal of any litter, soil heaps, building rubble and other elements that were not there prior to construction. All areas that were cleared of vegetation shall be rehabilitated as soon as construction activities have been completed in the affected area.	CTR	EPCM / ECO	√
q	GEN	The Contractor shall ensure that contractor employees remain within the Construction Right of Way or on approved roads providing access to the Construction Right of Way.	CTR		
r	GEN	The Contractor shall plan and manage his construction operations in such a manner that the minimum amount of vehicle trips and vehicles are used.	CTR		
s	GEN	The Contractor shall liaise with the local municipality and traffic authorities in an area prior to construction commencing and if so required, shall prepare a Transport Management Plan to be approved by the relevant municipality prior to construction commencing.	CTR		
t	GEN	Planning of material and equipment delivery must be done in advance by the Contractor so that the minimum disruption is caused to traffic in the area and nuisance to adjacent landowners is kept to a minimum.	CTR		
u	GEN	The Contractor shall ensure that all transport companies are provided with guidelines or speed and access restrictions to ensure that main access roads are not deviated from in order to deliver goods.	CTR	EPCM	
v	GEN monitoring	The Contractor shall ensure that utilising local rural village roads not constructed for large vehicles is restricted to the minimum possible. The Contractor shall monitor the impact of heavy duty vehicles on local secondary roads and any damage shall be addressed timeously in consultation with the relevant authorities.	CTR	EPCM	
w	GEN	Where particularly large vehicles will be required to move on public roads, the Contractor must notify local traffic authorities well in advance so that the necessary safety arrangements can be made. All relevant traffic regulations must also be adhered to in this regard.	CTR		
x	GEN	The Contractor shall employ suitable warning methods wherever required during construction process to ensure that safety measures are adhered to. Warning signage shall be erected according to applicable traffic regulations.	CTR		
y	GEN	Damage caused to roads as result of the Contractor activities shall be repaired either	CTR	EPCM	

ITEM NO.	GENERAL/SITE SPECIFIC	MITIGATION MEASURES	Main Responsibility	Support	Method Statement / Procedure
		immediately, if instructed to do so, or timeously as stipulated in the contractual agreements between the Contractor and Transnet, or as required by any landowners and local municipalities. All roads that have been used or are being used by the Contractor will be inspected on a regular basis in order to establish the status of any possible damages caused by the Contractor Activities. Potholes, ruts, areas of surface water ponding and other damage to roads which can be proven to have been caused by the Contractor will be continually repaired to avoid damage to vehicles of other road users.			
z	GEN	The Contractor must limit dust pollution from dirt roads wherever required by wetting or watering down road surfaces.	CTR		
aa	GEN	The Contractor shall prevent trespassing on the site. Public entry to the site shall be prohibited and signs to this effect shall be erected at points of potential public entry.	CTR		
bb	GEN	The Contractor shall restrict the number of entry and exit points to the properties of adjacent landowners to the minimum required for operations to occur, for security reasons. The Contractor shall take sufficient measures to ensure that his activities do not compromise the landowners or occupiers security, and to reduce the loss, injury or death of any farm animals or game to the greatest extent possible and using measures in agreement with the affected landowners.	CTR		
cc	GEN	The dismantling of gates and fences shall be subject to any special conditions reached in the Landowner Servitude / Consent Agreements between Transnet and the Affected Landowners.	CTR	EPCM	
dd	GEN	The Contractor must reinstate all existing fences and gates that have been dismantled during the course of construction to their original state and design specifications, or better as required by the affected landowners	CTR	EPCM	
ee	GEN	Fencing requirements will be agreed to with the landowners prior to fences being changed. Reinstatement of fences also needs to be accepted and signed off by the landowner.	CTR	EPCM	
ff	GEN	Where the Contractor has installed temporary gates in fences of adjacent landowners, these must be removed and the fences be replaced as soon as construction has been completed in the area, unless the owner wishes for the gate to remain.	CTR	EPCM	
gg	GEN	Wherever electrified security fencing has to be temporarily taken down for construction purposes, the Contractor shall provide a security guard to patrol the affected area or shall reach a written agreement with the affected landowner before fences are disturbed or removed. All fences disturbed are to be repaired or reinstated to a similar or better condition as soon as is practicable afterwards.	CTR	EPCM	
hh	GEN	The Contractor's LLOs shall inform adjacent landowners when construction workers are most likely to enter their land through existing gates and fences or use their access roads and shall to whatever extent possible stick to these schedules.	CTR	EPCM	√

ITEM NO.	GENERAL/SITE SPECIFIC	MITIGATION MEASURES	Main Responsibility	Support	Method Statement / Procedure
ii	GEN	The Contractor shall ensure that every one of his construction workers are thoroughly sensitised to the need for all gates to adjacent land to be closed whenever the gate is not in use. The Contractor must ensure that this requirement is adhered to at all times and will be solely responsible for any financial or other loss suffered by adjacent landowners due to the Contractor's failure to adhere to this requirement.	CTR		
jj	GEN	Where livestock or animals do escape as a result of gates being left open it will be the responsibility of the Contractor to ensure that they are safely rounded up again. The Contractor must immediately inform the relevant landowner should this occur and must assist the landowner in whatever way required to ensure that the animals are safely rounded up.	CTR		
kk	GEN	Where informal footpaths exist, the Contractor shall establish temporary crossings wherever these cross the Construction Right of Way. The placement of temporary crossing is to be decided in consultation with landowners to minimise disruption of people's movement patterns.	CTR		
ll		The Contractor shall set up and maintain a register of all gates and fences erected which specifies the type of fence and/or gate/s, length, date erected and removed for each individual landowner, which shall be used for possible dispute resolution. The LLO shall regularly inspect the register to ensure that it is complete and up to date.	CTR	ECO	

2.2 Geotechnical Stability and Contamination

2.2.1 Seismicity and Geological Instability

ITEM NO.	GENERAL/ SITE SPECIFIC	ENVIRONMENTAL MANAGEMENT REQUIREMENTS	Main Responsibility	Support	Method Statement / Procedure
a	GEN	In areas where potentially unstable geologic conditions are encountered, such as fault lines in rock formations, potential instability of underlying rock, potential slip circles or embankment failure etc., the Contractor shall take all necessary measures to ensure the safety of workers.	CTR	EPCM	
b	GEN	Engineering solutions to address specific risks as result of potentially unstable geologic conditions shall be obtained if required.	EPCM	CTR	

2.2.2 Induced Instability

ITEM NO.	GENERAL/ SITE SPECIFIC	ENVIRONMENTAL MANAGEMENT REQUIREMENTS	Main Responsibility	Support	Method Statement / Procedure
a	GEN + SS monitoring	Ongoing monitoring shall be conducted by the Contractor at any areas identified as being potentially unstable to ascertain whether any further mitigation will then need to be implemented. This may include localized re-alignment of the route or stabilizing the slope by measures such as rock anchors, temporary retaining structures, de-watering and the like.	CTR	EPCM	

2.2.3 Dispersive Soils

ITEM NO.	GENERAL/ SITE SPECIFIC	ENVIRONMENTAL DESIGN REQUIREMENTS AND CRITERIA	Main Responsibility	Support	Method Statement / Procedure
a	GEN	Dispersion testing must be undertaken during the detailed geotechnical investigation, especially in areas of steep slopes situated within the Karoo Supergroup. The best indication of the dispersive nature of a soil is usually obtained by subjecting the material to a range of dispersion tests which can be performed by commercial soils laboratories.	CTR	EPCM	
b	GEN	Typical and practical measures that are used to mitigate the effect of dispersive soils include: <ul style="list-style-type: none"> • Compaction of soils at a moisture content slightly wet of the optimum moisture content, • Treatment of the backfilled soils with a suitable agent prior to compaction. 	CTR	EPCM	

ITEM NO.	GENERAL/ SITE SPECIFIC	ENVIRONMENTAL DESIGN REQUIREMENTS AND CRITERIA	Main Responsibility	Support	Method Statement / Procedure
		<ul style="list-style-type: none"> If the suggested laboratory testing highlight particular areas of highly dispersive soils, compaction of the backfill material can be undertaken at a slightly higher than normal moisture content. 			

2.2.4 Soil Creep

ITEM NO.	GENERAL/ SITE SPECIFIC	ENVIRONMENTAL DESIGN REQUIREMENTS AND CRITERIA	Main Responsibility	Support	Method Statement / Procedure
a	SS	The following potentially unstable talus slopes have been identified and must be further investigated to establish if creep is likely to occur. <ul style="list-style-type: none"> Along the Durban – Umlaas Road section Approaching and slightly beyond the Transnet Pipelines pump station at Van Reenen. Between Umlaas Road and Van Reenen The Alignment Sheets must be consulted for the exact locations of these areas. 	EPCM	CTR	
b	GEN	Where possible, localised deviations of the pipeline shall be employed to avoid areas of specific risk identified during the detailed assessment of these areas.	EPCM	CTR	
c	GEN	Where feasible the Contractor shall, where soil creep may occur, lay the pipeline at a depth where intact, stable slope conditions prevail, i.e. below the colluvium (or talus) and residual soils into underlying geological formation. Alternatively appropriate engineering solutions such as slope stabilisation by means of rock anchoring may also be employed.	EPCM	CTR	

2.2.5 Unstable Steep Side Slopes

ITEM NO.	GENERAL/ SITE SPECIFIC	ENVIRONMENTAL DESIGN REQUIREMENTS AND CRITERIA	Main Responsibility	Support	Method Statement / Procedure
a	SS	The Contractor shall employ where necessary mitigation measures to stabilise side slopes of excavations where steep side slope conditions are encountered. The following areas of concern have been identified: <ul style="list-style-type: none"> The crossing of the Meul River valley The Alignment Sheets must be consulted for the exact locations of these areas. 	CTR	EPCM	
b	GEN	Where feasible the Contractor, where unstable side slopes may occur, may propose to locally adjust or slightly deviate the alignment of the pipeline within the Construction Right of Way to avoid these conditions.	CTR	EPCM	

2.2.6 Landslides

ITEM NO.	GENERAL/ SITE SPECIFIC	ENVIRONMENTAL DESIGN REQUIREMENTS AND CRITERIA	Main Responsibility	Support	Method Statement / Procedure
a	SS	The Contractor must take cognisance of the following potential landslide risk areas: <ul style="list-style-type: none"> Natal Group sandstone/Dwyka Tillite. South East inferred movement direction - coordinates X+33 19201.59; Y+22 840.23 Natal Group sandstone. West inferred movement direction – coordinates X+33 18919.82; Y+30 494.07. The Alignment Sheets must be consulted for the exact locations of these areas. 	CTR	EPCM	
b	SS	If re-routing is not practical in the above cases the Contractor shall dig out the landslide and stabilise the slope before embedding the pipeline. Alternatively appropriate engineering solutions such as slope stabilisation by means of rock anchoring may also be employed.	EPCM	CTR	

2.2.7 Liquefaction

ITEM NO.	GENERAL/ SITE SPECIFIC	ENVIRONMENTAL DESIGN REQUIREMENTS AND CRITERIA	Main Responsibility	Support	Method Statement / Procedure
a	GEN	The Pipeline Engineering Team and the Contractor must be aware of the potential for liquefaction as per the alignment sheets.	EPCM	CTR	
b	SS	A loose horizon of fine sand (colluvium) overlying hard impervious Natal Group sandstone on even a fairly gentle slope is vulnerable to 'liquefaction'. Should such ground conditions be encountered along the route, the pipeline shall be embedded into the sandstone bedrock and not supported entirely within the sandy colluvium. The Alignment Sheets must be consulted for the exact locations of these areas.	EPCM	CTR	

2.2.8 Expansive Clays

ITEM NO.	GENERAL/ SITE SPECIFIC	ENVIRONMENTAL DESIGN REQUIREMENTS AND CRITERIA	Main Responsibility	Support	Method Statement / Procedure
a	GEN	Pipeline appropriately designed so as to prevent rupturing and distress. Design measures from detailed geotechnical investigation.	EPCM	CTR	

a	SS	Pollution potential assessed by detailed geohydrological study with appropriate mitigation measures.	EPCM	CTR	
c	GEN	Monitoring of pipeline via the long term to continually check for leaks.	EPCM	CTR	
d	GEN	Should leaks occur then pipeline appropriately repaired and / or remedial measures implemented to prevent repeat of problem.	EPCM	CTR	
e	SS	In areas where expansive clays are present it is recommended that the expansive clay be removed where it is shallow and replaced with an inert soil or that the pipe be supported upon a suitably designed ground beam.	CTR	EPCM	
f	GEN	The pipe should be designed for the predicted total heave/shrinkage movement at a particular affected section of the pipe	EPCM	CTR	

2.2.9 Contaminated Soils

ITEM NO.	GENERAL/ SITE SPECIFIC	ENVIRONMENTAL DESIGN REQUIREMENTS AND CRITERIA	Main Responsibility	Support	Method Statement / Procedure
a	SS	The Contractor must take cognisance of the fact that localised soil contamination has been identified in the following localities and may be encountered elsewhere: <ul style="list-style-type: none"> Ash fill has been used along parts of the alluvial and estuarine flats of the southern corridor. This fill is highly alkaline with very appreciable levels of salts, which could adversely affect the pipeline coating over the design life of the pipe. Chromium waste sites have been identified to the north of the Umlaas Canal and around the Lanxess premises. Illegal dumping of chemical waste has been observed at the Mbokodweni River. Some of the aeolian sands in the AECI area of Umbogintwini have been contaminated by chemicals used in the former ammunition, explosives and fertilizer industries. 	CTR	EPCM	
b	GEN	If and where chemical contamination and corrosion levels are considered to be unacceptably high, additional coating or measures (concrete encasement) or other appropriate engineering solutions should be provided to ensure the integrity of the pipeline.	EPCM	CTR	√
c	GEN	The Contractor shall take all reasonable measures to ensure that existing contaminated soil excavated during construction does not cause contamination of adjacent, uncontaminated areas. Contaminated soil removed from the construction area shall be dumped at a licensed dumpsite.	CTR	EPCM	√
d	GEN	The Contractor is to employ soil sampling techniques in areas where localized soil contamination has been identified. Results of the samples is to be presented to the Engineering Teams.	CTR	EPCM	√
e	GEN	Where in the opinion of the Engineer, material is not suitable for use as backfill it shall be removed to a licensed disposal area and not be used for any other purpose.	EPCM	CTR	

ITEM NO.	GENERAL/ SITE SPECIFIC	ENVIRONMENTAL DESIGN REQUIREMENTS AND CRITERIA	Main Responsibility	Support	Method Statement / Procedure
f	GEN	Where in the opinion of the Engineer, material is not suitable for use as backfill it shall be removed to a licensed disposal area and not be used for any other purpose.	EPCM	CTR	

2.3 Threatened Plants

2.3.1 Search and Rescue

ITEM NO.	GENERAL/ SITE SPECIFIC	ENVIRONMENTAL DESIGN REQUIREMENTS AND CRITERIA	Main Responsibility	Support	Method Statement / Procedure
a	GEN	Damage or harm to threatened plant species is illegal in terms of the National Environmental Management: Biodiversity Act (Act 10 of 2004). Threatened species are defined in terms of the most recent Red Data list of Southern African Plants. While every effort has been made to ensure that the pipeline route does not impact on threatened species, the Contractor shall be responsible for any action necessary to ensure the prevention of harm to such species found during construction.	CTR	ECO	
b		The Contractor with the assistance of the ECO or suitable botanical specialist should review the vegetation specialist studies issued, indicating all sensitive areas where possible Red Data Species could be found. The RoW should then be inspected before and during construction in order to identify as far as possible any such species which must be protected and/or relocated	CTR	ECO	
c		Any Red Data species found to be impacted or possibly damaged by the pipeline construction activities during the above inspections must be reported immediately to the ECO's and EPCM in writing. The Contractor should put measures in place such as demarcation of the area, in order to protect such species, until the necessary permits have been obtained through the ECO's	CTR	ECO	
d		Thus the ECO's will be responsible for reporting such finds to the relevant Departments, Conservation or Park Boards Authorities, on behalf of Transnet and will also be responsible for obtaining all the necessary permits for relocation of a Red Data specie(s)	ECO	CTR / EPCM	
e		The ECO will be responsible to call upon a suitably qualified botanical expert to oversee: <ul style="list-style-type: none"> Rescue of the plant(s) and transplantation in a suitable local habitat in a conserved area or in a recognised botanical garden; or, where this is not possible The collection of seeds and cuttings for use at botanical gardens and for storage in seed banks (if authorised by the relevant authority). 	ECO	CTR / EPCM	
f	GEN	The Contractor shall prohibit and actively prevent the harvesting of endangered, significant or medicinal or any other plants by his employees. Construction workers shall only assist with the removal of significant vegetation if requested to do so by a specialist and agreed to by the Contractor. All plants removed in this fashion will be handed over to the appropriate specialist and shall not be kept by the Contractor or his staff.	CTR	ECO	

ITEM NO.	GENERAL/ SITE SPECIFIC	ENVIRONMENTAL DESIGN REQUIREMENTS AND CRITERIA	Main Responsibility	Support	Method Statement / Procedure
g	SS	The Threatened Species Study must be consulted in order to identify and mark species for removal if necessary within the construction sites. (Annexure A).	ECO	CTR	
h	GEN	The CLO / LLO shall also ensure that local people are advised when construction is about to commence so that they can harvest any plants which are of traditional value before they are destroyed.	CTR	ECO	
i	SS	<p>Between Curry's Post and Kiesbeen, sites were identified as being potentially suitable for important species requiring 'search-and-rescue' actions; These have been indicated on the alignment sheets and below are a summary of the areas listed: The Alignment Sheets must be consulted for exact KP's</p> <ul style="list-style-type: none"> • Boulder grasslands with interspersed wetlands and high species diversity. Possible habitat for <i>Syncolostemon latidens</i> and <i>Stachys rivularis</i>. • Near Griffin's Hill. Themeda grasslands with wetlands, high species diversity. Note: These areas are adjacent to the existing pipeline, but has possible habitat for <i>Bowiea volubilis</i> and <i>Stachys rivularis</i>. • Dolerite hills with possible habitat for <i>Bowiea volubilis</i>. • North of Wyford farm. Pipeline route lies adjacent to the eastern edge of the historically important wagon track (vegetation is disturbed, with <i>Hyparrhenia hirta</i> dominant), but the western side of the wagon track has a long, narrow remnant of high-diversity <i>Themeda triandra</i> grassland on a sandstone ridge. There is very little of this habitat left in the vicinity, so the 30m construction corridor boundary should be strictly enforced by confining all disturbance to the east of the wagon trail (which in any case needs to be protected during construction). The grassland strip to the west of the wagon trail should not be driven on, used for stockpiling materials of any sort, or damaged in any other way during construction. • North of Van Reenen. Moist grassland dominated by <i>Themeda triandra</i> and <i>Monocymbium ceresiiforme</i>, with extensive seeps. Possibly good habitat for <i>Kniphofia typhoides</i>; other endangered species possibly occur (also see de Castro vegetation report on the Free State sector). This section of pipeline is not adjacent to existing roads and therefore access to the pipeline needs to be carefully planned and demarcated to avoid unnecessary driving through the grasslands and seeps. Access in this area should be strictly controlled and access points agreed with the ECO's. All traffic for construction should be confined to the pipeline RoW and controlled by the CTR and ECO's 	CTR	ECO	
j	SS	In Mpumalanga - the 12.5 km of semi transformed and untransformed habitat affected in Mpumalanga, not along existing roads and inclusive of intervening wetlands, was checked for threatened species by a botanist during November 2008. All threatened or Near-Threatened species that were found were mapped (Annexure A).Appropriate in situ and/or ex situ	ECO	CTR	

ITEM NO.	GENERAL/ SITE SPECIFIC	ENVIRONMENTAL DESIGN REQUIREMENTS AND CRITERIA	Main Responsibility	Support	Method Statement / Procedure
		conservation measures shall be developed and implemented with the involvement of the Mpumalanga Parks Board.			
k	SS	In Gauteng, the crossing point of the Blesbokspruit floodplain near the inland terminal site in Gauteng was searched for <i>T. erythrorrhiza</i> in November 2008. Any species of significance that were found was mapped, appropriate in situ and/or ex situ conservation measures should be developed and implemented, with the involvement of the Gauteng Directorate of Nature Conservation. In addition, the 600m of untransformed habitat affected, not along existing roads, were checked for threatened species by a botanist during November 2009. (Annexure A).	ECO	CTR	

2.3.2 Training of Contract Staff

ITEM NO.	GENERAL/ SITE SPECIFIC	ENVIRONMENTAL DESIGN REQUIREMENTS AND CRITERIA	Main Responsibility	Support	Method Statement / Procedure
a	GEN	Environmental awareness training is required for all contractor staff on site, working in the RoW or any construction area, regarding the preservation of endangered, significant, medicinal or any other plants of significant importance.	CTR	ECO	
b	GEN	The Contractor shall ensure that all construction workers receive basic Environmental Awareness Training appropriate to their field of expertise which is to be accepted by the ECO, and shall ensure that staff members are continuously updated on any environmental issues related to the project. This training may take the form of information posters and pamphlets, “toolbox talks” and other easily accessible methods of information communication. The contractor shall ensure that all staff is educated regarding basic principles of environmental awareness and responsibility and that supervisors or foremen, or the EO's, are sufficiently trained.	CTR	ECO	
c	GEN	It is the responsibility of the Contractor to ensure that he is familiar with the fauna or flora species, habitat types, landforms, natural processes or any other component or process of the natural environment described or listed in this EMP. Should any uncertainty arise the Contractor shall immediately consult with the ECO.	CTR	ECO	

2.4 Threatened Animals

2.4.1 Mammals

ITEM NO.	GENERAL/ SITE SPECIFIC	ENVIRONMENTAL DESIGN REQUIREMENTS AND CRITERIA	Main Responsibility	Support	Method Statement / Procedure
a	SS	The Contractor is alerted to the fact that locations have been identified as sites where specific endangered Oribi may occur. The Contractor shall ensure that all personnel receive relevant ongoing environmental training in the form of “toolbox” talks, pamphlets etc. in order to be aware of their environmental responsibilities. The Contractor shall furthermore ensure that all personnel working in these locations respect and do not disturb these animals: The locations have been indicated on the Alignment Sheets and if any such species are found to be disturbed by the construction activities the ECO’s should be notified. The ECO’s should also be consulted to confirm these possible locations as indicated on the alignment sheets. The CTR will also ensure that there is no damage if possible to the Oribi preferred diet species. The ECO’s shall be consulted in the identification of the locations of preferred diet species.	CTR	ECO	
b	GEN	The following measures apply to Oribi conservation in all areas earmarked as possible habitat for this species:			
		<ul style="list-style-type: none"> Construction and post-construction work in areas where Oribi occur must be completed as quickly as possible in order to minimise risk. 	CTR	ECO	
		<ul style="list-style-type: none"> Onsite labour accommodation must be prohibited in areas where Oribi occur. Labour to be transported to site daily from camps approved for labour construction housing. 	CTR	ECO	
		<ul style="list-style-type: none"> Subject to agreement with the landowners, the construction servitude must be fenced through those farms where Oribi occur and shade cloth installed where possible to minimize visibility of the construction site from Oribi habitat. 	CTR	ECO	√
		<ul style="list-style-type: none"> The above conditions must be discussed with the ECO’s. Discussion must also be facilitated with authorities if necessary. Landowners should also be involved. It is important for all parties to agree to the controls to be put into place. It will be necessary to define these controls on a farm by farm basis and to discuss and agree to these with the environmental authorities and the affected landowners. 	ECO	CTR / EPCM	√
c		Noise levels in the vicinity of threatened mammal species, particularly Oribi (as identified in this EMP) are to be limited where possible. If blasting is required, adequate notification must be provided to the landowner beforehand, so that animals can be moved if required.	CTR	ECO	

2.4.2 Birds

ITEM NO.	GENERAL/ SITE SPECIFIC	ENVIRONMENTAL DESIGN REQUIREMENTS AND CRITERIA	Main Responsibility	Support	Method Statement / Procedure
a		The construction team must be briefed about the importance of threatened birds and how to avoid their disturbance. An Environmental Management Procedure is to be compiled, prior to construction, which guides the contract team with respect to the management of construction in areas where threatened birds occur.	CTR	ECO / EPCM	√
b		Any individual found deliberately harassing any wildlife in any way should face disciplinary measures, following which the possibility of immediate dismissal from the contract. The construction teams must be warned about the penalties for harassing, trapping or hunting the threatened bird species.	CTR	ECO / EPCM	
c		The Contractor is informed that threatened crane species were identified during the EIA Phase and are noted within the Alignment Sheets and also noted in the (Annexure A)., The ECO's should be consulted in terms of the significance of these species and the preservation of their habitat as far as possible. When any of these species are noted or seen in the vicinity of the Construction Areas, the ECO's must be notified.	CTR	ECO	√
d		In the event that the ECO requires guidance about the management of a particular situation with respect to cranes then he is to have access to assistance from an ornithologist.	ECO	CTR /EPCM	
e		Construction of the pipeline in the route sections within 3000 m of the known Wattled Crane breeding sites must be done outside of the Crane breeding season (construction permissible inside the 3000 m buffer between September and April). Thus no construction between May to August. These sections include the two breeding sites (shown on alignment sheets) on the farm Oaklands (1000 m west of pipeline), and the farm Rondebosch (1300 m west of pipeline). (Annexure A).	CTR	ECO	
f		The ECO's shall consult with the Crane Foundation (contact person Mr. Andre Rossouw 072391 9750) when the contractor is planning construction at these points listed above and indicated on the alignment sheets.	ECO	CTR /EPCM	
g	SS	The alignment shall be searched by an ornithologist between approximately KP120. and KP122. and any distance beyond this for the purposes of a buffer, to confirm that no Blue Swallow occur. While the pipeline does not traverse any confirmed Blue Swallow foraging and nesting areas, the owner of the property between KP 123 and KP 123.8, just south of Howick, believes that Blue Swallows forage in the KZN Mistbelt Grassland on his property. No nesting sites were found during the walk-through survey during the EIA Phase, but the presence of the birds need to be confirmed during the summer season before any decisions about mitigation are made and communicated to the contractor.	EPCM	ECO	
h	GEN	The occurrence of threatened cliff nesting species must be checked by an ornithologist prior to construction at KP 344 near Tafelberg, some 50 km north of Van Reenen. In the event that threatened raptors or other threatened species are nesting on these cliffs, then reduced blasting charges and blast matts must be used to lesson blast noise in the event that blasting	EPCM	ECO	

ITEM NO.	GENERAL/ SITE SPECIFIC	ENVIRONMENTAL DESIGN REQUIREMENTS AND CRITERIA	Main Responsibility	Support	Method Statement / Procedure
		is necessary between KP341 and KP347. This must be communicated to the Contractor.			

2.4.3 Reptiles

ITEM NO.	GENERAL/ SITE SPECIFIC	ENVIRONMENTAL DESIGN REQUIREMENTS AND CRITERIA	Main Responsibility	Support	Method Statement / Procedure
a	GEN	The Contractor shall ensure that no African Rock Pythons or any other snakes are killed or otherwise harassed and shall contact the ECO should a python be found within or near a construction site. The CTR shall as a minimum provide basic snake awareness training to all employees and sub-contractors.	CTR	ECO	
b		The Contractor shall prior to clearance commencing in any areas identified as suitable habitat for chameleon species notify the EPCM and ECO's at least 2 weeks prior to construction activities to commence in these areas in writing.	CTR	EPCM / ECO	
c		The above notification is to allow that a suitably qualified expert to search the alignment within this section, so as to rescue and relocate any Drakensberg Dwarf Chameleon and other endangered species found here.	ECO	EPCM	
d	SS	Valuable habitat for endangered chameleon species has been identified between KP143.5 and KP151 and is indicated on the alignment sheets.	EPCM	ECO	
e	SS	It is the responsibility of the ECO to familiarize themselves with the location of suitable habitats for chameleon species as described in the FINAL EIA Specialist Studies 10A and 10B .	ECO	CTR	
f	SS	The Contractor shall on instruction from the ECO's ensure that all dolerite sills and boulders occurring as indicated on the alignment sheets are protected. The areas of protection are described in the FINAL EIA Specialist Studies 10A and 10B . It is the Contractor's responsibility to ensure that these areas are protected against damage to the greatest extent possible as these constitute suitable habitat for chameleon species as stated above.	CTR	ECO	
g	SS	Search and rescue of threatened chameleon species must be undertaken by a suitable qualified specialist immediately prior to construction in the 9 locations (Approx KP11.9) defined in the EIA Specialist Studies as potentially suitable habitat for the Black Headed Dwarf Chameleon and Midlands Dwarf Chameleon.	ECO	EPCM	
h		The Contractor will be required to fence all areas identified as suitable habitats for endangered chameleon species on instruction from the ECO's. A bufferzone will be agreed with the ECO's.	CTR	ECO	
i		The route has been aligned to avoid the known burrows of the threatened Girdled Lizard, which is found in the Free State. The ECOs and EO's should familiarise themselves with	ECO	CTR / EPCM	

ITEM NO.	GENERAL/ SITE SPECIFIC	ENVIRONMENTAL DESIGN REQUIREMENTS AND CRITERIA	Main Responsibility	Support	Method Statement / Procedure
		species (before construction starts) to recognise the burrows of the Girdled Lizard. In the event that burrows of this species are found along the route, prior to construction, then construction in the area must be halted until such time as the colony can be surveyed by a suitable qualified expert and a re-route devised to avoid them if necessary.			

2.4.4 Invertebrates (Millipedes and Earthworms, Snails and Slugs)

ITEM NO.	GENERAL/ SITE SPECIFIC	ENVIRONMENTAL DESIGN REQUIREMENTS AND CRITERIA	Main Responsibility	Support	Method Statement / Procedure
a	SS	It is the responsibility of the ECO to familiarize themselves with the locations of where significant invertebrates could be found on the Trunkline route and should notify the CTR of these locations in writing. These are described in the FINAL EIA Specialist Studies 10A and 10B .	ECO	CTR	
b	SS	The Contractor shall notify the EPCM two weeks in advance in writing before any work is to commence in areas as indicated on the alignment sheets where significant invertebrates could occur as described in the FINAL EIA Specialist Studies 10A and 10B .	CTR	EPCM / ECO	
c	SS	The EPCM shall ensure that the appropriate specialists in KZN be afforded the opportunity to inspect the proposed route alignment in these areas indicated on the alignment sheets. [D. Herbert (molluscs), J. Plisko (earthworms) – both of the Natal Museum, Pietermaritzburg - and Prof. M. Hamer or Dr Friederike Voight (millipedes) of UKZN, Pietermaritzburg during Construction.	EPCM	ECO	
d	SS	The Specialists will be afforded the opportunity to ‘rescue’ any representatives of these groups (mentioned above) and/or retrieve specimens which may fall into the trench while it is open, for study purposes.	ECO's	CTR	
e	GEN	The ECO's and EO's (CTR) will be trained on the significance of identifying and recovery of specimens of invertebrates disturbed by construction activities.	EPCM	ECO	
f	GEN + SS	Dr. D. Herbert of the Natal Museum, and Prof. M. Hamer (UKZN) should be informed of construction progress and timeously notified in order to search sub-sectors of the route prior to the construction corridor being cleared so that any snail species and other invertebrates with very localised distributions that are present, can be relocated.	ECO	EPCM	

2.4.5 General

ITEM NO.	GENERAL/ SITE SPECIFIC	ENVIRONMENTAL DESIGN REQUIREMENTS AND CRITERIA	Main Responsibility	Support	Method Statement / Procedure
a	GEN	If any potentially dangerous, particularly fragile or any animal is discovered in a trench or within the construction servitude, operations in the direct vicinity of the animal shall be halted if necessary, and if feasible, the area of the trench or RoW in which it is found shall be temporarily blocked off. The EO shall immediately inform the ECO, who shall issue instructions for further actions that need to be taken.	CTR	ECO	
b	GEN	The Contractor shall cover the exposed open ends of all sections of pipe at the end of each day with DPC or other similar sheeting, which shall be tightly fitting over the pipe opening to prevent animals from entering the pipe at night.	CTR	EPCM	
c	GEN	The Contractor shall specifically ensure that no antelope are poached, killed, injured or harassed along any section of the alignment or any area adjacent to a construction site where they occur.	CTR	ECO	
d		The Contractor shall ensure that all of his construction workers receive training, developed by the Contractor and accepted by the ECO, as to the procedure that should be followed if any animals, including mammals, reptiles, amphibians, birds and invertebrates are discovered in an open trench or any other excavation area.	CTR	ECO	
e	GEN	The Contractor shall ensure that all construction workers receive basic Environmental Awareness Training appropriate to their field of expertise which is to be accepted by the ECO, and shall ensure that staff members are continuously updated on any environmental issues related to the project. This training may take the form of information posters and pamphlets, “toolbox talks” and other easily accessible methods of information communication. The contractor shall ensure that all staff are educated regarding basic principles of environmental awareness and responsibility and that supervisors or foremen, or the EOs, are sufficiently trained to oversee general environmental compliance.	CTR	ECO	

2.5 Conservation Areas

ITEM NO.	GENERAL/ SITE SPECIFIC	ENVIRONMENTAL DESIGN REQUIREMENTS AND CRITERIA	Main Responsibility	Support	Method Statement / Procedure
a	SS	Special Care should be taken in conservation areas in terms of any wild animals which may be affected by construction activities. Proper awareness training should be done by the Contractor accepted by the ECO, to inform all persons on the construction site about the significance of the areas that they are working in.	CTR	ECO	
b	SS	The Contractor should take note of the following listed Private and Nature Conservation areas that may be affected by Construction Activities. These areas are indicated on the alignment sheets <ul style="list-style-type: none"> • Umbogovango Nature Reserve • Mphafa Private Nature Reserve • Eston Conservancy • Acacia Fields Game Farm • Lower Mpushini Conservancy • Umgenyana Conservancy • Arboretum and Mamba Valley 'Nature Reserves' occur on opposite sides of the railway tracks between 	CTR	ECO	
c	SS	The Contractor is to adhere to any special conditions as specified in the Landowner Agreements in areas where any Private or other Nature Reserves are affected by the Pipeline Construction Activities.	CTR	ECO	

2.6 Other Areas of Conservation Significance

ITEM NO.	GENERAL/ SITE SPECIFIC	ENVIRONMENTAL DESIGN REQUIREMENTS AND CRITERIA	Main Responsibility	Support	Method Statement / Procedure
a	SS	The Contractor shall ensure that where it is unavoidable that the route has to cut across wetlands in which Swamp Forests occur as indicated on the alignment sheets – the mitigation recommendations for wetland rehabilitation as described in this EMP be implemented.	CTR	ECO	
b	SS	In the area of Coastal Lowland Forest as indicated on alignment sheets, the Contractor shall where the route passes between the railway embankment and the Amanzimtoti Treatment Works narrow the construction corridor to the greatest extent possible. The Contractor must remove the existing fence, replace it on the east side with a temporary fence during construction, construct the pipeline inside the railway reserve, then erect a new fence where the existing fence is. There are a few trees (<i>Albizzia sp.</i> , <i>Chaetacme sp.</i> , <i>Trema sp.</i>) in the railway reserve and in the construction path. The contractor shall ensure that the canopies of trees east of the sewer and projecting west into the railway reserve that protrude into the construction Right of Way are carefully trimmed and damaged as little as possible. Another possible impact resulting from this recommendation is that disturbing the forest margin on the sewer servitude could lead to alien plant incursion,	CTR	ECO	
c	SS	Transnet should undertake to control alien plants on the sewer servitude and forest margin until forest margin stability is re-attained (a few years).	Transnet		
d	SS	Where the route runs in the railway reserve between the two forests known as Mamba Valley and Arboretum as indicated on the alignment sheets these forest areas shall be fenced off for the duration of construction to prevent the forests from being used as shade rest areas, littering and toilets.	CTR	ECO	
e	SS	Where the route runs very closely adjacent to wetland dominated by <i>Phragmites</i> sp. The Contractor shall ensure that all applicable measures pertaining to wetland damage prevention and mitigation are employed. (This is indicated on the alignment sheets)	CTR	ECO	
f	SS	Horizontal drilling should not be used to cross Old Main Road as this is likely to result in profound disturbance to the wetland.	CTR	NMPP / ECO	
g	SS	Care must also be exercised as indicated on the alignment sheets where the proposed route runs closely adjacent to the boundary of the Umbogovango Nature Reserve.	CTR	ECO	
h	SS	As indicated on the alignment sheets the excavation of the trench could cause an increase in the volume of water which may be leaking beneath the berm from the adjacent wetland and end up flowing along the bottom of the trench. In the light of these concerns the Contractor shall assess the significance of the issue described above using a suitably qualified specialist	CTR	ECO	

ITEM NO.	GENERAL/ SITE SPECIFIC	ENVIRONMENTAL DESIGN REQUIREMENTS AND CRITERIA	Main Responsibility	Support	Method Statement / Procedure
		and ensure that excavation of this section of the route be undertaken in accordance with the recommendations of the specialist, so as to minimize risk to the wetland. Dewatering and silt traps – erosion control			

2.7 River Crossings

2.7.1 Management of Water / River Crossings

ITEM NO.	GENERAL/ SITE SPECIFIC	ENVIRONMENTAL DESIGN REQUIREMENTS AND CRITERIA	Main Responsibility	Support	Method Statement / Procedure
a	GEN	The Contractor is responsible for controlling riparian and in-stream damage to the river systems through which the pipeline is routed. In the event of aquatic organism stress caused by the works which, in the judgement of Transnet and the ECO, could have irreversible effects on the river ecosystem or individual species, the Contractor shall be instructed by Transnet to halt construction at the river crossing until adequate controls are put in place.	CTR	ECO / EPCM	
b	SS	<p>The Contractor shall prepare a detailed method statement for review by the EPCM, in accordance with DWAF WUL (if available). The method statement shall include but not be limited to:</p> <ul style="list-style-type: none"> • A biophysical description of the site (profile, depth and width of channel(s), geo-technical drawings, large trees, reed beds, etc); • The proposed timing and duration of river crossing construction; • A list of the typical types of equipment that will be used for the excavation, laying of pipe, backfilling of the trench and control of water; • Measures that will be used to control suspended sediment and turbidity (e.g. berms, hay bales, bidem curtains, river diversions, settling ponds), damage to riparian vegetation, spillage of fuels and oils, cement and other foreign materials and a monitoring program to provide rapid feedback on the effectiveness of controls. • Measures that will be used to ensure that identified and surveyed trees in the riparian fringe within the construction right of way, that are scheduled for protection, shall not be damaged during construction • Measures that will be used to stabilize river embankments after construction and to return the channel to its pre-construction profile or to a more stable profile. • Measures that will be used to minimize the impact of blasting on aquatic species in the event that construction under submerged conditions is necessary. • Methods used to remove alien and invader plant species within the Construction Right Of Way at major river crossings. 	CTR	EPCM / ECO	√

ITEM NO.	GENERAL/ SITE SPECIFIC	ENVIRONMENTAL DESIGN REQUIREMENTS AND CRITERIA	Main Responsibility	Support	Method Statement / Procedure
c	SS	<p>Major river crossings for the purpose of this EMP shall be defined as 3rd order streams and higher. The following 3rd to 6th order river crossings are applicable to this EMP:</p> <p>Upper Vaal Water Management Area: Gauteng (Stream ID 0) - Blesbokspruit (-26.47830; 28.42573) Gauteng/Mpumalanga border (Stream ID 5) - Suikerbosrand River (-26.60630; 28.49510) Mpumalanga (Stream ID 15) Molspruit (-26.76319; 28.63873) Mpumalanga (Stream ID 19) Silverbankspruit (-26.80779; 28.68192) Mpumalanga (Stream ID 29) - Waterval River (-26.94900; 28.76282) Mpumalanga (Stream ID 32) - Bossiesspruit (-27.00247; 28.81091) Free State (Stream ID 33) - Vaal River(-27.03821; 28.82225) Free State (Stream ID 36) - Skoonspruit (-27.10891; 28.88281) Free State (Stream ID 41) - Brakspruit (-27.18719; 28.95679) Free State (Stream ID 44) - Skulpspruit (-27.26004; 29.00236) Free State (Stream ID 49) - Venterspruit (-27.33950; 29.04701) Free State (Stream ID 50) - Venterspruit (-27.35701; 29.06416) Free State (Stream ID 76) - Holspruit (-27.68740; 29.12953) Free State (Stream ID 87) - Rondawelspruit (-27.81029; 29.16120) Free State (Stream ID 91) - Cornelis River (-27.86114; 29.16498) Free State (Stream ID 117) - Wilge River(-28.28508; 29.37774) Free State (Stream ID 118) - Meul River(-28.00867; 29.22635)</p> <p>Thukela Water Management Area: KwaZulu Natal (Stream ID 133) - Sandspruit (-28.44220; 29.48943) KwaZulu Natal (Stream ID 140) - Sand River (-28.52474; 29.56952) KwaZulu Natal (Stream ID 143) - Dewdrop Stream(-28.57673; 29.61215) KwaZulu Natal (Stream ID 155) - Tugela River (-28.75417; 29.66578) KwaZulu Natal (Stream ID 156) - Doringspruit (-28.83515; 29.74549) KwaZulu Natal (Stream ID 157) - Bloukrans River(-28.88645; 29.77135) KwaZulu Natal (Stream ID 160) - Drakespruit (-28.91746; 29.80329) KwaZulu Natal (Stream ID 165) - Boesmans River (-29.00634; 29.89603) KwaZulu Natal (Stream ID 180) - Mooi River(-29.18408; 30.03757)</p> <p>Mvoti to Umzimkulu Water Management Area: KwaZulu Natal (Stream ID 190) - uMngeni River (-29.49027; 30.20813) KwaZulu Natal 1(Stream ID 94) - Gwen's Spruit (-29.51519; 30.28703) KwaZulu Natal (Stream ID 197) - Doringspruit (-29.52226; 30.32776) KwaZulu Natal (Stream ID 198) - Doringspruit (-29.52169; 30.33038)</p>	INFO		

ITEM NO.	GENERAL/ SITE SPECIFIC	ENVIRONMENTAL DESIGN REQUIREMENTS AND CRITERIA	Main Responsibility	Support	Method Statement / Procedure
		KwaZulu Natal (Stream ID 205) - uMsunduze River(-29.61910; 30.45394) KwaZulu Natal (Stream ID 206) - uMsunduze River (-29.63333; 30.45681) KwaZulu Natal (Stream ID 207) - uMsunduze River(-29.63448; 30.45773) KwaZulu Natal (Stream ID 208) - Mpushini River (-29.65160; 30.46904) KwaZulu Natal (Stream ID 211) - uMlazi River (-29.80121; 30.52061) KwaZulu Natal (Stream ID 217) - Klipspruit (-29.97923; 30.64945) KwaZulu Natal (Stream ID 236) - Mbokodweni (-30.00453; 30.92320) KwaZulu Natal (Stream ID 237) - uMlazi River (-29.95514; 30.94851)			
d	GEN	The Contractor shall comply with any conditions of approval set by the DWAF.	CTR	EPCM / ECO	
e	SS + GEN	During construction the Contractor shall make provision to maintain the natural flow of any drainage line affected by construction.	CTR	ECO	
f	SS + GEN	In excavating the bed of the water body for the pipeline, the Contractor shall comply with the following: <ul style="list-style-type: none"> • Backfill will be done in accordance with the specifications and typical drawings issued to the Contractor. The Contractor together with the ECO's will review and assess the appropriateness of the drawings and specifications issued and will inform the EPCM if changes are required. • Where blasting takes place, the rock replaced in the trench at the surface is to give the trench as natural an appearance as possible, so that in low flow periods, a linear scar is not obvious. 	CTR	ECO / EPCM	
g	SS + GEN	Where isolating the location of works, the following measures, among others, must be considered by the Contractor or as instructed by the ECO, as per the method statement in order to minimise the risk of increased suspended sediment in the water column downstream of the works: <ul style="list-style-type: none"> • Elimination of surface flow through the construction site; • The use of non-erodible materials for the construction of any berms, coffer dams or other isolation structures used in a works within a flowing watercourse. The use of non-earthen dam structures, such as aquadams, are possible options; • In cases where the entire flow of water of a water body is diverted around the water crossing site, it must be returned to the water body immediately downstream of the crossing site; • The use of silt fences or hay bales to isolate the construction area from the water body in situations where the flow velocities and volumes are low; • The removal and temporary storage of any material excavated from the bed or banks of the water body to a location out of the water body until the materials are permanently removed from the location or backfilled into the water body. Where sufficient space exists, and where the storage will not cause any environmental 	CTR	ECO	√

ITEM NO.	GENERAL/ SITE SPECIFIC	ENVIRONMENTAL DESIGN REQUIREMENTS AND CRITERIA	Main Responsibility	Support	Method Statement / Procedure
		damage, this may be within the macro-channel banks of the river. <ul style="list-style-type: none"> The treatment of any water removed from the isolation area, prior to discharge back into the downstream river course, to remove suspended sediment. 			
h	SS + GEN monitoring	The Contractor shall monitor the effect of construction on downstream sediment loads. The monitoring programme shall include sampling in the river upstream and downstream of the works during the period when construction in the river is taking place. The details of the sampling programme shall include, as a minimum, provision for daily samples as agreed with the ECO's for each crossing point for the duration of the river crossing works. The samples shall be analysed on site for total suspended solids and turbidity, using recognised methods of determination, and the results shall be presented to Transnet at least on a monthly basis, or on request by Transnet when required. Sampling times shall be selected to correspond with any periods of higher sediment generation. At its sole discretion, Transnet may reduce the sampling rate at times when sediment is not being generated by the works. The Contractor shall at all times remain responsible for keeping accurate and updated records of suspended sediment and turbidity measured during construction.	CTR	ECO / EPCM	√
i	SS + GEN monitoring	The ECO or other specialist consultant appointed by Transnet shall undertake periodic independent audits of sediment generation caused by the construction works in the rivers in order to verify the results of the sediment monitoring maintained by the Contractor.	ECO	EPCM / CTR	
j	SS + GEN	During the carrying out of the works, the Contractor shall remove any fish that are found within the isolated portion of the watercourse crossing site, without harm to the fish. The Contractor shall obtain advice from the ECO on the relocation of the fish.	CTR	ECO	
k	SS + GEN	Where pipeline construction through river channels involves excavation of submerged rock, the contractor shall give preference to methods that do not involve underwater blasting. In the event that the Contractor adjudges underwater blasting methods to be the only practical method this shall be fully motivated and all necessary plans shall be prepared to demonstrate that the work can be conducted without significant risk to aquatic organisms. Such plans shall be submitted to Transnet for approval and acceptance as a part of the <u>method statements</u> for each major river crossing prior to implementation of the works. The plans shall include all information as listed below: <p>Measures to reduce blast shock, such as:</p> <ul style="list-style-type: none"> Minimising the size of explosive charges per delay and the number of days of explosive exposure. Subdividing the explosives deployment, using electric detonating caps with delays to reduce total pressure. Use of decking in drill holes to reduce total pressure. Use of shaped charges at surfaces to focus blast energy. 	CTR	EPCM	√

ITEM NO.	GENERAL/ SITE SPECIFIC	ENVIRONMENTAL DESIGN REQUIREMENTS AND CRITERIA	Main Responsibility	Support	Method Statement / Procedure
		<ul style="list-style-type: none"> Use of angular stemming material in drill holes to reduce energy dispersal to the aquatic environment. Use of energy absorbers upstream and downstream of the blast, such as temporary gabion structures. <p>Measures to reduce impact on spawning fish, such as:</p> <ul style="list-style-type: none"> Limiting the season of explosive use from March to September (non-spawning season). Use of non-explosive scare techniques to move fish from the immediate blast zone (Use of small repelling explosive charges are not considered to be an effective means of driving fish from a blast area. Acoustic repellent devices and/or bubble curtains may need to be considered). 			
l	SS + GEN monitoring	The Contractor shall notify the EPCM and Transnet in advance of any underwater blasting scheduled for the major river crossings. The Contractor shall monitor the effect of underwater blasts upstream and downstream of the blast zone. If any fish mortality results from a blast, the Contractor shall record the species and size and shall immediately notify the ECO / Transnet and the DWAF.	CTR	EPCM	
m	SS + GEN monitoring	The EPCM and Transnet will inform DWAF in advance of any underwater blasting scheduled for the major river crossings.	EPCM	CTR	
n	SS + GEN	<p>Where rehabilitating the water / river crossing works, the Contractor shall comply with the following (this will be included in the Rehabilitation Plan)</p> <ul style="list-style-type: none"> The Contractor and ECO's shall maintain a photographic record of all river / water crossings prior to construction, during construction and after rehabilitation The river channel embankments shall be returned to the pre-existing (or a more stable) profile than that which existed prior to construction as per the river / water crossing method statements River embankments shall be stabilised, using any necessary protection measures, including re-vegetation, rip rap, reno mattresses and other measures, to ensure that the banks are protected against erosion; Measures using indigenous grasses to permanently stabilise disturbed areas shall be fully effective as described in the re-vegetation sections of this EMP; Debris disposal and clean up shall be carried out to return the river course to its pre-existing condition prior to the works. 	CTR	ECO	√
o	GEN + SS	In rehabilitating the river crossings, the Contractor shall, in addition to the requirements specified in the re-vegetation specification, include the re-planting of indigenous trees in the riparian fringe, removed during construction and shall plant two trees of the same or similar species for each tree removed. All trees at each river crossing shall be alive and healthy at the	CTR	EPCM / Transnet	

ITEM NO.	GENERAL/ SITE SPECIFIC	ENVIRONMENTAL DESIGN REQUIREMENTS AND CRITERIA	Main Responsibility	Support	Method Statement / Procedure
		end of the construction liability period. All trees are to be purchased from a reputable commercial supplier and are to be supplied with a phyto-sanitary certificate which certifies that the soil in which they were propagated is weed free.			
p	GEN + SS	The precise location of the trees as stipulated above in the riparian zone shall be provided to the Contractor by the ECO's	ECO	CTR	
q	GEN + SS	Where legally required if water within a stream / wetland is to be diverted by means of dams, the construction of dams must be authorised by DWAF as part of the permitting process for the proposed NMPP under the National Water Act (Act 36 of 1998). In addition, any EIA authorisation requirements, in terms of the regulations promulgated on the 1st July 2006 under Section 24 and 24D of the National Environmental Management Act, Act No. 107 of 1998 must be complied with.	CTR	EPCM / Transnet	
r	GEN + SS	The EPCM (for Transnet) will apply for DWAF WUL for the following: Impeding or Diversion of flow and the Altering of the Beds and Banks of a water course	EPCM	Transnet	
s	GEN	Any dam / impoundment constructed should only be a temporary structure and must be completely removed once the construction of the pipeline has been completed. The area covered by the dam wall, and by any water impounded behind this structure, including any vegetation that is disturbed must be completely rehabilitated.	CTR	ECO	
t	GEN	The CTR will be responsible to comply to all relevant legislation pertained to the use and protection of water resources.	CTR	ECO	
u	GEN	The pipeline must be designed to take into account the potential occurrence of severe year flood events and to ensure the stability of the pipeline as it crosses rivers.	EPCM	CTR	√

2.7.2 Pollution Prevention (Including River / Water / Wetland Crossings)

ITEM NO.	GENERAL/ SITE SPECIFIC	MITIGATION MEASURES	Main Responsibility	Support	Method Statement / Procedure
a	GEN	No dumping of any building rubble, soil, litter, organic matter or chemical substances may occur within any drainage line or area of standing water. Dumping and temporary storage of the above shall only occur at predetermined locations.	CTR	ECO	
b	GEN	The Contractor shall ensure that construction workers do not use any water body for washing, cleaning or as latrine area.	CTR	ECO	
c	GEN	Access of people and vehicles to wetlands and any other water bodies along the pipeline construction servitude must be restricted as far as possible. Signage must remain for the duration of construction activities.	CTR	ECO	
d	GEN	The contractor shall ensure that the placing of silt fences / silt barriers adjacent to all water bodies occurs to prevent discharge of silt into the water bodies, and the inclusion of buffer	CTR	ECO	

ITEM NO.	GENERAL/ SITE SPECIFIC	MITIGATION MEASURES	Main Responsibility	Support	Method Statement / Procedure
		zones as required by Legislation in which no stockpiles, machinery, chemicals or construction camps must be included to prevent pollution into the wetland. Where no specific standards exists or have not been identified in this EMP a minimum boundary of 32 meters shall apply or otherwise specified in the Water Use License (WUL).			
e	GEN	In cases where any seepage water is removed from the pipeline trench (including from wetlands) as part of a dewatering process, this water may contain a high silt load, which could have a detrimental effect if discharged back into the wetland. It is thus recommended that water from dewatering operations be cleaned of silt as far as possible prior to the water being discharged into the wetland. Advanced notice of intended construction with these areas is to be provided to ECO'S, EO's and wetland specialist. Erosion and silt control mechanisms must be in place prior to the onset of construction within any wetland or river crossing. EO's must liaise with ECO's and Engineers (or specialist wetland crossing team foremen) as to where these measures should be placed to ensure adequate and reasonable distances for access to the de-watering points. Since de-watering points are often dependent on site conditions that can change rapidly, EO's and the erosion control team should be present at all times within these areas, ready to mobilize new measures for erosion and silt control as when necessary upon request of the ECO's.	CTR	ECO	

2.7.3 Horizontal Directional Drilling

ITEM NO.	GENERAL/ SITE SPECIFIC	ENVIRONMENTAL DESIGN REQUIREMENTS AND CRITERIA	Main Responsibility	Support	Method Statement / Procedure
a	SS	The Contractor shall prepare a detailed Method Statement for all HDD sites for approval by the EPCM and Transnet prior to commencing with Construction.	CTR	Transnet / EPCM	√
b	SS	The Contractor shall take all expected measures required to prevent risks typically associated with HDD methods of construction including but not limited to ground subsidence during drilling operations, inadvertent spills of bentonite and final disposal of the grout.	CTR	Transnet / EPCM	
c	SS	If any sensitive environments are expected to be affected by HDD Activities such as wetlands, river, water crossings or any other environments classified as sensitive as part of this EMP, mitigation measures will be stipulated in the method statements issued to the EPCM and Transnet.	CTR	Transnet / EPCM	√
d	SS + GEN monitoring	As part of the method statements to be provided by the contractor prior to construction, procedures for monitoring the flow and recycling of bentonite will be submitted and reviewed. This will include emergency measures to deal with unwanted spillages. Details will also be required of where and how the bentonite grout is finally disposed of. Although this grout is non-toxic, it has the consistency of mud and disposal thereof will have to be carefully controlled to avoid any adverse environmental impacts.	CTR	Transnet / EPCM	√

2.7.4 Blasting Operations

ITEM NO.	GENERAL/ SITE SPECIFIC	ENVIRONMENTAL MANAGEMENT REQUIREMENT	Main Responsibility	Support	Method Statement / Procedure
a	GEN	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.	CTR	EPCM	
b	GEN	To limit damage to structures, even old buildings, to only very slight damage (less than 5%) The Contractor shall adhere to all published PPV limits for built-up or potential risk areas and strictly enforced. Regular peak particle velocity (PPV) measurements shall be taken along the route where blasting is being carried out close to buildings, using a velocity seismograph. The Contractor shall submit the results to the EPCM at agreed-upon intervals.	CTR	EPCM	
c	GEN + SS	The Contractor shall use blast mats wherever fly-rock may result in damage to adjacent buildings, power lines or other built structures, or sensitive ecological areas.	CTR	EPCM	
d	GEN	The Contractor shall apply due diligence and all industry-accepted methods to limit factors contributing to the development of an airblast and noise, which include overcharged blast holes, poor stemming, uncovered detonating cord, venting of explosive gasses and inadequate burden giving rise to cratering.	CTR	EPCM	
e	GEN	The Contractor shall control blasting operations to ensure sound pressure levels are kept below the generally accepted 'no damage' level of 140 decibels. The Contractor must investigate local area requirements and enforce these if different from the latter stated.	CTR	EPCM	
f	GEN + SS	Where blasting is disallowed due to any reason, only pneumatic tools or chemical breaking of the rock should be permitted.	CTR	EPCM	
g	GEN	The Contractor will be responsible to enforce any special conditions as stipulated in the Land Owner agreements in terms of blasting operations in close proximity to boreholes, the recommended mitigation measures shall be employed upon consultation with the affected landowner and could include the following: <ul style="list-style-type: none"> • Pump test to establish existing reliability of borehole supply, prior to construction, so that this may serve as a benchmark against which change can be measured. • Use of special methods to limit potential damage to boreholes if blasting is to be used. • Use of controlled blasting or mechanical excavation on those properties where it is agreed that there is a potential risk to boreholes due to normal blasting methods. • Monitoring of blast shock using standard monitoring practices. 	CTR	EPCM	√
h	GEN	Notwithstanding any information provided within the EMP or any other report, the Contractor shall ensure that appropriate mitigation is employed wherever hard rock is encountered and blasting is required.	CTR	EPCM	

ITEM NO.	GENERAL/ SITE SPECIFIC	ENVIRONMENTAL MANAGEMENT REQUIREMENT	Main Responsibility	Support	Method Statement / Procedure
i	GEN + SS	Homesteads and structures <ul style="list-style-type: none"> • Prepare a photographic survey (including a crack survey) of all structures in proximity to the pipeline so as to manage issues relating construction damage, including damage caused by blasting and vibration. The survey intent must be well communicated and agreed with householders. Proper documentation should be kept in the form of a database or similar. • This database will serve as a baseline for determining the impact of construction-related blasting and vibration on buildings. The intent of this survey must be communicated to all stakeholders, and must be conducted with their consent. Where impacts on structures are unavoidable as result of blasting operations, Contractor shall compensate owners for damages based on a valuation by a certified valuer.	CTR	EPCM	√
j	GEN	Complaints regarding blasting-damage to structures must be lodged with the Land Liaison Officers	EPCM	ECO / CTR	
k	GEN	Such complaints will be investigated by the contractor and their validity determined by comparing the post-construction state of structures with their state as recorded in the photographic survey. A register must be kept of all construction-related complaints (including those that are not specifically related to building damage). The register must be designed in such a way as to capture: <ul style="list-style-type: none"> • The name of the person lodging the complaint, • The nature of the complaint, • The date on which it was lodged, • What action was taken, and by whom, to address the complaint, • The date on which this action was taken, and • The outcome of this action. 	CTR	EPCM	
l	GEN	In addition to the complaints register, a record must be kept of all communication with communities.	EPCM	ECO / CTR	
m	GEN	The Contractor shall submit Method Statements for all methods of blasting mitigation for approval by the EPCM prior to commencing with such activities and shall comply with all relevant ISO standards and health and safety legislation.	CTR	EPCM	√

2.8 Waste Management and Littering

2.8.1 General Waste

ITEM NO.	GENERAL/ SITE SPECIFIC	ENVIRONMENTAL MANAGEMENT REQUIREMENT	Main Responsibility	Support	Method Statement / Procedure
a	GEN	The Contractor shall prevent littering and the random discard of solid waste on the site. The Contractor shall not dispose of any waste in the pipeline trench. The trench shall be inspected on a daily basis and all foreign objects shall be removed and properly disposed of.	CTR	ECO	
b	GEN	It is recommended that Litter collection points are to be provided along the RoW and Construction Sites. It is also advisable that the Contractor establishes central waste collection and sorting sites where litter and other waste will be stored temporarily for sorting purposes and collection. A waste recycling mindset should be encouraged. Collected waste may only be disposed of at licensed dumpsites and the Contractor shall keep written proof of materials disposed.	CTR	ECO / EPCM	
c	GEN	The Contractor is to prepare a method statement in terms of waste management to be accepted by Transnet.	CTR	ECO / EPCM	√

2.8.2 Hazardous Waste

ITEM NO.	GENERAL/ SITE SPECIFIC	ENVIRONMENTAL MANAGEMENT REQUIREMENT	Main Responsibility	Support	Method Statement / Procedure
a	GEN	All necessary precaution measures shall be taken to prevent soil or surface water pollution from hazardous materials used during construction and any spills shall immediately be cleaned up and all affected areas rehabilitated.	CTR	ECO	
b	SS	An area for the storage of hazardous materials must be established within construction camps that conforms to the relevant safety requirements and that provides for spillage prevention and containment	CTR	ECO	
c	GEN	The Contractor shall comply with all applicable laws, regulations, permit and approval conditions and requirements relevant to the storage, use, and proper disposal of hazardous materials.	CTR	ECO	
d	SS	All hazardous substances shall be stored in designated areas within the construction camps that are bunded and provided with a hard, impervious surface, as well as sufficient roof cover to prevent the ingress of water. All bunded areas will be provided with a catchment sump that	CTR	ECO	

		drains to a separator unit that prevents runoff from entering and contaminating any adjacent areas. Bund walls must be of a sufficient height to contain at least 110% of the volume of any materials stored within the bunded area.			
e	SS	The hazardous materials storage area must be locked and access restricted to authorised personnel, and must be clearly marked as such.	CTR	ECO	
f	SS	The Contractor shall at all times have a skip on site (Construction Camps) for the disposal of hazardous waste and polluted soil, which will be cleaned regularly. Waste shall have a turnaround cycle that will ensure that the skips never exceed their maximum carrying capacity.	CTR	ECO	
g	GEN	All major spills as specified in the contractor emergency response procedure of any materials, chemicals, fuels or other potentially hazardous or pollutant substances must be cleaned immediately and the cause of the spill investigated. Preventative measures must be identified and submitted to the EPCM and ECO for information.	CTR	ECO	
h	GEN	The Contractor shall prepare a Hazardous Materials and Waste Management Plan for inclusion in the site specific Environmental Plans to be submitted to Transnet prior to establishment on site. This plan shall include, but shall not be limited to, measures to prevent: <ul style="list-style-type: none"> • contamination of soils; • pollution of water; • accidental fires; • risk/injury to people or animals. 	CTR	EPCM / ECO	√
i	GEN	The Contractor shall classify all hazardous materials to be used on site according to recognised Codes of Practice such as SABS Code 0228 for the Identification and Classification of Dangerous Substances and Goods and the Department of Water Affairs and Forestry <i>Minimum Requirements for the Handling, Classification and Disposal of Hazardous Waste</i> , and shall ensure that the handling, storage, transport and disposal of these materials meets the requirements of these Codes.	CTR	ECO	
j	GEN	Material Safety Data Sheets (MSDS) Information and records of all materials stored must be available and strict control of the volumes stored and removed must be kept.	CTR	ECO	
k	GEN	Staff must be trained in the hazards and required precautionary measures for dealing with these substances.	CTR	ECO	
l	SS	All Waste within the designated waste skips (hazardous or general) may only be disposed at a licensed disposal site to receive such materials. The Contractor shall keep written record of materials dumped and shall provide such proof to Transnet when requested.	CTR	ECO	
m	GEN	The Contractor shall manage all hazardous materials and wastes in a safe and responsible manner, and shall prevent contamination of soils, pollution of water and/or harm to people or animals as a result of the use of these materials.	CTR	ECO	
n	GEN	Construction equipment and vehicles are not to be serviced within the Construction Right of Way or any other area outside of the Construction Camps as a matter of course and this practice should be limited to breakdowns and unavoidable maintenance only. In such	CTR	ECO	

	instances drip trays or other absorbent material shall be placed underneath the serviced vehicle, the contents of which shall only be disposed of in the hazardous materials skip at the Construction Camp, or otherwise a dumping site licensed to receive such waste. No dumping of any broken parts, oils, grease or any other material in the Construction Right of Way or adjacent areas will be tolerated under any circumstances and strict action shall be taken against any offenders.			
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2.9 Boreholes and Springs

ITEM NO.	GENERAL/ SITE SPECIFIC	ENVIRONMENTAL MANAGEMENT REQUIREMENT	Main Responsibility	Support	Method Statement / Procedure
a	SS	<p>The Contractor is to take note of any special conditions listed within landowner agreements with landowners within the Curry's Post Area.</p> <p>It was noted that 2 springs and 1 borehole in the Curry's Post area in KZN Midlands, are located either within or immediately adjacent to the construction zone of the trunk line route.</p> <ul style="list-style-type: none"> • Spring No. 755-S1: To minimise any possible negative impacts on the vulnerable water sources, it is recommended that where alternate potable water supply sources are available, that these water sources are checked prior to, during and after construction of the pipeline to ensure that flow rates/ water quality remain unaffected. • Spring No. 757-S1: It is recommended that the pipeline route is moved to the eastern side of the proposed route to reduce the possibility of the spring being disturbed/ effected. If blasting is to be undertaken in this vicinity, alternate water supply options, such as drilling and equipping of a borehole should be investigated. • Borehole No. 792-1: The pipeline route is moved to the western side of the proposed route. If blasting is to be undertaken in this vicinity, it is recommended that this borehole is pump tested under the supervision of a Geohydrologist. The borehole should then be sleeved with 140mm Class 12 factory slotted casing to ensure the stability of the borehole, before being re-pump tested to re-confirm the yield after the installation of the casing to ensure that the borehole remains operational, as this borehole forms the only source of potable water to the school. <p>(Annexure B).</p>	CTR	ECO / EPCM	
b	GEN	In all cases, the Land Liaison Officers (LLO's) must verify with landowners whether they make use of any water supply boreholes or springs within 200 m of the pipeline.	EPCM	ECO	
c	GEN	If any boreholes or groundwater sources are identified, over and above those listed in (Annexure B) , these should be logged by the Contractor.	CTR	ECO	
d	GEN	In the event that blasting is required in a section of route which is within 200 m of a borehole or shallow groundwater source, the yield is to be tested prior to and after blasting has taken place.	CTR	EPCM	√

ITEM NO.	GENERAL/ SITE SPECIFIC	ENVIRONMENTAL MANAGEMENT REQUIREMENT	Main Responsibility	Support	Method Statement / Procedure
		Any damage to yields which is incurred as a result of pipeline construction is to be fully compensated for, if necessary, by means of drilling an additional borehole or using the other means to supply water to the affected landowner.			
e	GEN	In the case of identification of any additional farm water supply from springs and seeps, close to the alignment, these should be reviewed by the ECOs and an appropriate course of action determined.	CTR	ECO / EPCM	√

2.10 Veld Fires

ITEM NO.	GENERAL/ SITE SPECIFIC	ENVIRONMENTAL MANAGEMENT REQUIREMENT	Main Responsibility	Support	Method Statement / Procedure
a	GEN	The Contractor shall minimise the risk of bush or veld fires caused by any activity on the site. Where adjacent areas are at risk of fire, the Contractor shall produce Method Statements indicating how the spread of fires will be prevented. These are to be accepted by the affected adjacent landowner/s, ECO and local Fire Departments and/or Fire Protection Agencies (FPA).	CTR	ECO / EPCM	√
b	GEN	The Contractor shall ensure through fire breaks and other appropriate measures that all Construction Camps are protected from the risk of oncoming veld fires that have originated on adjacent properties.	CTR	ECO / EPCM	
c	GEN+SS	Where construction sites, specifically the Pump Station and Terminal sites are at risk of oncoming fires the Contractor shall also provide firebreaks and shall where necessary coordinate fire prevention efforts with adjacent landowners and local FPA.	CTR	ECO / EPCM	

2.11 Soil and Erosion Management

2.11.1 Vegetation Clearing

ITEM NO.	GENERAL/ SITE SPECIFIC	MITIGATION MEASURES	Main Responsibility	Support	Method Statement / Procedure
a	GEN	Where possible, trees existing within the Construction right of Way that are not interfering with the operation of construction (either individual specimens or groups) shall be left undisturbed, and shall be clearly marked.	CTR	ECO	
b	GEN	When entering areas of predominantly indigenous vegetation the ECO's will be consulted in terms of the possibilities of transplantation of any specimens that are of ecological significance within the RoW to outside of the Construction RoW.	CTR	ECO	
c		The ECO's and LLO's will consult with all landowners where the above stated is relevant in order to reach land owner agreements.	ECO	EPCM / CTR	
d		The Contractor shall notify the ECO's of any protected or endangered species which requires removal found within the construction RoW or any other construction area.	CTR	ECO	
e	GEN	The ECO will be responsible for permits to be obtained for the removal of any protected or endangered species, as required by the National Environmental Management: Biodiversity Act (Act 10 of 2004) and any other related legislation or local ordinances. Such species shall be photographically recorded and inventoried, and their position indicated on the site plan prior to removal. Removal of plants shall be the responsibility of the appointed dedicated permitting officials.	ECO	CTR / EPCM	
f	GEN	The Contractor may not remain in possession of any endangered plants and shall be fined as per any relevant legislation. All specimens removed must be relinquished to the relevant conservation authorities.	CTR	ECO	
g	GEN	The Contractor shall remove all alien invader plant species from the construction site as directed by the ECO.	CTR	ECO	
h	GEN	The Contractor will agree with the ECO on site appropriate weed control measures to be put in place, in order to develop a weed control management plan. The plan will be dependant on the species encountered and the location of their occurrence. The plan will also take into account areas where weed infestation cannot be appropriately managed as result of surrounding area weed infestation, which might limit the success of weed control on the construction sites. Such areas will be mapped and noted in the Weed Control Management Plan and communicated to the ECO's.	CTR	ECO	√
i	GEN	Herbicides and pesticides may only be used for vegetation clearance and alien plant species eradication with the prior approval of Transnet and the ECO. Wherever the Contractor	CTR	ECO / EPCM	

ITEM NO.	GENERAL/ SITE SPECIFIC	MITIGATION MEASURES	Main Responsibility	Support	Method Statement / Procedure
		proposes to use these measures he shall submit a Method Statement for approval. The use of these measures shall only be considered if it can be demonstrated that alternative measures are not feasible or practicable.			
j	GEN	No soil stripping or vegetation removal shall take place on areas within any site that the Contractor does not require for construction works.	CTR	ECO	

2.11.2 Topsoil and Subsoil Management

ITEM NO.	GENERAL/ SITE SPECIFIC	MITIGATION MEASURES	Main Responsibility	Support	Method Statement / Procedure
a	GEN	The Contractor shall prior to commencement of Topsoil Stripping determine the average depth of topsoil for each construction spread. This will be agreed in consultation with the ECO. Typically topsoil constitutes the top 150mm of soil including organic matter, however the depth may vary from virtually zero to 300mm.	CTR	ECO	
b	GEN	Topsoil shall be stripped in the presence of the ECO. Once the Contractor has demonstrated to the satisfaction of the ECO that the topsoil in a specific area is being sufficiently stripped and stockpiled, these activities may then subject to agreement of the ECO, take place unsupervised. However this in no way absolves the Contractor of any responsibility in this regard and the Contractor will be expected to act with due diligence at all times.	CTR	ECO	
c	GEN	The Contractor shall take care not to mix topsoil and subsoil during stripping operations.	CTR	ECO	
d	GEN	The Contractor shall separately stockpile topsoil and subsoil and shall ensure that all construction workers are able to distinguish between the different stockpiles. All construction workers shall be educated about the importance and correct methodology of soil management.	CTR	ECO	
e	GEN	The Contractor shall ensure that no littering, waste disposal, fuel or chemical contamination, plant matter dumping or other activity occurs that may introduce pollutants or foreign plant species into stockpiled soils.	CTR	ECO	
f	GEN	If significant contamination or pollution of topsoil occurs, the Contractor shall ensure that the entire depth of affected soil is carefully removed and shall dispose thereof at a licensed hazardous waste site. Written proof of disposal shall be kept and forwarded to the ECO and Transnet on request.	CTR	ECO / EPCM	√
g	GEN	The Contractor shall replace all polluted or contaminated soils that have been contaminated as a result of his construction activities at own expense with soil that is of a standard acceptable to the ECO and that conforms to all relevant topsoil specifications of the National Department of Agriculture.	CTR	ECO	

ITEM NO.	GENERAL/ SITE SPECIFIC	MITIGATION MEASURES	Main Responsibility	Support	Method Statement / Procedure
h	GEN	All soil stockpiles shall be kept free of any weeds or alien invader plant species through regular weeding. Through instruction from the ECO's weeds, where practicable shall be removed completely from the RoW.	CTR	ECO	
i	GEN	To the greatest extent possible topsoil and subsoil shall be handled twice only-once to get it off of the trench alignment and a second time to replace it.	CTR	ECO	
j	GEN	The process of returning topsoil to the servitude must be undertaken using equipment that limits compacting of the topsoil to a minimum.	CTR	ECO	
k	GEN	The Contractor shall endeavour to minimise the period during which topsoil is stockpiled to the greatest extent possible, so as not to diminish its plant support capacity.	CTR	ECO	
l	GEN	Topsoil shall be used for rehabilitation purposes only and shall only be placed on top of all other subsoil. Under no circumstances shall topsoil be used for filling of the pipe trench or any other excavations.	CTR	ECO	
m	GEN	The Contractor shall remove topsoil from the full width of the construction corridor where required	CTR	ECO	
n	GEN	All soil stockpiles shall be so positioned that they are not in any way impacted upon by vehicular movement, other materials storage or construction activities in general.	CTR	ECO	
o	GEN	Soil stockpiles shall not be so positioned that they obstruct any water drainage line or area of concentrated runoff.	CTR	ECO	
p	GEN	Where stockpiles are necessarily positioned along any sloped area, diversion berms or rock packs shall be constructed around their uphill sides to prevent scouring of the stockpile. Extreme care must be taken that runoff does not concentrate around the edges of the diversion structures and straw mulch should be spread around the edges of the structures to prevent erosion.	CTR	ECO	
q	GEN	Soil stockpiles shall not exceed 2 metres in height, unless prior approval has been obtained from the ECO.	CTR	ECO	
r	GEN	At all Terminal and Pump Station construction sites, all stockpiled topsoil shall be conserved by limiting the surface area to volume ratio of stockpiles. Fewer, larger stockpiles should be used in preference over more, smaller stockpiles. However this should not be done at the cost of greater areas of vegetation clearance.	CTR	ECO	
s	GEN	Topsoil shall be windrowed along the construction Right of Way along the pipeline construction site, in such a manner and position that it is not driven over by construction vehicles or trampled by workers. Topsoil shall be turned during stripping and left undisturbed until it is reinstated during rehabilitation.	CTR	ECO	
t	GEN	The full depth of topsoil must be stripped from all areas that will be affected by construction-related activities and shall include the construction footprint, working and storage areas as well as any other operational spaces.	CTR	ECO	

ITEM NO.	GENERAL/ SITE SPECIFIC	MITIGATION MEASURES	Main Responsibility	Support	Method Statement / Procedure
u	GEN	All soils must be reinstated in the reverse order of that in which they have been removed. Extreme care should be taken so that intermixing of soils does not occur during reinstatement. After the completion of the backfilling, re-contouring and erosion control works, the Contractor shall spread the topsoil evenly at uniform depth over the areas from which it was removed.	CTR	ECO	
v	GEN	Any Construction Vehicle movement over topsoil stockpiles shall be prohibited.	CTR	ECO	
w	GEN + SS	A fixed-point photo survey shall be undertaken of all sections of the pipeline that crosses through agricultural land to allow for a comparison between the state of the landscape after rehabilitation and what it was before. In order to identify any reduction in soil fertility, it is recommended that soil tests be conducted at regular intervals along the route through all affected communities. These tests must be conducted before construction, once the route has been pegged, with a repeat test from the same location six months after soil reinstatement. These tests should include tests of organic soil content.	CTR	ECO	

2.11.3 Erosion prevention and mitigation

ITEM NO.	GENERAL/ SITE SPECIFIC	MITIGATION MEASURES	Main Responsibility	Support	Method Statement / Procedure
a	GEN + SS	The following generic measures are provided to limit the occurrence of and mitigate existing erosion. The Contractor is furthermore referred to the Procedures for Arresting Gully Erosion supplied in this EMP, as derived from the “Erosion Risk Assessment Report” compiled for the NMPP project by Mentis (June 2008) (<i>FINAL EIA Specialist Study 10C</i>). While the Contractor may implement these and / or alternative methods of erosion prevention and rehabilitation, the Contractor remains liable for environmental compliance and shall ensure that erosion is prevented and successfully mitigated, notwithstanding any provision or methodology described in this EMP. Wherever so required, the Contractor shall obtain specialist input in the interpretation and application of specific methods and if so required, shall provide Method Statements for approval by the ECOs and / or consulting engineer prior to commencing with their installation.	CTR	EPCM / ECO	√
b	GEN	On cultivated land the Contractor shall backfill the pipeline trench to approximately the same compaction density as the existing soil nearby, and/or hump backfill over the trench and allow it to settle before handing back for farm use.	CTR	ECO	
c	GEN	The Contractor shall construct berms at frequent intervals to divert and disperse runoff and / or develop contour bank systems to divert runoff flowing down slope along the backfilled trench. The berms are to be constructed before a dense perennial grass cover is to be established.	CTR	EPCM / ECO	

ITEM NO.	GENERAL/ SITE SPECIFIC	MITIGATION MEASURES	Main Responsibility	Support	Method Statement / Procedure
d	GEN	The Contractor shall mulch soils on steep and long slopes and on erodible soils where deemed necessary, as a precaution to limit erosion in the event of unseasonal rains, before a dense perennial grass cover has been established. Mulch obtained from any alien plant species matter is not to be used for this purpose.	CTR	EPCM / ECO	√
e	GEN	The Contractor shall lay out stone packs on the contour on bare expanses of earth where deemed necessary, especially where there are slaking shale's present. Stone packs shall be frequently spaced and must be long enough to prevent lateral erosion around the structures.	CTR	ECO	
f	GEN	The Contractor shall construct drop weirs or gabion structures to prevent susceptible slopes against knicks. The Contractor may consult a suitably qualified and experienced agricultural engineer and shall submit Method Statements for their design to the ECO prior to construction commencing.	CTR	ECO	√
g	GEN	The Contractor shall take diligent aftercare for the duration of the contract whereby all sites that have been rehabilitated are visited after every storm, in order to ascertain whether erosion has occurred. The Contractor is reminded of the fact that his responsibilities do not end with the implementation of initial rehabilitation measures and shall repair rills or gullies that have formed. Erosion damage is to be filled with suitable soil, smoothed to match the adjacent topography and re-grassed.	CTR	EPCM / ECO	
h	GEN	Where highly erodible soils with high proportions of silt and fine sand, or low proportions of clay are encountered the Contractor shall employ mulch before grassing. Grass establishment and maintenance must be done to a high standard – refer to re-vegetation guidelines provided in this EMP in section 2.13.2	CTR	ECO	√
i	GEN	Where duplex soils are encountered grass establishment and maintenance must be done to a high standard– refer to re-vegetation guidelines provided in this EMP.	CTR	ECO	
j	GEN	Where dispersive soils are encountered the Contractor shall either apply gypsum to displace excess sodium, or incorporate mulch to permit sodium infiltration and leaching out with rainwater. Soil amelioration shall be done where required in order to establish grass cover– refer to re-vegetation guidelines provided in this EMP.	CTR	ECO	
k	GEN	Where the pipeline traverses sections of slaking shale, all areas of exposed shale are to be covered with soil which is then properly grassed. The Contractor shall take special precautions to prevent incision and to stabilise gully sides - refer to the Guideline Procedure for Arresting Gully Erosion.	CTR	ECO	
l	GEN	Wherever the pipeline traverses long or steep slopes, the Contractor shall reinstate the original topographical profile as soon as the pipe has been placed in the trench and covered. Berms, rock stacks and other soil conservation measures should be employed to divert runoff from the Construction Right of Way which will initially not have attained any vegetative cover. A dense perennial grass cover should be established as soon as possible - refer to re-vegetation guidelines provided in this EMP.	CTR	ECO	

ITEM NO.	GENERAL/ SITE SPECIFIC	MITIGATION MEASURES	Main Responsibility	Support	Method Statement / Procedure
m	GEN	In sections of the alignment where a low degree of existing plant cover is encountered prior to construction, the Contractor shall undertake grass establishment as soon after construction as possible. Soil fertilisation shall be done and fertiliser-responsive grass species must be used. Proper aftercare of at least two years shall be done by the servitude maintenance teams, to ensure that sufficient vegetative cover is attained - refer to re-vegetation guidelines provided in this EMP.	CTR	ECO	
n	GEN	The Contractor shall take the necessary measures to prevent trench subsidence, which may lead to severe gully erosion and possible pipe exposure. Wherever the pipeline traverses slopes, the Contractor shall construct trench-breakers in the trench to prevent subsurface flow. Backfill shall be properly compacted and slightly heaped, so that the soil surface of the trench, once settling has occurred, is not lower than the surrounding soil levels. However the backfilled trench should not be less permeable than surrounding soils, which may lead to underground damming of water. Contour banks should be developed over the Construction Right of Way which will prevent preferred runoff channels from developing along the backfilled trench. The Contractor shall establish suitable natural vegetation cover over all disturbed areas and such cover must be to a degree where the erosion potential is minimised.	CTR	ECO	
o	GEN	Wherever the pipeline crosses a watercourse the Contractor shall ensure that all excess spoils are removed from the watercourse and that adequate care is taken that the profile of the stream channel is not altered. Where temporary alteration of the stream channel profile is required the Contractor shall reinstate the stream channel to as close to its original profile as possible. The Contractor shall where feasible establish plant cover by selectively procuring native plants from upstream and downstream areas and transplanting on the disturbed sections.	CTR	ECO	
p	GEN + SS	Where temporary vehicle crossings are required over watercourses, the Contractor shall either construct a low drift in the watercourse that flow passes over; or a temporary bridge structure that the flow passes under. Neither structure shall be so constructed that the flow of water is impeded. This will be subject to the approval and issue of the WUL.	CTR	ECO	
q		The Contractor shall submit a Method Statement for the design of all temporary stream crossings for acceptance by the EPCM prior to its construction.	CTR	EPCM / ECO	√
r	GEN	Wherever berms are constructed, these will be installed as per the typical drawings. The contractor shall submit method statements for the installation of berms. (refer to Guideline Procedure for Arresting Gully Erosion.	CTR	EPCM / ECO	√
s	GEN	The Contractor shall take preventative measures to prevent severe erosion of un-vegetated steep slopes, caused by unseasonal rain. Hessian bags or other degradable cloth shall be pegged down over exposed surfaces. These measures shall be done where bare slopes may be at risk of erosion.	CTR	EPCM / ECO	

ITEM NO.	GENERAL/ SITE SPECIFIC	MITIGATION MEASURES	Main Responsibility	Support	Method Statement / Procedure
t	GEN	<p><i>Guideline Procedure for Arresting Gully Erosion General</i></p> <ul style="list-style-type: none"> • Identify the causes of gully initiation & growth • Neutralize the cause of gully erosion • Adapt designs and procedures to arrest gully growth and fit each specific case • Important: Start gully reclamation work at the upslope end and work down-slope • If there is excess water entering and enlarging a gully, divert and disperse the water • Fence of all rehabilitation areas to exclude livestock during reclamation operation <p><i>Drop weirs to arrest gullies</i></p> <ul style="list-style-type: none"> • Construct with rock in gabions, or concrete, or bricks and mortar • Preferably locate the structures across wide (not narrow) sections of the gully • Key weirs into the gully sides and gully floor • Line gabions underneath, upslope and on sides with geofabric • Weirs must be lower at gully centre than at gully sides to provide an overflow • Weir sides must be flush with and not project above the gully banks • Many small weirs are preferable to a few big weirs • Build weirs on grade-line (the top of one structure is level with the bottom of the next upslope structure) • For very steep gradients a gabion staircase is warranted • At the foot of the weir, build a dissipation structure (stilling pond or apron underlain with geofabric) • Moist gully floors can be planted to indigenous reeds (<i>Phragmites spp</i>) • Inspect at least annually and after big storm events. Repair damage immediately <p><i>Rock packs to protect & reclaim bare areas</i></p> <ul style="list-style-type: none"> • Use biodegradable hessian on soil surface and rocks laid along contour to reclaim large bare sloping areas (e.g. slaking shales) • Many modest rock packs at close intervals down a slope are preferable to a few big packs • Construct on the grade-line (top of one structure to be level with the bottom of the next structure upslope) 	CTR	EPCM / ECO	
u	SS	<p>The Contractor shall be expected to employ mitigation measures as required wherever soil erosion risk areas are encountered. These areas has been captured in the alignment sheets as far as possible. The Contractor is to take note of the potential high risk soil erosion areas as identified in the geotechnical assessment reports carried out for the project located in the FINAL EIA Specialist Study 7A, 7B and 7C, these are listed below:</p> <ul style="list-style-type: none"> • Erosion of the unconsolidated Berea type sand is a medium-level risk, which will 	CTR	EPCM / ECO	

ITEM NO.	GENERAL/ SITE SPECIFIC	MITIGATION MEASURES	Main Responsibility	Support	Method Statement / Procedure
		<p>however be aggravated where the vegetation on slopes steeper than 1:5 (20%) is removed over extensive lengths.</p> <ul style="list-style-type: none"> • Vertical slopes range up to 1:2.9 (35%), which is steep and approaching the internal friction angle of the soils. • Steep topography where rainfall is fairly high, hillsides and valley lines are generally stable, with minimal evidence of long-term erosion. • The presence of dispersive and erodible soils has however resulted in significant and extensive erosion of the lower-slope stratified colluvial pedisediment soils, creating erosion gulleys (dongas). • Crossing of the Wilge River • Vaalkop • Crossing of the Verkykerskop-Harrismith Road • Crossing of the Meul River Valley • Long steep slopes near Tafelkop • Ascent of the Draaihoek scarp • Steep rise north of Holspruit Stream • Langverwag • Crossing of Brakspruit • Crossing of the Vaal River 			
v	SS	<p>The Contractor is to take note of the risk areas as identified in the Erosion Risk Assessment Report (<i>FINAL EIA Specialist Study 10C</i>) All risk areas are indicated on the alignment sheets</p>	CTR	ECO	

2.12 Waste Rock

ITEM NO.	GENERAL/ SITE SPECIFIC	MITIGATION MEASURES	Main Responsibility	Support	Method Statement / Procedure
a	GEN	The Contractor may move surface stone and rock to facilitate pipeline construction, but shall not stockpile or dispose of this material off the Construction Right of Way without landowner consent	CTR	ECO	
b	GEN	Waste rock excavated during the construction process shall be replaced in the trench to whatever extent possible, to reduce the amount of rock that has to be transported from the site.	CTR	ECO	
c	GEN	No permanent dumping or spreading of rock spoil over the construction right of way to be permitted	CTR	ECO	
d	GEN	The Contractor shall prepare a Method Statement detailing the proposed locations and method of disposing of excess spoil excavated from the pipeline trench or construction sites. As a general rule, windrowing of excavated material along the perimeter of the trench shall be allowed. Excavated spoil and other granular material shall be collected and transported to a suitable licensed disposal site if considered to be waste and where such material cannot be re-used. The Contractor shall identify erosion gullies or old borrow pits for preferential rehabilitation of such areas with the excess spoil and other granular material. The Method Statement shall include the measures that are proposed to stabilise and rehabilitate any such sites (erosion gullies and old borrow pits).	CTR	ECO	√
e	GEN	The Contractor shall under no circumstance dump rocks or stone waste into adjacent veld areas, pastures or agricultural land, or in any natural area or river or water body. Rock waste shall be disposed of at a dumping facility licensed to receive such waste and the Contractor shall keep written record of all materials dumped.	CTR	ECO	

2.13 Rehabilitation

2.13.1 Reinstatement

ITEM NO.	GENERAL/ SITE SPECIFIC	MITIGATION MEASURES	Main Responsibility	Support	Method Statement / Procedure
a	GEN	A detailed reinstatement database shall be developed for the entire pipeline route per KP section, detailing the condition to which rehabilitation must be done and any specific rehabilitation objectives that are to be achieved.	CTR	ECO	
b	GEN	The Contractor shall remove all temporary works along the Construction Right of Way and fences and private roads disturbed by construction shall be restored to their original condition unless another agreement is reached with the applicable landowner.	CTR	ECO	
c	GEN	On arable land, the Contractor shall ensure that stone and rock unearthed during construction does not constrain use of the land or adjacent land after rehabilitation. Rock Spoil within ploughing depths must be prevented in areas where this rock did not previously occur.	CTR	ECO	
d	GEN	Rehabilitation shall establish a grass cover. The Contractor is to consult with a vegetation specialist to advise on the best grass and plant species (planting methodology) that should be used for rehabilitation. The Contractor will include the recommendations of the vegetation specialist in the reinstatement database for review and acceptance by the ECO's and Transnet. This reinstatement database will be in compliance with the re-vegetation guidelines specified in this EMP in section 2.13.2.	CTR	ECO	
e	GEN	The Contractor shall ensure that this grass cover is maintained for the duration of the rehabilitation period. Areas where the vegetation does not establish shall be re-vegetated within the 1 year rehabilitation period. The Contractor shall be responsible for topsoil shaping, ensuring the required drainage patterns and main soil engineering works. However a specialist rehabilitation contractor may be appointed or otherwise consulted for seeding and vegetation establishment	CTR	ECO	
f	GEN	The Contractor shall prepare a rehabilitation plan, prior to re-vegetation, detailing the method of preparation, soil amelioration, fertilising and seeding to be used in rehabilitating each area of the works and the post-establishment maintenance regime to be implemented. The Contractor shall consider the guideline presented in this EMP in this regard. While the Contractor may implement alternative methods of grass establishment and fertiliser and maintenance regimes, compliance with this EMP re-vegetation guidelines will be judged strictly in accordance with the species composition and cover established at the end of the maintenance period	CTR	ECO	√

ITEM NO.	GENERAL/ SITE SPECIFIC	MITIGATION MEASURES	Main Responsibility	Support	Method Statement / Procedure
g	GEN	<p>The Contractor shall maintain and submit to the ECO detailed records of the method used to re-establish grass in each area of the contract. These records shall include the following and / or any other relevant items:</p> <ul style="list-style-type: none"> • Subsoil preparation (scarifying/ripping/disking) • Soil tests (Fertility Testing – Agricultural Land, or as required by any landowner) • Volume of soil spread • Soil amelioration applied • Fertiliser application • Seed source, mixture and quantity • Date of seeding • Method of seeding (hydro-seeding, hand-seeding, sodding) • Post-establishment maintenance (fertilising, weeding, mowing/slashing) 	CTR	ECO	
h	GEN	The Contractor shall restore the trench and Construction Right of Way to the natural contours of the ground and shall allow normal surface drainage.	CTR	ECO	
i	GEN	The Contractor shall loosen compacted soils along the Construction Right of Way by means of a plough or scarifier. Scarifying areas where topsoil has been removed shall be carried out prior to the replacement of topsoil. Care shall be taken to avoid topsoil inversion if scarifying is carried out in areas where topsoil has not been removed. Any ploughing or scarifying operation shall not exceed a depth of 100mm.	CTR	ECO	
j	GEN	The Contractor shall prevent concentrated run-off along, or next to, the Construction Right of Way, and shall do so by shaping the land, establishing vegetation, and taking other appropriate measures to absorb and disperse runoff.	CTR	ECO	
k	GEN	The Contractor shall, cover the backfilled pipeline trench evenly with topsoil to a minimum depth of 150mm. Where the natural topsoil depth is less the applied topsoil shall be adjusted accordingly. If necessary, hostile sub-soils shall be ameliorated by liming, fertilisation and incorporation of organic matter. If any sections of the route exist where sufficient topsoil could not be stripped during vegetation clearing,	CTR	ECO	
l	GEN	If required, although not encouraged, the Contractor shall import topsoil with the same soil properties as where it must be used as far as possible in order not to change the local soil properties. The soil should be of the same general type as the soil being supplemented as far as possible and which shall be free of all invasive alien and invader plant species.	CTR	ECO	
m	GEN	Where the land is naturally armoured with surface rock or stone, the Contractor shall, after construction, replace the armouring rock over the Construction Right of Way to protect against erosion, in a manner similar to its original condition.	CTR	ECO	

2.13.2 Re-Vegetation Guidelines

ITEM NO.	GENERAL/ SITE SPECIFIC	MITIGATION MEASURES	Main Responsibility	Support	Method Statement / Procedure
a	GEN	<p>Rehabilitation procedure The long term objective for rehabilitation is as follows:</p> <p>Rehabilitation must ensure that in the long term, re-establishment of the vegetation that existed prior to the construction of the line is facilitated to the greatest extent possible.</p> <ul style="list-style-type: none"> • Site - specific conditions must be established and characterised so as to provide a detailed basis for the choice of rehabilitation approach; • Detailed information must be sourced on how best to rehabilitate, drawing on landowners and other stakeholders' experience and preferences, as well as an understanding (as far as this may be possible) of why rehabilitation efforts in the area have either succeeded or failed; • Based on the above the appointed rehabilitation specialist must detail the rehabilitation approach that will be used in that specific section of the line and communicate the same to the affected landowners; • The specific rehabilitation approach must draw also on the recommendations contained below and these should be used as is appropriate to the specific requirements for that section of the line and upholding the preferences of the landowners; • The rehabilitation approach must detail the full extent of the rehabilitation requirements, the time required for the same, monitoring and corrective action and allocation of responsibilities between the contractors, construction manager and Transnet; • Supervision and monitoring of the rehabilitation must be ensured for the entire duration of the rehabilitation and must not be limited to the construction phase only; • The approach must be carefully documented so that is clear as to the approaches that have been used in specific areas so that the learning can be carried forward to other parts of the line, or indeed other projects. 	Transnet		√
b	GEN + SS monitoring	<p>Task</p> <ul style="list-style-type: none"> • If the site of application is a planted pasture, determine the pre-construction soil fertility at a reputable soil fertility lab. • For all sites to be grassed, determine soil fertility of soil/spoil material to be grassed by resort to soil sampling & testing at a reputed soil fertility lab. • Exclude domestic livestock from the area to be rehabilitated, by fencing construction Right of Way if necessary. 	CTR	ECO	

ITEM NO.	GENERAL/ SITE SPECIFIC	MITIGATION MEASURES	Main Responsibility	Support	Method Statement / Procedure
		<ul style="list-style-type: none"> Reinstate the land to pre-construction profile, as closely as possible. Apply mulch (hay, straw, kraal manure or chicken litter) at 5 t/ha & incorporate to 10 cm if (a) the land is steeper than 1 in 5 and construction was completed between 1 Feb & 31 Aug or (b) very high soil erodibility exists. If acid saturation >20% then apply calcitic lime to reduce acid saturation to 2% OR If acid saturation > 10% & Mg < 100 mg/kg then apply dolomitic lime at ≥1 t/ha. Lime should be applied 2 months before grassing & incorporated to 10 cm depth. Undertake grass establishment between 1 Oct & 31 Jan only or as agreed by the landowner and/or specialist where required. 			
c	GEN	In order to ensure that re-vegetation efforts are successfully undertaken and that the desired end results are obtained a specialist contractor may be appointed or consulted with for this purpose. Re-vegetation efforts of pristine grassland areas and planted pasture cannot be left to the individual landowners as they do not have the means, or the technical experience to oversee that it is successfully executed.	CTR	ECO	
e	GEN	The use of alien invasive species such as <i>Pennisetum clandestinum</i> (kikuyu grass) for re-vegetation shall be strictly avoided unless where existing kikuyu pasture is being re-instated.	CTR	ECO	

2.13.3 Control of Alien Plants

ITEM NO.	GENERAL/ SITE SPECIFIC	MITIGATION MEASURES	Main Responsibility	Support	Method Statement / Procedure
a	GEN	In consultation with the ECO's and where practicable areas where the pipeline construction train passes through stands of any alien invasive plant species as defined in the latest published official invasive alien plant species lists, all vehicles must be thoroughly cleaned to ensure that no propagules of these species cling to the construction vehicles and are thus dispersed into surrounding habitats. Of particular concern in this regard are the following alien invader species: black wattle (<i>Acacia mearnsii</i>), silver poplar (<i>Populus X canescens</i>), black locust (<i>Robinnia pseudoacacia</i>) and kikuyu grass (<i>Pennisetum clandestinum</i>).	CTR	ECO	√

2.13.4 Warranty of re-vegetation

ITEM NO.	GENERAL/ SITE SPECIFIC	MITIGATION MEASURES	Main Responsibility	Support	Method Statement / Procedure
a	GEN	Once the grass has been established and an 'acceptable cover' has been achieved, as defined in the Re-vegetation guidelines found in this EMP, the rehabilitation period shall commence. This period shall extend for a minimum period of one calendar year. If the vegetation is still compliant with the definition of acceptable cover after one calendar year, then the requirements of the re-grassing specification shall be deemed to have been met. Transnet, in consultation with the ECO, shall determine whether acceptable cover has been achieved.	CTR	ECO	√
b	GEN	Re-vegetation shall be done on the pipeline Right of Way including, but not limited to, all borrow areas, temporary access roads, spoil sites, camp sites and the like.	CTR	ECO	√

2.14 Prevention of Nuisance

ITEM NO.	GENERAL/ SITE SPECIFIC	MITIGATION MEASURES	Main Responsibility	Support	Method Statement / Procedure
a	GEN	The Contractor shall comply with the legal requirements for the management of noise impact specified in the Noise Regulations under the Environment Conservation Act (Act 79 of 1989). If instructed to do so by the ECO, the Contractor shall demonstrate compliance with the noise regulations by means of measurement of residual noise levels at receiver points specified by the ECO. Measurement shall be in accordance with the requirements of the noise regulations.	CTR	ECO	
b	GEN	Wherever local authorities have determined maximum allowable ceiling noise levels for certain areas, these levels shall be adhered to.	CTR	ECO	
c	GEN	All construction equipment, machinery and vehicles shall be in good working order and maintained regularly.	CTR	ECO	
d	GEN	The Contractor shall notify all landowners and inhabitants within 200m of a blast zone of the dates and times at which blasting is scheduled to occur. Blasting shall not be undertaken outside of the hours as contractually agreed upon without the agreement of the affected landowners and occupiers.	CTR	ECO	
e	GEN	The Contractor's employees shall not make recreational use of all-terrain / 4x4 vehicles or motorcycles on the site.	CTR	ECO	
f	GEN	Wherever possible the Contractor shall limit the clearing of the full Construction Right of Way as much as possible so that unnecessary vegetation loss is avoided and to prevent unnecessary dust nuisance.	CTR	ECO	
g	GEN	The rehabilitation and stabilisation of vegetation of all rehabilitated areas, buffer strips and new landforms shall be done as soon as the forms are complete in order to minimize dust nuisance. Dust suppression to be applied in all areas.	CTR	ECO	
h	GEN	The liberation of dust into the surrounding environment shall be effectively controlled by the use of water spraying and/or other dust-allaying agents, such as dust nets. Regular and effective damping down of all working areas and exposed surfaces (especially during dry and windy periods) must be carried out to avoid dust pollution that will have a negative impact on the surrounding environment. When necessary, these working areas should be damped down as far as necessary as warranted by the conditions encountered on site as instructed by the ECO. Where practical or required due to construction occurring within water-constrained areas, alternative means of dust suppression agreed upon may also be employed.	CTR	ECO	

ITEM NO.	GENERAL/ SITE SPECIFIC	MITIGATION MEASURES	Main Responsibility	Support	Method Statement / Procedure
i	GEN	When working close to residential areas nuisance in terms of dust and noise will be controlled as far as possible and adjacent landowners will be notified in advance of planned working hours and duration of works.	CTR	ECO	
j	GEN	The Contractor shall regularly consult the Complaints Register and shall immediately attend to any complaints emanating from adjacent landowners or the public in general.	CTR	EPCM / ECO	
k	GEN	The Contractor shall not burn any waste in a Construction Camp or on site.	CTR	ECO	
l	GEN	The Contractor shall ensure that all litter and refuse collection points are so situated that they do not cause nuisance to adjacent landowners or the general public ensure that regular collection of all waste is carried out. The Contractor shall immediately attend to any complaints emanating from adjacent landowners or the public in general.	CTR	ECO	
m	GEN	The Contractor shall regularly service and clean out all site toilets to avoid odours.	CTR	ECO	

2.15 Construction Contract Employment

ITEM NO.	GENERAL/ SITE SPECIFIC	MITIGATION MEASURES	Main Responsibility	Support	Method Statement / Procedure
a	GEN	The Contractor is to strictly abide by all applicable labour legislation. Any transgression of labour legislation must be reported to Transnet or the Department of Labour.	CTR	EPCM / Transnet	
b	GEN	Where farm workers are employed as casual labourers on the project, this shall be done in liaison with landowners. Any persons applying for jobs with the construction Contractor are to be informed that such jobs are temporary and do not offer any security of employment. Local labour employed in this fashion must enter into a limited duration contract that clearly stipulate the duration of the contract period.	CTR	EPCM / Transnet	
c	GEN	Where necessary in areas where communities are affected, the CLOs (Contractor) shall consult with the communities in terms of job creation and other aspects that may affect these communities during construction.	CTR	EPCM / Transnet	
d	GEN	The Contractor shall where applicable establish local "labour and employment desks" as a contact point for local community members who wish to seek employment on the project. These locations of these points must be communicated to the public as part of the Construction Awareness Creation and Education Programme and may be undertaken at the site offices.	CTR	EPCM / Transnet	
e	GEN	The Contractor shall where applicable use the services of local SMMEs (Small, micro and medium enterprises). The Contractor shall establish the types of goods and services provided by them in accordance with the project contract requirements.	CTR	EPCM / Transnet	
f	GEN	Where potentially feasible such as at the Terminal and Pump Station construction sites the Contractor shall establish linkages with other institutions involved in skills development and SMME development, such as the community development programme of the local municipality and non-governmental organisations (NGOs) active in the area. The performance indicator of this measure shall be minutes of meetings conducted with representatives of these institutions.	CTR	EPCM / Transnet	
g	GEN	The Contractor shall endeavour to maximise local employment opportunities through training and capacity building to enhance benefits to the local communities.	CTR	EPCM / Transnet	
h	GEN	In order to promote the creation of employment opportunities for the communities that will be affected by the construction process of the pipeline, the Contractor shall to the greatest extent possible employ persons living within the District Municipality or within 100km of the construction site for general labour and construction activities. Employment of non-local labour for the purposes of general construction activities shall only be considered if it can be demonstrated that sufficient numbers of local labourers could not be obtained. The	CTR	EPCM / Transnet	

ITEM NO.	GENERAL/ SITE SPECIFIC	MITIGATION MEASURES	Main Responsibility	Support	Method Statement / Procedure
		appointment of higher level construction activities shall be done on the basis of skill and experience in the specific engineering requirements of these tasks. Preference shall be given to local labour and these positions may only be filled with non-local persons if it can be demonstrated that no suitable persons are recorded in the skills register to fill these positions. The performance indicator for the promotion of employment of women and youth would be the number of local persons who are employed in the construction phase of the project.			
i	GEN	Transnet shall include Training of emerging BEE companies as part of its overall Corporate Social Responsibility programme and include conditions in the NMPP construction contract to involve and train emerging BEE companies. Conditions shall be included in the construction contract to utilise BEE companies in procurement of goods and services.	CTR	EPCM / Transnet	
j	GEN	Provide training/ skills development initiative under the auspices of the Corporate Social Responsibility programme of Transnet to develop local entrepreneurial skills.	CTR	EPCM / Transnet	
k	GEN	The Contractor shall prepare employment policy compliance reports to be submitted to Transnet at regular intervals, as agreed to between both parties beforehand, illustrating how the Contractor is honouring the various employment policies.	CTR	EPCM / Transnet	

2.16 Social and Land Use Impacts

2.16.1 Construction Awareness

ITEM NO.	GENERAL/ SITE SPECIFIC	MITIGATION MEASURES	Main Responsibility	Support	Method Statement / Procedure
a	GEN	A Method Statement shall be submitted to Transnet for approval for a community Construction Awareness Creation and Education Programme, which will be aimed at informing and educating I&APs about the manner of construction and related activities that will be occurring in their area.	EPCM	Transnet / CTR	√
b	GEN	The Construction Awareness Creation and Education Programme shall be done in accordance with Transnet Communication Policies and within this framework consist of a variety of media relevant to each affected area which could include, but not be limited to: <ul style="list-style-type: none"> • Toll-free phone-in system • Posters • Information brochures • Handout leaflets • Newspaper and radio advertisements • Open days or presentation at local community centres, libraries and other public facilities. 	EPCM	Transnet / CTR	
c	GEN	The Construction Awareness Creation and Education Programme should provide I&APs with information on when construction will start in a particular area, how long it will last, the contact details of servitude negotiators and then contact details of the contractor LLOs, the dangers of construction such as open trenches, large construction vehicles, etc. and information on how to stay safe with construction taking place in the area. All potentially hazardous working areas are to be demarcated as such with signage English and locally spoken languages and barrier tape.	EPCM	Transnet / CTR	
d	GEN	The Construction Awareness Creation and Education Programme shall sensitise community members to the need to prevent children and animals from wandering into the Construction Right of Way and shall specifically highlight and identify the various dangers associated with the construction process.	EPCM	Transnet / CTR	
e	GEN	The Construction Awareness Creation and Education Programme shall be extended into the operational phase to sensitise community members to safety issues related to trunkline operation.	EPCM	Transnet / CTR	
f	GEN	As part of the Construction Awareness Creation and Education Programme the Contractor shall furnish all adjacent landowners with the contact details of all relevant emergency	EPCM	Transnet / CTR	

ITEM NO.	GENERAL/ SITE SPECIFIC	MITIGATION MEASURES	Main Responsibility	Support	Method Statement / Procedure
		response bodies and local authorities to be notified in the event of a fire, hazardous material spill or environmental incident. Such information shall also be contained in all distributed media and advertisements.			
g	GEN	Any changes in the arranged construction schedules must be communicated to affected landowners in a timeous manner.	EPCM	Transnet / CTR	

2.16.2 Landowner and Occupier Relations

ITEM NO.	GENERAL/ SITE SPECIFIC	MITIGATION MEASURES	Main Responsibility	Support	Method Statement / Procedure
a	GEN	The Contractor shall strive to ensure good lines of communication with landowners prior and during the entire construction period, as well as during construction phase impact management.	CTR	EPCM / Transnet	
b	GEN	The Contractor shall appoint dedicated Land Owner Liaison Officers (LLOs) to liaise on an ongoing basis with landowners and keep them informed of construction progress and any specific activities that may influence them.	CTR	EPCM / Transnet	
c	GEN	Dedicated LLOs must be appointed for each construction spread and must be fluent in the languages spoken in the area. LLOs must also have good inter-personal skills and must be effective communicators with the ability to clearly and understandably communicate matters relating to the project to affected parties.	CTR	EPCM / Transnet	
d	GEN	LLO's will be employed to discuss all matters in terms of this EMP and Construction with all affected landowners	EPCM	Transnet	
e	GEN	Notification on the start of construction activities on a particular area will be provided to all affected landowners. Such notification shall occur well enough in advance for landowners to consult any third parties and make required arrangements prior to any activity commencing on their property. Typically a minimum period of two weeks should be allowed.	CTR	EPCM / Transnet	
f	GEN	Landowners should be notified by the LLOs of the Contractor's name and contact details, the number and type of construction workers on site, the construction schedule and all other relevant information so that affected landowners are able to make any necessary arrangements prior to construction commencing.	CTR	EPCM / Transnet	
g	GEN	Where the land users are not the current owners they should receive copies of these servitude agreements and be informed of the owners' approval that construction can commence. Occupation certificates need to be signed by the current tenants.	EPCM	Transnet	
h	GEN	If any activities are required to be outside the proposed construction area, the Contractor shall enter into Landowner Consent Agreements with all affected landowners prior to any activity commencing on their land. In these agreements, the affected landowner will stipulate	CTR	EPCM / Transnet	

ITEM NO.	GENERAL/ SITE SPECIFIC	MITIGATION MEASURES	Main Responsibility	Support	Method Statement / Procedure
		any special conditions that the Contractor will adhere to whilst occupying the affected landowner's land. The agreements must be signed by both the Contractor and landowner before any activities may take place on the affected landowner's property. The CTR shall supply copies of such documentation to the LLO and it must be kept on property file together with all other relevant documentation.			
i	GEN	All construction workers that will access an adjacent property must be fully briefed on the requirements of the Landowner Consent Agreements prior to construction taking place. Thus the Construction team is to be aware of all specific conditions of land owner agreements	CTR	EPCM / Transnet	
j	GEN	Where possible the LLOs must assist the landowner, if he/she so requires, with any arrangements that must be made in order for construction to take place.	EPCM	Transnet	
k	GEN	Transnet shall continue to negotiate with landowners and accommodate, where reasonable, any further requests for minor adjustment of the alignment where affected landowners request it. While this process is already well advanced as a result of the EIA process, it is likely that there will be such requests during negotiations for servitudes.	EPCM	Transnet	
l	GEN	A database of complaints regarding damage to structures must be maintained by the Contractor. Such complaints will be investigated and their validity determined by comparing the post-construction state of structures with their state as recorded in the photographic survey. A register must be kept of all construction-related complaints (including those that are not specifically related to building damage). The register must be designed in such a way as to capture: <ul style="list-style-type: none"> • The name of the person lodging the complaint, • His or her domicile and contact details • The nature of the complaint, • The date on which it was lodged, • What action was taken, and by whom, to address the complaint, • The date on which this action was taken, and • The outcome of this action. 	CTR	EPCM / Transnet	
m		A General Complaints Register for periodic review by Transnet that logs all complaints raised by landowners, occupiers or the general public about construction activities will be developed. This Complaints Register will be regularly updated.	EPCM	ECO / Transnet / CTR	
n	GEN	An investigation shall also be launched into the cause of every complaint lodged in order to take remedial action and prevent recurrence. The findings of these investigations will be communicated to Transnet.	EPCM	ECO / Transnet / CTR	
o	GEN	A method of communication with I&AP will be established. This could include the development of Community Liaison Forums (CLF's) specifically in areas where Farmers Associations exist, the CLOs shall liaise directly with the organisations to set up a Forum where affected landowners can register their comments and complaints. A Method Statement	EPCM	ECO / Transnet / CTR	√

ITEM NO.	GENERAL/ SITE SPECIFIC	MITIGATION MEASURES	Main Responsibility	Support	Method Statement / Procedure
		for approval by Transnet for how the Forum is to operate and how responses received through it is to be included in the Complaints Register. The LLOs shall inform all adjacent landowners of the Forum and the relevant contact details and procedures. However comments from individual landowners must still be facilitated by the Complaints Register.			
p	GEN + SS monitoring	In instances where Community Monitoring Committees or Liaison Forums have been requested by the affected communities, the LLOs are to assist the relevant communities to set up and establish such committees. These committees will then act as a forum where affected communities can register their comments and complaints. This Forum will operate in the same manner as contemplated above.	EPCM	ECO / Transnet / CTR	
q	GEN	The Contractor shall specifically ascertain from all adjacent landowners whether there are any potentially hazardous conditions or dangerous materials storage on their property that may be affected by construction. These should be accurately surveyed before construction commences and indicated on a map and all relevant information captured. The landowner must sign off that all such sites or structures and information has been captured.	CTR	EPCM	
r	GEN	The Contractor shall prepare individual Method Statements for every occurrence involving potentially hazardous conditions or materials, indicating what the particular risk/s are that have been identified, how they are to be mitigated and if required, what specialist inputs will be obtained in the process. All Method Statements are to be accepted by Transnet and the affected landowner prior to any related action being taken.	CTR	EPCM	√
s	GEN	The Contractor must also determine from the affected landowners whether there are any dams, permanent paved roads, buildings, driveways, servitudes, underground services, building foundations or other underground structures that may be affected by construction. Notwithstanding any information provided by the various landowners, it remains the responsibility of the Contractor to locate and survey all services and structures.	CTR	EPCM	
t	GEN	Where services or servitudes do not belong to the landowner of the property on which they occur, the Contractor shall determine to whom the services belong. The Contractor shall submit his Method Statement and obtain written permission from the owner of the service, prior to commencing with crossing operations.	CTR	EPCM	√
u	GEN	The Contractor shall take all reasonable measures to ensure that the power supply to adjacent landowners is not disrupted. Where this may potentially occur the Contractor shall have a back-up power supply at hand to ensure that power can be restored as soon as possible, should an interruption occur.	CTR	EPCM	
v	GEN	The Contractor shall in all instances request permission to access adjacent landowners' land and may not commence with any vegetation or land clearance without having a written agreement with the relevant landowners.	CTR	EPCM	
w	GEN	The Contractors responsibility towards affected landowners, in terms of reinstatement and rehabilitation, shall only end once written approval and sign-off for the work has been	CTR	EPCM / ECO	

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		received from both the ECO and the relevant landowner.			
x	GEN	Payment of retention moneys to the Contractor, the amounts or percentages to be determined by Transnet, shall be contractually tied to sign-off on the reinstatement of the Construction Right of Way and shall only be released to the Contractor once write-off has been received.	CTR	EPCM	
y	GEN + SS	Wherever the pipeline route passes through arable agricultural land, a fixed-point photo survey shall be undertaken, and soil fertility tests shall be conducted at regular intervals along the route before and after construction as required in previous sections of this EMP.	CTR	EPCM / ECO	
z	GEN	After construction, where the alignment passes through pasture and grazing land the disturbed area of veld must be fenced for at least two seasons to allow the veld to re-establish itself before livestock is re-introduced. This must only be done with the consent of the relevant landowner, however the importance of these measures in terms of erosion prevention and land capacity rejuvenation must be clearly communicated to the landowner.	CTR	EPCM / ECO	
aa	GEN	Where irrigation and fertilisers are required to ensure the re-establishment of rooigras veld, such will be negotiated with the landowner and implemented by Transnet.	CTR	EPCM / ECO	
bb	GEN	Where possible, the pipeline design shall be so aligned that surface markers are placed on the edges of agricultural crop fields, so as to minimise their nuisance to farming activities.	CTR	EPCM / ECO	
cc	GEN	Where possible, other surface infrastructure (such as the block valves and CP marker posts) must be located at points where they do not impact directly on cultivation.	CTR	EPCM / ECO	
dd	GEN	Where possible, the pipeline route should be adjusted to avoid impact on agricultural irrigation systems. Adequate compensation must be paid to farmers for disruption of or loss to irrigation systems that will include provision to re-establish or move the systems.	CTR	EPCM / ECO	
ee	GEN	Noise levels in the vicinity of threatened mammal species, particularly Oribi (as identified in this EMP and indicated on the Alignment Sheets) are to be limited where possible. If blasting is required, adequate notification must be provided to the landowner beforehand, so that animals can be moved if required.	CTR	EPCM / ECO	
ff	GEN	The Contractor shall endeavour not to disrupt water supply to game and livestock and shall, where water supply installations are in place, ensure that alternative water provision is ensured prior to any disruption to water supply is caused.	CTR	EPCM / ECO	
gg	GEN	Wherever possible, the Contractor shall ensure that the construction schedule is to be planned so that construction on game farms does not take place during the hunting season. Where this is not possible the Contractor shall ensure that all coordination and safety measures required are taken to ensure the safety of his workers. The Contractor's LLOs shall liaise with all relevant landowners well in advance in this regard to ensure that information regarding the hunting season and activities is accurate and that all required planning and scheduling takes place beforehand.	CTR	EPCM / ECO	

2.17 Subsistence farming

2.17.1 Loss of Fertility and Soil Productivity

ITEM NO.	GENERAL/ SITE SPECIFIC	MITIGATION MEASURES	Main Responsibility	Support	Method Statement / Procedure
a	GEN monitoring	<p>Handling of topsoil to reduce the risk of reduced productivity:</p> <ul style="list-style-type: none"> The contractor must ensure that stone and rock within the soil profile and at the surface do not constrain use of agricultural land. In order to reduce the risk of damage to soil structure, the process of returning topsoil to the servitude must be undertaken using equipment that limits compacting of soil to a minimum. This precaution is particularly relevant to clay soils. Mitigation measures as outlined in the erosion management section of the EMP must be implemented to ensure that drainage patterns are properly reinstated. 	CTR	EPCM / ECO	
b	GEN	<p>Pre- and post-construction audits:</p> <ul style="list-style-type: none"> A fixed-point photo survey should be undertaken in areas where subsistence farming is practiced to allow for a comparison between the state of the landscape before and after rehabilitation. 	CTR	EPCM / ECO	
c	GEN	<p>Minimizing risk to building infrastructure:</p> <ul style="list-style-type: none"> In areas where building structures are potentially impacted, the construction servitude shall be narrowed, as far as possible, in order to avoid the need for relocation A database shall be maintained, with records including photographs, GPS coordinates and owner details of all structures potentially affected by construction. An appropriate distance for record keeping would be around 50 m from the pipeline centreline. 	CTR	EPCM / ECO	
d	GEN	<p>Livelihood support to subsistence farmer communities:</p> <p>It is acknowledged that, even if these measures are implemented, the possibility remains that disturbed land might not be completely reinstated to its former productive capacity. In order to account for this possibility, it is recommended that the following additional measures be implemented to minimise potential impacts on the livelihoods and food security of poor rural communities:</p> <ul style="list-style-type: none"> A livelihood restoration team should be established to undertake support activities. 	EPCM	Transnet	

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		<ul style="list-style-type: none"> The team will use the expertise of an agricultural specialist, in order to advice on appropriate rehabilitation techniques. Workers who are familiar with the area and can speak the local languages will be employed. The team will be responsible to assist project-affected communities in dealing with construction-related impacts and to minimise any impacts on restored land after the construction period. It is recommended that the livelihood restoration team consists of at least two extension workers who will be dedicated to the project for six months after implementation. In order to reduce the communities' dependence on subsistence agriculture, the possibility must be investigated to implementing community development programmes in the area. 			
e	GEN	<p>Implementation monitoring and evaluation programme: Post Construction</p> <ul style="list-style-type: none"> A programme must be implemented to monitor long-term impact of the project on the livelihoods of poor communities in this Ngonyama Trust Area and to evaluate the effectiveness of livelihood restoration measures. Aspects to be monitored as part of this programme include the condition of soils and crops, as well as progress and results of livelihood restoration activities (to be assessed using standard Input-Output-Outcome-Impact methodology), The activities and findings of the monitoring and evaluation programme must be documented in reports at regular intervals (e.g. yearly). These reports shall document the effectiveness of management measures designed to minimise the long-term impact of the project on the livelihoods of poor rural communities, as well as problem areas and remedial actions proposed. 	Transnet		
f	GEN	<p>Disruption of daily movement patterns</p> <ul style="list-style-type: none"> Establishment of temporary crossing points is recommended. The recommendations for the placement of temporary crossings are based on the assumption that the spacing of temporary crossings should limit the additional distance that people have to walk to about 500 metres. 	CTR	EPCM / ECO	
g	GEN	<ul style="list-style-type: none"> Once the Trunkline route for construction has been finalised and surveyed, meetings should be held with local community leaders to confirm where temporary access points should be located 	CTR	EPCM / ECO	
h	GEN	<ul style="list-style-type: none"> Mechanisms should be established to ensure that problems are dealt with promptly. It is recommended that a team of community liaison officers (CLO) be appointed. The CLOs should be local residents, and should comprise a representative sample of 	CTR	EPCM / ECO	

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		<p>communities along this section of the trunkline route.</p> <ul style="list-style-type: none"> The CLOs will serve as points of contact between the ECO and the communities, ensuring that residents are kept informed on a day-to-day basis of construction progress and when access will be blocked. It is also recommended that the CLOs assist in circulating a printed timetable of the construction schedule. It is recommended that measures be implemented to address pedestrian safety at crossing points and in the vicinity of construction works 			
i	GEN	<p>Loss of Crops and fruit trees</p> <ul style="list-style-type: none"> Once the final route alignment has been established and the construction RoW marked, a survey must be conducted to compile a complete inventory of all crops and other community resources that will be lost within the construction servitude. For compensation purposes, this inventory must include the details of the household owning those crops. A certified valuer should be appointed to conduct the survey and assess the value of losses incurred. Values will vary according to the soil and climatic conditions along the length of the pipeline; hence, it is not possible to specify a “generic” value for all instances of a particular crop. The valuer shall be assisted by skilled social scientists versed in methods used to determine the extent and value of resource losses in subsistence communities. The valuer would need to undertake the survey at the time of disturbance to calculate the compensation amount, which should take account of the “food value” of the crop (subsistence value) rather than the commercial value. Compensation for lost crops should be in kind rather than cash, where practical. Payments will mainly be in the form of grain payments rather than fresh produce. Any individual fruit trees that are lost during construction must be inventoried and replaced, if necessary, adjacent to the servitude. If fruit trees are used for subsistence purposes, it is recommended that two saplings be provided for each fruit tree that is lost. If trees are used for commercial purposes, commercial compensation rates will apply. The fact that about one-third of the fields surveyed in KwaMakhuta and one-half of those in Ingonyama Trust were fallow at the time of the survey (which was in March, towards the end of the rainy season) indicates that a large proportion of arable land in these areas is not under permanent cultivation. This raises the issue of whether and how compensation should be provided for the loss of fallow land. Households may argue that they did not prepare land for cultivation because they were prevented from doing so, or because they anticipated that their work would be lost to the project anyway, and that they should be compensated for foregone opportunities for 	EPCM	Transnet	

ITEM NO.	GENERAL/ SITE SPECIFIC	MITIGATION MEASURES	Main Responsibility	Support	Method Statement / Procedure
		<p>cultivation. In this regard, it must be clearly communicated to communities well in advance that they should in no way alter their agricultural activities in view of the project.</p> <ul style="list-style-type: none"> Where land is fallow at the time construction commences, but is possibly being used from grazing of livestock on weeds or the previous season's crop residue, this must be assessed and suitable compensation provided. This compensation must be paid to the owner of the field (where ownership can be established) or to the traditional authority (where communal grazing occurs). The value of this compensation should take account of local market rates of leasing grazing, with adjustments being made to allow for the condition of grazing and the subsistence value of livestock. The policy and procedure for determining this value would be negotiated with the Compensation Determination Committee (CDC). With regard to the timing of compensation payments, it is recommended that payments be made before construction commences. It is recognised that such an approach deviates from Transnet's existing policy of making compensation payments after construction is complete. However, this deviation is considered essential to ensure that the loss of arable land does not impact on affected households' food security. 			

2.17.2 Loss of Land

ITEM NO.	GENERAL/ SITE SPECIFIC	MITIGATION MEASURES	Main Responsibility	Support	Method Statement / Procedure
a	GEN	<p>A Compensation Determination Committee (CDC) should be established that represents project-affected households, the traditional authority, local government and the project proponent. The function of the CDC would be to serve as a platform for negotiation of all matters related to compensation for losses incurred through the project, including the methods by which values will be attached to these losses and the methods by which compensation will be provided. The main function of the CDC will be to negotiate and give final sign-off on an Entitlement Framework describing:</p> <ul style="list-style-type: none"> Which categories of project-affected persons will be entitled to compensation; How the compensation amount for each project-affected person will be calculated, based on the his or her current assets that will be affected by the project; and The form in which compensation will be provided. 	EPCM	Transnet	
b	GEN	<p>The values for the various types of land as set out in the Entitlement Framework will be negotiated in the CDC, taking account of the subsistence value of land types (as opposed to</p>	EPCM	Transnet	

ITEM NO.	GENERAL/ SITE SPECIFIC	MITIGATION MEASURES	Main Responsibility	Support	Method Statement / Procedure
		their commercial value). The same process will apply to the various classes of veld (rangeland).			
c	GEN	Once the CDC has given final sign-off on the Entitlement Framework, the procedure set out in the framework for calculating compensation amounts shall be employed to calculate the amount due to each project-affected person. This compensation amount will be reflected in a compensation agreement set up for each project-affected household, and signed by the household and an authorised representative of the CDC.	EPCM	Transnet	
d	GEN	The possibility should be investigated of adding a solatium to compensate for inconvenience suffered by affected households. It is recommended that the value of this solatium be set at 10% of the value of compensation for land within the six-metre permanent servitude.	EPCM	Transnet	
e	GEN	Systems and support must be established to facilitate the process of affected land owners obtaining alternative land, either through long-term lease agreements with those with surplus land or through new allocations by the Chief.	EPCM	Transnet	
f	GEN	Servitude agreements to be signed with land owners prior to commencement of construction. Where the land users are not the current owners they should receive copies of these servitude agreements and be informed of the owners' approval that construction can commence. Individual landowners are to be compensated for the loss of permanent servitude. In cases of communal land the means of compensation for the permanent servitude lost must be established in consultation with the local authorities, the traditional authority (if relevant) and the current land users.	EPCM	Transnet	

2.17.3 Social Investment in poor rural communities

ITEM NO.	GENERAL/ SITE SPECIFIC	MITIGATION MEASURES	Main Responsibility	Support	Method Statement / Procedure
a	Trunkline	As a part of Social Investment in poor rural communities through which the trunkline is routed, Transnet shall investigate the possibility of initiating and contributing to community development and education programmes.	Transnet		

2.18 Commercial Farming

2.18.1 Loss of Land

ITEM NO.	GENERAL/ SITE SPECIFIC	MITIGATION MEASURES	Main Responsibility	Support	Method Statement / Procedure
a	GEN	<p>Compensation for the loss of land: Compensation must be paid for the servitude as if the land were lost to the owner, despite the fact that the owner will still have access to and use of the land. Compensation will be undertaken based on Transnet's Servitude and Land Acquisition Principles:</p> <ul style="list-style-type: none"> • Servitude acquisition based on negotiations with landowners and an amicable agreement being reached. Expropriation shall not be used unless all other reasonable avenues have been exhausted. • Appointment of a professional valuer to compile an evaluation of the land lost under the 6-metre servitude, based on prevailing market conditions. • 100% compensation for the servitude area based on the strip valuation on registration of the servitude. • Land required for the pump stations will be purchased from landowners at market-related prices. <p>In addition, it is recommended that provision be made for the payment of a solatium on the value of the property, to the value of 10% of total consideration amount if the consideration amount does not exceed R100 000, 5% if the consideration does not exceed R100 000, 3% if the consideration does not exceed R500 000 and 1% if the consideration exceeds R1million.</p>	EPCM	Transnet	
b	GEN	<p>Continued use of land within the servitude: Most farming activities can still take place over the servitude; farmers would therefore continue to have the benefit of the land.</p>	EPCM	Transnet	
c	GEN	<p>Loss of crops and grazing land: The approximate extent and value of crop and other obvious losses should be quantified by a certified valuer, based on substantiated information assuming a certain proportion of standing crops at the time of construction. Compensation should be calculated as the full value of any losses incurred by the farmer. If it can be clearly established that there was opportunity for cultivation lost because of construction activities, compensation for uncultivated fields will be reviewed on this basis.</p>	EPCM	Transnet	

ITEM NO.	GENERAL/ SITE SPECIFIC	MITIGATION MEASURES	Main Responsibility	Support	Method Statement / Procedure
d		Loss of rooigras veld: The value of compensation for the loss of rooigras veld will include provision for reestablishment, where practical.	EPCM	Transnet	
e		Disruption of planting cycles: The following mitigation measures are recommended: <ul style="list-style-type: none"> • Transnet is to advise farmers to continue with normal farming activities, as they will be compensated for any loss they may incur due to crop damage through construction, whatever the stage of production at the time construction commences. 	EPCM	Transnet	
f		<ul style="list-style-type: none"> • If feasible, construction should be planned in such a way that construction activities occur outside of the critical agricultural phases. • A clear and efficient communication channel must be established between the construction management team and all affected farms. • Farmers should be provided with adequate notification of the construction schedule. • The construction contractor must make every effort to keep to the prior arranged and communicated schedules. 	CTR	EPCM	
g		Disproportionate impact on small properties, and fragmentation of farm land: Wherever possible, the trunkline route should be aligned to avoid small properties where a large proportion (more than a pre-determined %) of the property would be temporarily lost to the servitude, and also to avoid the creation of small, unusable residual pieces of land cut off from the remainder of a farm. Alternatively, full compensation must be paid, determined by a certified valuer.	EPCM	Transnet	
h	GEN	Loss of deep-rooted crops: Where possible, the trunkline route should be aligned so as to avoid cutting through orchards or plantations. Where this is not practical, the compensation principles outlined above for the loss of land and the temporary loss of crops will also apply to the permanent loss of trees.	EPCM	Transnet	

2.18.2 Loss of Soil Productivity

ITEM NO.	GENERAL/ SITE SPECIFIC	MITIGATION MEASURES	Main Responsibility	Support	Method Statement / Procedure
a	GEN	Rigorous soil management and erosion prevention and management principles as outlined in this EMP are to be adhered to at all times.	CTR	EPCM	
b	GEN	Servitude agreements: <ul style="list-style-type: none"> • The land owner has the right to specify and negotiate conditions related to the 	EPCM	Transnet	

ITEM NO.	GENERAL/ SITE SPECIFIC	MITIGATION MEASURES	Main Responsibility	Support	Method Statement / Procedure
		<p>pipeline construction into the servitude agreement with Transnet under ‘Special Conditions’</p> <ul style="list-style-type: none"> Landowners are to be informed by Transnet’s servitude negotiators that landowners have the power to negotiate servitude agreements. A sign-off system should be implemented between the Contractor and landowners, and retention payments to the Contractor be tied to sign-off on servitude agreements. Compensation payments for agreed construction damages should not be withheld from the landowner in cases where the landowner is not willing to sign off rehabilitation and re-instatement activities. 			
c		<p>Pre- and post-construction audits: The following measures are recommended:</p> <ul style="list-style-type: none"> A fixed-point photo survey should be undertaken, and soil tests be conducted at regular intervals along the route before and after construction as defined by the ECO. This should be undertaken by specialists if required; <p>Areas where fertiliser is required to improve soil productivity should be identified on the basis of soil tests.</p>	CTR	EPCM / ECO	
d	GEN	<p>Reduction in the quality of grazing land: A similar approach must be adopted as for the loss of crops:</p> <ul style="list-style-type: none"> Compensation must be paid to the value of grazing land that is lost to construction. After construction , the disturbed area of veld should be fenced for at least two seasons subject to agreement with the farmer/landowner to allow the veld to re-establish itself before livestock is re-introduced, while ensuring that the farmer has access to other parts of the farm traversed by the fenced-off area. Where Themeda veld exists on a property the area affected by the construction servitude is to be estimated and the farmer is to be paid additional compensation for the assumed reduction in grazing capability after construction. A reasonable rate for compensation is to be calculated on the basis of the difference in price between range land which is semi-transformed and range land which is untransformed (pristine). 	EPCM	CTR / ECO / Transnet	
e	GEN	<p>Game</p> <ul style="list-style-type: none"> Maintain water supply to game farms in cases where watering points are cut of from the remainder of the farm during construction. Discuss scheduling with landowners and where possible, accommodate requests which avoid construction during peak hunting season. 	CTR	EPCM / ECO	
f		<ul style="list-style-type: none"> Where the above stated is not possible, the game farmer is to be compensated for any demonstrable loss of income that will be incurred due to lost sales, based on records of previous 2 years. 	EPCM	CTR / ECO / Transnet	

ITEM NO.	GENERAL/ SITE SPECIFIC	MITIGATION MEASURES	Main Responsibility	Support	Method Statement / Procedure
g	GEN	Irrigation Systems <ul style="list-style-type: none"> • Where possible, the trunkline route should be adjusted to avoid impact on irrigation systems. • Compensation should be paid to farmers for disruption of or loss to irrigation systems that will include provision to re-establish or move the systems. • Where disruption of irrigation systems would result in inability to irrigate crops outside the construction servitude, the farmer is to be compensated to the full value of either being able to water such crops by alternative means until the irrigation system is re-installed, or for the full value of the standing crop should the crop be lost due to lack of irrigation. 	EPCM	CTR / ECO / Transnet	
h	GEN	Feedlots <ul style="list-style-type: none"> • Pipeline construction may take place in close proximity (within a few metres) of a feedlot. Temporary relocation of the feedlot should be undertaken at Transnet's cost to a distance where cattle would not be stressed by the noise and activity of construction. • The landowner should be compensated for any loss of or injury to cattle during temporary relocation and returning cattle to the property. • Appropriate security measures should be provided to safeguard the cattle while in the temporary feedlot. 	EPCM	CTR / ECO / Transnet	
i	GEN	Impacts on water sources, water pipelines and electricity lines <ul style="list-style-type: none"> • The pipeline should be rerouted wherever possible to avoid impacts to water sources on farms. Where this is not possible, the source of water should be rehabilitated to the same condition as prior to the impact, if the latter is not possible Transnet should compensate the landowner to the extent of being able to replace the volume of water from such a water source. • Transnet's servitude negotiators should make it clear to landowners that landowners should detail all water sources, water pipelines, electricity lines and other such infrastructure under 'Special Conditions' in the servitude agreement. • All damages should be communicated by the Contractor to the landowner. • Any interruption of or damages to existing infrastructure should be fully repaired by the Contractor to the satisfaction of the landowner. 	EPCM	CTR / ECO / Transnet	
j	GEN	Loss of access to land and roads <ul style="list-style-type: none"> • Once the line has been pegged, and to make final decisions on access points, the Contractor should discuss access with landowners, their workers, tenants and other inhabitants. • Timetables of when access points would be blocked, provided elsewhere or shifted 	CTR	EPCM / ECO	

ITEM NO.	GENERAL/ SITE SPECIFIC	MITIGATION MEASURES	Main Responsibility	Support	Method Statement / Procedure
		<p>should be developed and communicated.</p> <ul style="list-style-type: none"> In the case of informal footpaths, a temporary, safe crossing point should be established at 500 m intervals. The dangers of construction should be well communicated to users. In the case of roads, the placement of temporary crossings is to be decided in consultation with landowners to minimise disruption of people's movement patterns. Landowners are to be consulted to identify essential access routes (e.g. access to cattle for feed or water). Once these are identified, construction activities are to be planned in such a way as to minimise disruption of these access routes, and where unavoidable, temporary access should be provided. Where the Contractor requires access roads to the construction servitude, such access roads should be planned in consultation with the landowner, and follow the recommendations of the Natural Heritage Specialist Study. Should a landowner wish to retain the construction access road, this should be granted. Where the landowner does not wish to retain the road, the road should be de-compacted and rehabilitated following the recommendations of the Natural Heritage Specialist Study. 			
k	GEN	<p>Impact on farm workers and non-landowning tenants</p> <ul style="list-style-type: none"> In cases where tenants lease parts of a farm from its owner, the lease should be terminated according to the conditions specified in the lease agreement. In cases where labour tenants have acquired rights to parts of a farm, they should be compensated for the impact on their land in the same way as farm owners. Where labour tenants are partly reliant on subsistence agriculture for food security, it may be necessary to provide additional support after the construction phase to ensure full re-establishment of agricultural production. 	EPCM	CTR / ECO / Transnet	
l	GEN	<p>Loss of <i>Themeda</i> climax grassveld: In grazing areas, the main risk relating to soil productivity is the potential loss of Rooigras (<i>Themeda triandra</i>). Rooigras is a climax grass with a high carrying capacity. A total of approximately 299 ha of Rooigras will be impacted by the proposed pipeline route. While the rehabilitation of the pipeline construction servitude to Rooigras may be achieved in some instances, in the view of the specialist team this cannot be guaranteed. In most cases, a more realistic assumption would be rehabilitation to semi-transformed vegetation consisting of a mix of pioneer and other seral species. The socio-economic consequences of this will be a decrease in the carrying capacity of the veld in these areas. An estimate of the loss in value is in the order of R2000 per hectare. While this does not result in large scale depreciation in value – a total of R598 000 for the entire pipeline route - it will represent a significant long term loss to individual stock farmers unless it is compensated for.</p>	EPCM	CTR / ECO / Transnet	

ITEM NO.	GENERAL/ SITE SPECIFIC	MITIGATION MEASURES	Main Responsibility	Support	Method Statement / Procedure
		<ul style="list-style-type: none"> • Align the route to avoid climax Themeda grassveld wherever possible. • Determine the quality of grazing land and the area of Rooigras that will be affected on each landowner's property, based on the database prepared for the EIA. Use this as a basis for discussion with the landowner and for compensation calculations. • Rehabilitate areas of climax grassland to as high a standard as is reasonably practical, with a view to creating stable conditions, free of erosion and invasive plants, and encouraging the return of Themeda grassveld. Follow the principles set out in the Natural Heritage Erosion Study. • For the purposes of compensation, accept that Themeda cannot be re-established in the foreseeable future and compensate farmers who lose Themeda veld accordingly. It can be assumed that in all cases, a minimum of Mtshiki veld will be re-established on the pipeline construction right of way. Compensation rates are to be determined by an independent land valuer by establishing the difference in value between farms that are predominantly Mtshiki veld versus farms that are predominantly Themeda veld. The order of magnitude difference is expected to be in the range of R2000/ha. • Where stock is present in the camp, fence off the construction right of way for a period of up to two seasons in order to facilitate establishment of the vegetation. Where necessary, and based on negotiations with the farmer, provide access across the right of way. 			
m	GEN	<p>Transnet are to consider a reasonable increase in the negotiated value of compensation in those agricultural smallholdings where there is a risk of property depreciation. As far as possible, all property acquisition is to be based on Transnet's stated principles of willing buyer / willing seller, and expropriation is not to be considered except as a final resort when all other reasonable measures have been exhausted. Smallholdings are defined in the report as properties less than 2 ha and there are about 45 along the route.</p>	EPCM	Transnet	

2.19 Community and Worker health management

ITEM NO.	GENERAL/ SITE SPECIFIC	MITIGATION MEASURES	Main Responsibility	Support	Method Statement / Procedure
a	GEN	<p>The Contractor shall prepare and implement a programme to minimise the spread of HIV infection as a result of the construction contract. The programme shall be prepared with the assistance of a medical doctor with experience of HIV prevention and treatment. A typical programme would include, among other things, the implementation of the following measures:</p> <ul style="list-style-type: none"> • An HIV/AIDS training course and on-going education on transmission of HIV/AIDS and STDs to employees, through workshops, posters and informal information sessions. • Undertaking an HIV/AIDS and STD prevalence survey amongst all workers on a regular basis through voluntary testing. • Encouragement of employees to determine their HIV status. • Supply of condoms at the project site. • Encouragement of the early treatment of STDs in employees, to minimise the risk of HIV infection. • Encouragement of early treatment and monitoring of secondary/opportunistic infections such as coughs, influenza and pneumonia. • Promotion of an HIV/AIDS stigma free environment by means of an open and non-discriminatory approach to the epidemic at all levels of employment. • Development of a comprehensive Construction Camp management plan including rules for on-site behaviour, entrance and exit policies, and prohibition of the sex worker trade. 	CTR	EPCM	
b	GEN	The Contractor shall take appropriate steps to prevent the contamination of farmers' livestock with 'measles'. This would typically involve the administration of antihelmintics to contract employees for the control of tapeworm, as well as strict enforcement of the use of site mobile toilets to prevent contamination.	CTR	EPCM	
c	GEN	The Contractor shall ensure that his workers are treated for worms as well as any other infectious diseases or conditions that may be relevant to a specific region.	CTR	EPCM	
d	GEN	Where feasible the Contractor shall align his Community and Worker Health Programme with those of other organisations in the area (i.e. the Local Municipality etc.).	CTR	EPCM	
e	GEN	The Contractor shall ensure that sufficient recreation space is provided within the Construction Camp to facilitate the number of workers housed and shall provide entertainment facilities where possible. The Contractor is furthermore encouraged to provide	CTR	EPCM	

ITEM NO.	GENERAL/ SITE SPECIFIC	MITIGATION MEASURES	Main Responsibility	Support	Method Statement / Procedure
		shuttle transportation for workers to and from local entertainment venues and shall ensure strict adherence to Construction Camp entry and closing time procedures.			

2.20 Cultural Heritage

2.20.1 General

ITEM NO.	GENERAL/ SITE SPECIFIC	MITIGATION MEASURES	Main Responsibility	Support	Method Statement / Procedure
a	GEN	A Heritage Awareness Program must be initiated as part of the construction induction of the NMPP, which can take place as a series of toolbox talks and utilising a variety of other media, so that all persons are informed about the heritage sites that have been identified, and aware that future heritage artefacts may be found on-site. The Contractor is to ensure that his workforce is aware of the necessity of reporting any possible historical or archaeological finds to the EO or ECO.	CTR	EPCM	
b	GEN	The Contractor will be responsible to prepare a Heritage Management Plan which incorporates all information from the Heritage Specialist Studies and relevant provincial heritage resources authorities	CTR	EPCM	
c	GEN	Any finds of possible palaeontological, archaeological or historical significance identified during survey or construction must immediately be reported to the EPCM and Transnet in writing before any construction commences in the area.	CTR	ECO / EPCM	
d	GEN	Permits for the construction, destruction, damage or alteration of the heritage sites shall be obtained prior to such activities taking place.	ECO	CTR / EPCM	
e	GEN	Where relevant, the ECO's will be responsible to inform the relevant specialist consultant and local heritage resources authority as well as SAHRA, in order to be in compliance with the National Heritage Resources Act (Act 25 of 1999).	ECO	CTR / EPCM	
f	GEN	Discovered artefacts or any item of potential significance shall not be moved or tampered with under any circumstances until the necessary permits has been obtained by the ECO's	CTR	ECO / EPCM	
g	GEN	The Contractor will be responsible for the preservation of any finds (including existing documented heritage sites / graves) through the use of appropriate measures such as fencing of the area on instruction from the ECO/heritage specialist.	CTR	ECO / EPCM	

2.20.2 Palaeontological Sites

ITEM NO.	GENERAL/ SITE SPECIFIC	MITIGATION MEASURES	Main Responsibility	Support	Method Statement / Procedure
h	GEN	A palaeontology workshop shall be presented to the field managers and Contractor staff involved with the construction in order to sensitise them to the fossils that may be encountered en route. This is to enable them to contact the palaeontologist if anything of major significance is discovered and they need advice in how to continue.	EPCM	ECO / CTR	
a	GEN	Transnet shall appoint a qualified consulting palaeontologist, who is registered with SACNAS to advise and assist wherever fossils are encountered within the Construction Right of Way. Palaeontology awareness, as part of regular “toolbox” talks and by means of other appropriate media should be encouraged whereby key personnel are trained to identify items or palaeontological significance.	EPCM	ECO / CTR	
b	GEN	The ECO shall wherever fossils are encountered notify the palaeontologist, who shall apply for a permit from the South African Heritage Resource Agency (SAHRA) to salvage the fossils. According to the stipulations of the permit, with permission of the land owner, the palaeontologist shall collect (and excavate if necessary) fossils found on the route. These fossils must then be taken to, and stored at a recognised fossil repository as stipulated in the permit. It is acknowledged, by SAHRA, that in the case of palaeontological remains, the permitting of removal of fossils must often be post-facto.	ECO	EPCM	
c	GEN	The appointed consultant shall conduct a palaeontological surface survey after the pegging of the route has been completed in areas where fossils are known to occur. A Heritage Management Plan will be developed by the palaeontologist. It is recommended that this be done in sections, i.e. for individual or groups of construction spreads at a time. During this survey fossil localities shall be marked by means of a GPS and topographical map and after obtaining a permit from SAHRA, removed.	EPCM	ECO / CTR	
d	GEN + SS	<p>The Contractor is notified of the fact that the section of the pipeline alignment from Howick to Heidelberg is palaeontologically significant. The Contractor shall take particular care in identifying plant fossils, of which leaf imprints is the predominant palaeontological feature, through the sections extending from Howick to Ladysmith and between Villiers and Heidelberg. Animal fossils have been found in:</p> <ul style="list-style-type: none"> • Rosetta, • Bergville, • Van Reenen, • Harrismith and • Warden regions. <p>Petrified tree trunks have been found in the</p> <ul style="list-style-type: none"> • Tarkastad Subgroup in Harrismith, • Warden and 	CTR	ECO / EPCM	

ITEM NO.	GENERAL/ SITE SPECIFIC	MITIGATION MEASURES	Main Responsibility	Support	Method Statement / Procedure
		<ul style="list-style-type: none"> Van Reenen regions The Contractor shall implement any special precautionary measures that the palaeontologist may specify along these sections.			
e	GEN	Where possible the Contractor shall ensure that excavated material, in areas where plant fossils have previously been found, are left in undisturbed piles adjacent to the trench. The palaeontologist or assistant trained by the palaeontologist shall be allowed to collect any fossil-bearing material unhindered. This shall be done so as not to hold up the trenching operations. In the case of the plant fossils, the appointed palaeontologist should collect samples from the excavated material for storage at a fossil repository.	CTR	ECO / EPCM	
f	GEN	In the case of plant fossil sites, which shall be documented in the Heritage Management Plan, which normally are found in shales and are less sensitive to excavation than the mudstone where animal fossils may occur, the appointed palaeontologist should collect samples from the excavated trench material for storage at a fossil repository. Fossil wood is common in the sandstones of the escarpment and Harrismith region. Petrified tree trunks should also be removed with care and long sections will have to be excavated.	EPCM	ECO	√
g	GEN	In the case of animal skeletons, the fossils should be excavated by a suitably qualified palaeontologist with more care, using standard excavation techniques. Site visits along the Rosetta to Warden sections of the pipeline alignment should be done more frequently by a palaeontologist to assist in the removal of animal fossils.	EPCM	ECO	
h	GEN	The only major palaeontological obstruction that may be encountered is a palaeosurface. These are very scarce and of high scientific value and therefore irreplaceable. There are known palaeosurfaces to the east of Mooi River, but the possibility exists that others may be encountered. The appointed palaeontologist shall conduct a survey of areas of the pipeline route between Pietermaritzburg and Heidelberg where surface rock outcrops and where there is a possibility of palaeosurfaces being encountered. This survey should be done once the pipeline route has been pegged in the field by the project surveyors but before vegetation clearing takes place. In the event that a palaeosurface along the route is found, then slight realignment of the pipeline will need to be negotiated with the landowner or the surface must be removed, under the supervision of the palaeontologist, for safekeeping by a recognised heritage institution, after obtaining a permit from SAHRA.	EPCM	ECO	

2.20.3 Archaeological and Historic Sites

ITEM NO.	GENERAL/ SITE SPECIFIC	MITIGATION MEASURES	Main Responsibility	Support	Method Statement / Procedure
a	GEN	In Areas where the RoW is not fenced off, all archaeological and historical sites that occur within 100 meters of the centre of the Construction Right of Way shall be demarcated and fenced so that they are clearly visible and shall be pointed out to all construction workers by the EO or resident archaeologist.	CTR	ECO / EPCM	
b	GEN	In General all sites of archaeological and historical sites that occur within the Construction RoW or any other construction site, shall be demarcated and fenced	CTR	ECO / EPCM	
c	GEN	A Heritage Specialist shall be appointed by Transnet to develop a Heritage Management Plan. This plan will be issued to the Contractor for reference.	EPCM	ECO	
d	GEN	All such sites shall be photographed and measured before construction takes place as directed by a heritage specialist.	EPCM	ECO	
e	GEN	Buildings, stone walling, and other features may only be damaged if mitigation as prescribed by the ECO or resident archaeologist occurs and if duly permitted by the relevant Heritage Conservation authority.	EPCM	ECO / CTR	
f	GEN monitoring	On-site supervision during the construction phase reserves the right to 'circumvent construction' in a specific area where material may need to be salvaged. 'Circumvent Construction' will mean that work can continue further along the pipeline until the salvage operation is complete.	ECO	EPCM / CTR	
g	GEN	Some sites extend over a large area. If a currently undiscovered portion of the site is affected, the entire site should be mapped to obtain all the information of importance so a true assessment of the site can be undertaken. Trial sections of trench should be dug beforehand (and in the presence of a suitably qualified archaeologist) in sections of the alignment where it is anticipated that additional sites of significance may be encountered, so that these may be discovered before the construction train reaches these areas.	EPCM	ECO	
h	GEN	Mapping and/or excavating sites must where possible be undertaken during the winter or early summer months when grass and/ or vegetation are not too dense. Grass shall otherwise be cut in order for sites to be properly mapped.	EPCM	ECO	
i	GEN	Visual impacts from pipeline markers along sections of the alignment that have been identified as being of historical or heritage significance must be counteracted by laying the markers flat on the ground and pointing in the direction of the next marker.	CTR	ECO / EPCM	
j	GEN	In some instances excavating and mapping a site prior to disruption would be a preferable form of preservation of the heritage site. In this way information is not lost but rather recorded for future use.	EPCM	ECO	

2.21 Safety and Emergency Planning and Response

2.21.1 Emergency Preparedness

ITEM NO.	GENERAL/ SITE SPECIFIC	MITIGATION MEASURES	Main Responsibility	Support	Method Statement / Procedure
a	GEN	The Contractor shall develop an Emergency Plan that will enable rapid and effective spill response as well as to all other expected types of environmental emergencies, in accordance with recognised international standards and as per the tender requirements and conditions of contract.	CTR	ECO / EPCM	√
b	GEN	The Emergency Plan shall in accordance with the National Environmental Management Act (Act 107 of 1998) Section 30(3) notify the Director General, the relevant provincial head of the Department in which the incident occurred, the local municipal authorities and police, traffic police, fire departments, local medical and ambulance. Further measures should include the establishment of a network of communication between the Contractor and farmers associations, conservancies, farmer neighbourhood watches, etc. Where emergency incidents related to water resources occur such shall be reported to the above agencies as well as DWAF, in accordance with Section 20 of the National Water Act (Act 36 of 1998).	CTR	ECO / EPCM	
c	GEN	The Emergency Plan shall be submitted to the Project Manager for approval, who must in turn consult with the Environmental Manager and various consulting project engineers for their inputs and approval.	CTR	ECO / EPCM	
d	GEN	The Contractor shall test emergency preparedness with drill operations and shall review drills, conduct mock emergencies and remedy shortcomings to ensure a high level of emergency readiness to deal with environmental and third party incidents. The Contractor shall submit a concise but thorough summary report of each emergency response drill held, to the Project Manager for record keeping purposes. All emergency preparedness drill and reporting procedures shall comply with the requirements of the Occupational Health and Safety Act (Act 85 of 1993).	CTR	ECO / EPCM	
e	GEN	The Contractor's Emergency Plan must make specific contractual provision for a major spill of any hazardous material, where either substantial environmental damage or potential danger to members of the public or his construction workers is possible. Service level agreements with suitably qualified and experienced specialist cleanup and rehabilitation contractors must be built into the plan, so that in the event of a major incident occurring, immediate and effective response will be possible.	CTR	ECO / EPCM	

2.21.2 Fire Prevention and Management

ITEM NO.	GENERAL/ SITE SPECIFIC	MITIGATION MEASURES	Main Responsibility	Support	Method Statement / Procedure
a	GEN	<p>The Contractor shall prepare a Fire Prevention and Fire Emergency Management Plan as a part of the Environmental Plan to be submitted to the Project Manager prior to establishment on site. The plan shall include, but not be limited to, the following:</p> <ul style="list-style-type: none"> • Sources of fire risk; • Measures to comply with any requirements of local authority fire departments; • Measures to minimise the risk of accidental veld fires caused by any activity related to the works; • Measures to control an accidental veld fire. 	CTR	ECO / EPCM	√
b	GEN	The Fire Prevention and Fire Emergency Management Plan shall outline all necessary precautions to prevent the ignition of veld fires, caused either deliberately or accidentally as a result of the work being performed. This plan should also outline precautions to prevent construction teams from being trapped by runaway veld fires.	CTR	ECO / EPCM	
c	GEN	The Contractor shall provide adequate fire fighting equipment at specified localities on any construction site and Construction Camp, to meet any emergency resulting from ignition of a veld fire. This equipment should include, but not be limited to, fire extinguishers, fire resistant clothing for fire fighters and fire fighting flails.	CTR	ECO / EPCM	
d	GEN + SS	The areas of commercial plantations as well as agricultural cropland through which the pipeline is routed are particularly sensitive to fire hazard and fires will result in substantial financial loss to the affected landowners. The Contractor shall strictly comply with all fire management requirements set by the owners of these plantations. The Contractor may expect that hot work will be strictly halted under specified meteorological conditions. Certain “low risk” hot works such as welding and oxy acetylene flame work may be carried out under windy conditions, provided that a fire watchman with appropriate and adequate fire fighting equipment be on standby at all times when such work is being carried out.	CTR	ECO / EPCM	
e	GEN	The Fire Prevention and Management Plan shall in accordance with the National Environmental Management Act (Act 107 of 1998) Section 30(3) notify the Director General, the relevant provincial head of the Department in once any incidents occurred, the local municipal authorities and police, traffic police, fire departments, local medical and ambulance. Further measures should include the establishment of a network of communication between the Contractor and farmers associations, conservancies, farmer neighbourhood watches, etc.	CTR	ECO / EPCM	

2.21.2 Health and Safety Management

ITEM NO.	GENERAL/ SITE SPECIFIC	ENVIRONMENTAL MANAGEMENT REQUIREMENT	Main Responsibility	Support	Method Statement / Procedure
a	GEN	A Health and Safety plan must be drawn up by the Contractor that is in accordance with the Occupational Health and Safety Act (Act 85 of 1993) and all other relevant legislation and best practice standards and which must be accepted by Transnet.	CTR	ECO / EPCM	√
b	GEN	The Health and Safety plan as well as conduct on site must be in accordance with all applicable legislation and standards, notwithstanding any of the requirements specified in this EMP.	CTR	ECO / EPCM	

2.22 Hydrotesting

ITEM NO.	GENERAL/ SITE SPECIFIC	MITIGATION MEASURES	Main Responsibility	Support	Method Statement / Procedure
a	GEN	Once the details of the proposed hydrotesting programme have been established, the Contractor must develop a treatment programme for the water at each site, prior to disposal. Record must be kept of this programme, with treatment methods and, where necessary, specific test results supporting the methods. This information must be made available on request from the Department of Water Affairs and Forestry (DWAF). All relevant permits/authorisations must be obtained prior to abstraction or discharge of water.	CTR	ECO / EPCM	√
b	GEN	<p>The following specific recommendations are made to manage the impact of NMPP trunk line hydrotesting:</p> <ul style="list-style-type: none"> • Exercise caution when selecting a water source and verify that the quality of the water is such that, in itself, it does not present a disposal problem in another environment (eg: high salinity, SRB presence, sewerage effluent, etc). • Design the quantity of oxygen scavenger on a stoichiometric basis plus a small residual - excessive addition of scavenger does not improve corrosion control, but does increase TDS. Excess oxygen scavenger is readily deactivated by aeration, and the water is readily re-oxygenated by the same method. Disposal water is to be re-oxygenated before release into natural ecosystems • If disposal into an aquatic ecosystem is considered, increased concentrations of Zn, Cu and Mn are to be considered and may warrant further investigation of the ecosystem tolerance and site specific conditions of the waterway used for disposal. • Consider contaminant levels in the disposal water in the context of the local aquatic ecosystem prior to discharge. While the contaminant levels are generally not toxic and do not contain significant levels of plant or aquatic nutrients, turbidity tends to increase due to iron compounds introduced into water by hydrostatic testing. This is not a significant risk to land or marine ecosystems and can be readily managed, but it may need to be managed in order to avoid a reduction in light transmission and any detrimental impact to aquatic life. • If flushing is used to pre-clean the pipeline, special consideration needs to be given to the disposal of flushing water. Although of small volume, flushing water may contain higher levels of contaminants than test water. • If the source water is heavily contaminated, or if the water must be treated with 	CTR	ECO / EPCM	

ITEM NO.	GENERAL/ SITE SPECIFIC	MITIGATION MEASURES	Main Responsibility	Support	Method Statement / Procedure
		biocide, the foregoing conclusions are not relevant, and project-specific testing, including eco-toxicity testing, is required to determine the contaminant level and the treatment process.			
c	GEN	It is further recommended that a monitoring programme be implemented before, during and after the pipeline testing procedure. The monitoring programme should comprise the following: <ul style="list-style-type: none"> Chemical sampling. The ecological assessment should be complemented with analyses of chemical grab samples. 	CTR	ECO / EPCM	√

2.23 De-Commissioning of Construction Facilities

ITEM NO.	GENERAL/ SITE SPECIFIC	ENVIRONMENTAL MANAGEMENT REQUIREMENTS	Main Responsibility	Support	Method Statement / Procedure
a	GEN	Once the construction phase has been completed all temporary Construction Camps and other infrastructure is to be completely dismantled and the entire area completely rehabilitated. All physical structures are to be removed, and where possible materials should be recycled, re-used or given to locals or adjacent landowners for their use.	CTR	ECO / EPCM	√
b	GEN	All waste must be removed to appropriate licensed waste disposal facilities.	CTR	ECO / EPCM	
c	GEN	No polluted soil or remnants of concrete batching may remain once the area has been vacated by the Contractor.	CTR	ECO / EPCM	
d	GEN	The Construction Camp site shall be rehabilitated to resemble the natural topography as closely as possible.	CTR	ECO / EPCM	
e	GEN	All compacted areas are to be ripped, levelled and re-vegetated. All erosion damage that may have occurred will be repaired and made good. Wetland areas will be rehabilitated as directed by the Wetland Specialist employed by the developer (Transnet).	CTR	ECO / EPCM	
f	GEN	Rehabilitation of such sites will not be deemed complete until the ECO has indicated that rehabilitation is sufficient and sign-off from both Transnet and landowner has been received.	CTR	ECO / EPCM	

3 Construction Phase – Monitoring and Auditing

3.3 General

ITEM NO.	GENERAL/ SITE SPECIFIC	MITIGATION MEASURES	Main Responsibility	Support	Method Statement / Procedure
a	GEN	The ECO's shall monitor and inspect the Contractors' written records to demonstrate compliance with this EMP, and the Contractor shall make available each record for this purpose.	ECO	CTR / EPCM	
b	GEN	The ECOs shall undertake audits to assess the Contractor's compliance with the EMP. Intensive auditing may be anticipated for sensitive sections of the route such as river and stream crossings, game ranches and the pristine sections of the route. The Contractor shall participate in the environmental audits, and shall answer questions and provide information as the ECOs may require.	ECO	CTR / EPCM	

3.4 Water Analysis

3.4.1 Point Source (waste water released from a specific point)

ITEM NO.	GENERAL/ SITE SPECIFIC	MITIGATION MEASURES	Main Responsibility	Support	Method Statement / Procedure
a	GEN	Point source water monitoring standards and practices are to be implemented in all areas where waste water is released into the environment at a specific source.	CTR	ECO / EPCM	
b	GEN	Sampling should take place on a regular basis, approximately once a week where there is a regular flow of discharge into the environment. If testing can not take place due to no discharge being released this should be recorded.	CTR	ECO / EPCM	
c	GEN	Water from external sources such as the municipal water supply system and boreholes may be monitored from time to time to provide a set of baseline data to compare samples to. This is to determine exactly what the impact of the water use activities are on the quality of the discharge.	CTR	ECO / EPCM	
d	GEN	The exact location and regularity of monitoring points is to be agreed by the environmental representatives of the Contractor and the ECO's and must be documented.	CTR	ECO / EPCM	
e	GEN	Records of all sampling locations and data should be kept and submitted to Transnet on a Monthly Basis.	CTR	ECO / EPCM	
f	GEN	As a general rule, parameters to be measured are to comply with the "General Limit" as presented in the DWAF Water Quality Standards and Guidelines	CTR	ECO / EPCM	

3.4.2 Diffuse Source Water

ITEM NO.	GENERAL/ SITE SPECIFIC	MITIGATION MEASURES	Main Responsibility	Support	Method Statement / Procedure
a	GEN	Diffuse source water testing is recommended for areas where disturbance to a water body or course has been the direct result of construction activities.	CTR	ECO / EPCM	
b	GEN	This monitoring should be undertaken both up and down stream of the construction works to enable the results to be compared. The up and down stream samples are to be taken during the same monitoring period each time so that they can be compared. Sampling points are to be identified and agreed with the Engineer and should be situated approximately 50m upstream and 50m downstream of the project activities. The same sampling points should be used each time sampling is done. The location and frequency of sampling must be agreed with the ECO;s and records of all sampling data must be kept and submitted to Transnet.	CTR	ECO / EPCM	

ITEM NO.	GENERAL/ SITE SPECIFIC	MITIGATION MEASURES	Main Responsibility	Support	Method Statement / Procedure
c	GEN	It is further recommended that in conjunction with this monitoring fixed point photographs are taken to record changed in the stream over time. These are also to be used for rehabilitation of stream crossings after construction activities haven ended.	CTR	ECO / EPCM	

3.4.3 Sampling Protocols

ITEM NO.	GENERAL/ SITE SPECIFIC	MITIGATION MEASURES	Main Responsibility	Support	Method Statement / Procedure
a	GEN	The Contractor will prepare a Sampling Protocol as part of the Monitoring Method Statement for review and acceptance by Transnet.	CTR	ECO / EPCM	√
b	GEN	Method A: The bottles are all numbered with permanent markers to identify where the samples were taken. Stickers may become wet or peel off, thus potentially confusing to the person required to do the testing.	CTR	ECO / EPCM	
c	GEN	Procedure: <ul style="list-style-type: none"> • 250 ml plastic sample bottles will be rinsed using clean water • The sample bottles will then be rinsed using sample water from the sampling site • Samples are to be taken as close as possible to the centre line of the river. These sites are to be used as fixed sampling sites for the duration of the contract • The bottles must be submerged below water level to allow for the water to enter the bottles and to circulate, ensuring foreign objects are not trapped up in the bottled but are allowed to escape. • The bottle is immediately capped and the outside dried • The relevant information is recorded onto the monitoring sheet • The samples are placed in a box, kept cool and outside of direct sunlight and transported to the lab • It is then placed in a cooler box and maintained cold and transported to a suitable laboratory within 24 hours of collection • The results of which are submitted to the engineer and entered into the data base 	CTR	ECO / EPCM	
d	GEN	Method B: Monitoring is conducted in the field using hand held monitoring equipment. These tests include diffuse monitoring in the river, whereby samples are taken at four equidistant points across the river channel, fifty meters above and below the feature / monitoring site or disturbance. The tests are required for the settlement pond/s, sewerage retention pond/s, dewatering operation/s and all those areas contaminated by construction activities on	CTR	ECO / EPCM	

ITEM NO.	GENERAL/ SITE SPECIFIC	MITIGATION MEASURES	Main Responsibility	Support	Method Statement / Procedure
		site.			
e	GEN	<p>Procedure</p> <ul style="list-style-type: none"> • All handheld equipment will be calibrated at a regular basis to ensure accurate results are being achieved. • The samples sites will be at the same location to maintain accurate data collection. • It will be attempted to conduct the sampling at the same time each day to relay similar results • Probes will be placed and not thrown in the water, to ensure no damage to the equipment • Readings will be transferred at the sampling location to the data collection sheet • These readings will be captured on the data base to be submitted to the Engineer 	CTR	ECO / EPCM	
f	GEN	<p>Sampling sites</p> <p>The point source monitoring is to occur where effluent is emanating from settlement ponds, sewerage treatment works, batch and crusher plants, washing areas and any other area where water or effluent is discharged into the environment. The water will be monitored as agreed with the ECO's</p>	CTR	ECO / EPCM	

3.5 Noise Monitoring

ITEM NO.	GENERAL/ SITE SPECIFIC	MITIGATION MEASURES	Main Responsibility	Support	Method Statement / Procedure
a	GEN	The Contractor shall prepare a noise monitoring procedure.	CTR	ECO / EPCM	√
b	GEN	Noise monitoring shall be carried out using integrated sound level meters the calibration certificate of which shall be attached to this document once the unit is available.	CTR	ECO / EPCM	
c	GEN	Noise monitoring shall respect the following requirements: <ul style="list-style-type: none"> Monitoring is to take place at points of impact where there is expected to be disturbance to the public or landowners form construction activities and at worksite boundaries if applicable; Monitoring points are to be agreed with the ECO's on site and are to be recorded and referenced properly. This data will be submitted to Transnet on a monthly basis. 	CTR	ECO / EPCM	
d	GEN	Noise baselines: <ul style="list-style-type: none"> Baseline noise monitoring shall be conducted so that the real Impact caused by construction activities could be effectively measured; Baseline noise monitoring should take place for at least 2 weeks but preferably 1 month prior to construction activities in an area and should continue for at least 2 weeks but preferably one month after the major construction activities have ended. 	CTR	ECO / EPCM	
e	GEN	Monitoring along the construction activities: <ul style="list-style-type: none"> During construction activities noise levels are to be monitored at all points as agreed with the ECO's at least once per week. The monitoring points are to remain constant and are to be monitored during a variety of times during working hours. These periods are to be times during which construction activities are taking place and should not fall over lunch breaks, on public holidays or other periods of reduced activities. Data recorded is to reflect the ambient average noise level for the monitoring period. The data is to reflect the ambient average noise level for the monitoring period. The data is to be recorded onto field data sheets and is to be captured on a central database. The reporting of all noise monitoring data is to be done via the relevant reporting 	CTR	ECO / EPCM	

ITEM NO.	GENERAL/ SITE SPECIFIC	MITIGATION MEASURES	Main Responsibility	Support	Method Statement / Procedure
		channels to Transnet.			
f	GEN	Calibration certificates are to be provided for all new equipment and regular field calibration is to be done as per the manufacturer's specifications. These calibrations are also to be recorded on a register.	CTR	ECO / EPCM	
g	GEN	The measurement and rating of environmental noise with respect to land use, health, annoyance and to speech communication shall be as per SANS 10103:2004. The contractor is to monitor noise in relation to the type of area in which activities are taking place.	CTR	ECO / EPCM	

3.6 Dust Monitoring

ITEM NO.	GENERAL/ SITE SPECIFIC	MITIGATION MEASURES	Main Responsibility	Support	Method Statement / Procedure
a	GEN	The Contractor is required to implement a dust management programme, the aim of which is to ensure that the air quality on site does not impact negatively on the health or environment of the persons, animals and plants that are living and working in close proximity to the construction activities. The primary purpose of the dust management programme is to be able to measure the efficiency of the dust management programme. As dust is an immediate problem which results in loss of visibility “at the present moment” so visual monitoring of dust conditions is considered to be the most effective means of monitoring this.	CTR	ECO / EPCM	
b	GEN	Should there be areas where the management of dust suppression is not effective it is recommended that a quantifiable system is implemented. <ul style="list-style-type: none"> • The Contractor shall agree with the ECO's the areas of greatest importance in terms of managing dust on site. • A number of meters for measurement of dust are to be placed throughout the works areas during the work activities. • As far as possible dust monitoring stations will be active for at least 1 month prior to the onset of construction in the dry season in areas as directed by the ECO's. • The meters will be placed in representative areas in such a way that they will not be impacted on by construction activities. • The location of the meters is to be agreed based on the closest points of impact such as schools, houses, dangerous bends on roads and at businesses. • The meters will collect fall out dust either in a single bucket unit or in a directional dust collection device with four removable dust collection cups. • The agreement of the preferred collection device for each area is to be agreed on site with the ECO's. the determination of this will be based on the potential dust sources. • In areas where dust is from sources other than construction are expected the directional meters are recommended. • All meters are to be at a height of 2m above the ground and are to be firmly planted or weighed down to prevent wind damage. • Monthly collection of the samples is to be done. • Where readings are unacceptably high the areas will be classified as a hot spot and weekly monitoring may be advised until such time as the dust problem has been 	CTR	ECO / EPCM	

ITEM NO.	GENERAL/ SITE SPECIFIC	MITIGATION MEASURES	Main Responsibility	Support	Method Statement / Procedure															
		rectified.																		
c	GEN	<p>The classification of dust levels is indicated in the table below and is based on the Department of Environmental Affairs and Department of Minerals and Energy definition of dust levels.</p> <table border="1"> <thead> <tr> <th>Dust level</th> <th>Quality)g/m²/day)</th> <th>Action required</th> </tr> </thead> <tbody> <tr> <td>Slight</td> <td>> 250</td> <td>No additional action</td> </tr> <tr> <td>Moderate</td> <td>250 to 500</td> <td>Investigate cause of increase and upgrade dust management efforts with water carts</td> </tr> <tr> <td>Heavy</td> <td>500 to 800</td> <td>Increase dust management efforts with water carts or binding agents</td> </tr> <tr> <td>Very heavy</td> <td>800 to 1200</td> <td>Use of additional agents for dust management</td> </tr> </tbody> </table>	Dust level	Quality)g/m ² /day)	Action required	Slight	> 250	No additional action	Moderate	250 to 500	Investigate cause of increase and upgrade dust management efforts with water carts	Heavy	500 to 800	Increase dust management efforts with water carts or binding agents	Very heavy	800 to 1200	Use of additional agents for dust management	CTR	ECO / EPCM	
Dust level	Quality)g/m ² /day)	Action required																		
Slight	> 250	No additional action																		
Moderate	250 to 500	Investigate cause of increase and upgrade dust management efforts with water carts																		
Heavy	500 to 800	Increase dust management efforts with water carts or binding agents																		
Very heavy	800 to 1200	Use of additional agents for dust management																		
d	GEN	<p>Areas considered to be “active areas” where dust can be expected include:</p> <ul style="list-style-type: none"> All areas where trenching, drilling, blasting and backfilling are taking place. Where the above activities are taking place including areas where hauling is actively being undertaken. Note that rehabilitation areas are not considered to require monitoring. It is also noted that other material will from time to time skew results. This other material includes ash from veld fires, sand, grass and other seeds. These will not be totally eliminated by the design of the meters and the interpretation of the results are to take these factors into account 	CTR	ECO / EPCM																

4 Post-Construction / Operational Phase– Monitoring and Auditing

4.1 Re-establishment of livelihoods in poor communities

ITEM NO.	GENERAL/ SITE SPECIFIC	MITIGATION MEASURES	Main Responsibility	Support	Method Statement / Procedure
a		Transnet shall monitor the re-establishment of the livelihoods of all households in the traditional authority areas and other areas that are affected by temporary disruption of farming production due to construction of the trunkline. The monitoring indices shall be finalized once the inventory or resources that will be affected during construction has been completed (refer Section 2.20.3 above). Monitoring shall be continued for a period of 5 years after construction.	Transnet		√
b		Aspects to be monitored as part of this monitoring programme shall include the condition of soils and crops, as well as progress and results of livelihood restoration activities (to be assessed using standard Input-Output-Outcome-Impact methodology), The activities and findings of the monitoring and evaluation programme shall be documented in reports at regular intervals (e.g. yearly). These reports shall document the effectiveness of management measures designed to minimise the long-term impact of the project on the livelihoods of poor rural communities, as well as problem areas and remedial actions proposed.	Transnet		

4.2 Monitoring of Rehabilitation

ITEM NO.	GENERAL/ SITE SPECIFIC	MITIGATION MEASURES	Main Responsibility	Support	Method Statement / Procedure
a	Pipeline	A detailed post-construction rehabilitation monitoring plan shall be developed which includes all monitoring required to evaluate the success of rehabilitation along the trunkline right of way and to specify remedial measures, where necessary. The monitoring shall be undertaken along the trunkline for a minimum of 5 years, whereafter the programme may be modified or discontinued, being replaced by standard maintenance management of the servitude in some or all areas of the right of way.	Transnet		√

4.3 Monitoring of River Crossings

ITEM NO.	GENERAL/ SITE SPECIFIC	MITIGATION MEASURES	Main Responsibility	Support	Method Statement / Procedure
a	SS	A baseline SASS-5 inventory / survey is to be carried out at all major river and stream crossings as identified in this EMP (3 rd to 6 th order) before construction activities commence. This survey is to include an assessment of the occurrence of fish and aquatic invertebrate species and shall be compared with post-construction surveys carried out for the same sections. The post-construction surveys shall be carried out twice per year initially, and annually thereafter, as recommended by a suitably qualified aquatic ecologist. The annual surveys shall be carried out for a period of 3 years after construction, following which SASS-5 monitoring may be discontinued at all of the streams where, in the opinion of the aquatic ecologist, the crossings have fully stabilized. Continued monitoring of the other streams shall be as determined on the recommendation of the aquatic ecologist.	EPCM	Transnet / CTR / ECO	

5 Design and Operational Phase

The environmental management requirements detailed in this section include both activities that will need to be conducted during the design and operation of the project.

5.1 Site Locations of Facilities

ITEM NO.	PROJECT COMPONENT	MITIGATION MEASURES	Main Responsibility	Support	Method Statement / Procedure										
a	Trunkline	The Final EIA Route for the trunkline, as specified as Shape File DNR_JMP_200908 shall be implemented, except in cases where changes can be motivated on the grounds of landowner reluctance or refusal to grant servitudes or any other material grounds that have a proven safety, ecological or cultural advantage, to the satisfaction of Transnet's EPCM team including the environmental manager.	EPCM	Transnet											
b	Trunkline	Any route changes required after the Construction Team reviewed the Servitude which is made subsequent to the Final EIA Route (and the route changes described in item d) below, shall be fully documented, and shall be verified as acceptable by the EPCM if within the 1000m approved corridor (Thus a deviation of more than 500m from the EIA Final Route)	CTR	EPCM / ECO											
c	Trunkline	If any route changes made subsequent to the Final EIA Route falls outside the 1000m corridor approved as part of the Environmental Authorisation, Amendment Applications shall be communicated to the relevant Authority which could include additional specialist ecological consultant or cultural historian input as required.	EPCM	Transnet											
d	Trunkline	The four route changes at river crossings that have been recommended subsequent to the Final EIA Route (the EIA Final Route as published in Appendix 12-1 and Appendix 12-2 of the FINAL EIA, Shape File DNR_JMP_200908) shall be incorporated in the route design. Precise river crossing locations shall only be finalized only after the geotechnical surveys at rivers have been completed, but the general location of the following crossings, as the basis for the geotechnical investigation, shall be altered as follows: <table border="1" data-bbox="383 1251 1487 1414"> <thead> <tr> <th>River</th> <th>Approximate Realignment</th> </tr> </thead> <tbody> <tr> <td>Mpushini</td> <td>30 m downstream</td> </tr> <tr> <td>Bushmans</td> <td>400 m upstream</td> </tr> <tr> <td>Tugela</td> <td>50 m downstream</td> </tr> <tr> <td>Venterspruit</td> <td>20 m upstream above bridge (or alternative stabilization)</td> </tr> </tbody> </table>	River	Approximate Realignment	Mpushini	30 m downstream	Bushmans	400 m upstream	Tugela	50 m downstream	Venterspruit	20 m upstream above bridge (or alternative stabilization)	EPCM	Transnet	
River	Approximate Realignment														
Mpushini	30 m downstream														
Bushmans	400 m upstream														
Tugela	50 m downstream														
Venterspruit	20 m upstream above bridge (or alternative stabilization)														
e	Inland Terminal	The revised location for the Inland Terminal, as illustrated in Figure 7-8 in the Final EIA, should be implemented in preference to the original layout.	EPCM	Transnet											

5.2 Risk Management

5.2.1 General

ITEM NO.	PROJECT COMPONENT	MITIGATION MEASURES	Main Responsibility	Support	Method Statement / Procedure
a	All	Transnet shall operate the pipeline in accordance with the standards of a recognised international Code of Practice for the Operation and Maintenance of Pipelines, such as the American Society of Mechanical Engineers (ASME).	Transnet	EPCM	
b	All	Transnet shall implement a recognised environmental management system for the project for the management of environmental impacts associated with the operation of the pipeline.	Transnet		√
c	All	Transnet shall prepare a Maintenance Plan for the operation of the pipeline. This plan shall meet the requirements of ASME B31.8 and shall include, but not be limited to, the following: <ul style="list-style-type: none"> Detailed instructions for employees covering maintenance procedures for the pipeline during normal operations and repairs. Details of pipeline surveillance requirements including methods, personnel frequency and record keeping. Particular reference to those portions of the pipeline presenting the greatest hazard to the public in the event of an emergency or because of extraordinary maintenance requirements. Procedures for monitoring of the pipeline for evidence of accelerated erosion or invasion of the servitude by noxious weeds during the rehabilitation period. 	Transnet		√
d	Pipeline	Transnet shall establish an ongoing programme of communication and education within the various affected communities around the terminals, pump stations and trunkline to ensure that people are aware of risks associated with the pipeline so as to prevent the digging of pit latrines or other excavations over the pipeline.	Transnet		
e	Pipeline	Transnet shall enhance the safety of the trunkline through the commercial, industrial, urban, suburban and peri-urban areas (eThekweni and environs, Umlaas Road to Howick) by on-going education of local authorities and communities on the risks of, and precautions to be taken.	Transnet		
f	Pipeline	Along the entire length of the trunkline, on-going surveillance must be undertaken of pipeline integrity particularly with respect to erosion and scouring, and especially from the foot of Griffins Hill, across the Tugela Basin, up the Low Drakensberg at Van Reenen and across the eastern Free State to Vrede.	Transnet		

5.2.2 Trunkline – Quantified risk Assessment Mitigation

ITEM NO.	PROJECT COMPONENT	MITIGATION MEASURES	Main Responsibility	Support	Method Statement / Procedure
a	Pipeline	Risk reduction is to be effected along those sections of the pipeline where sensitive developments exist within defined risk isopleths, as determined by Core Risk (Pty) Ltd, and where risk mitigating measures are thus required. These requirements are detailed in the following document: Risk Review and Evaluation NMPP Trunkline, 2684358-B-PL1-RM-RP-011	Transnet	EPCM	
b	All	Transnet shall comply with all statutory requirements for hazardous installations	Transnet	EPCM	
c	Pipeline	Transnet shall implement the mitigation described in Table 10-13 in the Environmental Impact Report (EIR) (Annexure C) to ensure that the risks associated with the pipeline are reduced to levels considered to be acceptable according to the Risk Review and Evaluation NMPP Trunkline 2684358 B-PL1-RM-RP-011 system.	Transnet	EPCM	
d	All	Transnet shall conduct a recognised Process Hazard Analysis (HAZOP, FMEA) for the proposed pipeline prior to construction. This is to ensure that all design and operational hazards have been identified and adequate mitigation put in place. It would be preferable if the study could be facilitated by an independent party who cannot benefit financially from offering services, equipment or instrumentation for the project.	Transnet	EPCM	
e	Pipeline	As part of the HAZOP, Transnet should assess the reduction in risk caused by the recent proposals for sections of Horizontal Directional Drilling (HDD) in eThekweni.	Transnet	EPCM	
f	All	Transnet shall prepare a safety document detailing safety and design features that would reduce the impacts from fires, explosions and flammable atmospheres and issue to the HAZOP assessment body at the time of the HAZOP assessment. The built facility can be audited against the safety document to ensure compliance with the EIA Authorisation. Codes such as IEC 61511 can be used to achieve these requirements. Transnet and their contractors must demonstrate that sufficient mitigation has been included in the designs to ensure the safe continued operation of the pipeline.	Transnet	EPCM	√
g	All	Transnet shall finalise emergency response documentation to ensure appropriate preparedness to deal quickly and effectively with spillages that have the potential to impact significantly on the health and safety of surrounding communities.	Transnet	EPCM	√
h	Pipeline	The leak detection system of the trunkline must be regularly maintained to ensure continuous functionality.	Transnet		
i	Pipeline	In addition to the design, construction, operation and maintenance of the pipeline as well as the electronic monitoring devices (ATMOS Leak Detection, pressure and flow monitoring etc), patrols as per the ASME B31.4 Code of 2006 must take place at intervals as specified in that Code or as agreed to with the regulating authority (NERSA). Quarterly foot patrols along the pipeline of one (1) kP length must take place opposite to sensitive groundwater areas such as existing boreholes situated within 500 m of the pipeline servitude and in the	Transnet		

ITEM NO.	PROJECT COMPONENT	MITIGATION MEASURES	Main Responsibility	Support	Method Statement / Procedure
		groundwater flow direction that are used for the supply of potable groundwater to the farming activities, whether domestic consumption or irrigation. In the event of a leak being detected during these patrols, Transnet shall immediately activate their emergency plan and notify the relevant authorities within 24 hours of such an incident.			

5.2.3 Trunkline – Ecological Risk Assessment

ITEM NO.	PROJECT COMPONENT	MITIGATION MEASURES	Main Responsibility	Support	Method Statement / Procedure
a	SS	Transnet shall consider decreasing the interval between block valves installed along sections of the pipeline with a higher risk of environmental damage (i.e. Island View to Howick and especially from chainage 0 to 50 kP) due to third party interference. The interval distance in such instances shall be finalized by means of the Quantitative Risk Assessment (QRA) study on a case-to-case basis by a qualified risk assessor, the project engineer in consultation with Transnet, an experienced ecologist and any other party deemed relevant.	Transnet	EPCM	
b	GEN	The design and positioning of block valves shall ensure that they are accessible under worst case scenarios, such as 1:100 year flood conditions.	Transnet	EPCM	
c	GEN	The placement of block and check valves specified in NMPP Alliance report 'Valve Location Report for the DNR-JMP Trunkline' (Doc. No. 2684358-J-PL1-PL-RP-002) shall not be modified except on the basis of a Quantitative Risk Assessment.	Transnet	EPCM	

5.2.4 Coastal Terminal – Quantified Risk Assessment

ITEM NO.	GENERAL/ SITE SPECIFIC	ENVIRONMENTAL DESIGN REQUIREMENTS AND CRITERIA	Main Responsibility	Support	Method Statement / Procedure
a	GEN	All Emergency Plans and Procedures developed by Transnet must be compiled to deal with the potential incidents outlined in the independent specialist risk assessments and other potential emergencies identified as part of the Transnet Risk management policies and procedures.	Transnet	EPCM	√
b	SS	The on-site emergency plan at the Island View Terminal TM1 will have to be compiled to enable it to fit into the Cutler Projects emergency plan for the entire Island View Complex. It is important that the Cutler Project are consulted to ensure that they can provide the necessary levels of fire fighting capability for the additional risk brought by the Transnet Island View Coastal Terminal.	Transnet	EPCM	√
c	SS	The potential consequences of the incidents identified in this assessment should be discussed	Transnet	EPCM	

ITEM NO.	GENERAL/ SITE SPECIFIC	ENVIRONMENTAL DESIGN REQUIREMENTS AND CRITERIA	Main Responsibility	Support	Method Statement / Procedure
		with the Cutler Project and the eThekweni Fire and Disaster Services who would be expected to render emergency services to the Terminal. The Transnet Coastal Terminal, if it will be established at Island View would also have to be integrated into the Cutler Projects fire fighting systems. The latter is to be upgraded as required in order to have sufficient capacity to deal with risks identified.			

5.2.5 Buncefield Incident Recommendations

ITEM NO.	GENERAL/ SITE SPECIFIC	ENVIRONMENTAL DESIGN REQUIREMENTS AND CRITERIA	Main Responsibility	Support	Method Statement / Procedure
a	SS	The following recommendations that have been developed as a result of the Buncefield Incident in the United Kingdom, shall be critically reviewed and implementation strategies relevant to the specific context of the Coastal and Inland Terminals shall be developed:	Transnet	EPCM	
b	SS - monitoring	<p>1.) The Competent Authority and operators of Buncefield-type sites should develop and agree a common methodology to determine Safety Integrity Level (SIL) requirements for overfill prevention systems in line with the principles set out in Part 3 of B3 EN 61511 ref 3) This methodology should take account of:</p> <ul style="list-style-type: none"> the existence of nearby sensitive resources or populations; the nature and intensity of depot operations; realistic reliability expectations for tank gauging systems; and the extent / rigour of operator monitoring. <p>Application of the methodology should be clearly demonstrated in the COMAH safety report submitted to the Competent Authority for each applicable site. Existing safety reports will need to be reviewed to ensure this methodology is adopted.</p> <p>Process Action: SIL Review</p> <p>Instrumentation Action: SIL Review – The Engineering Contractor proposes that the independent level switch be an analogue level transmitter, not a digital switch. The independent level transmitter will enable the control system to identify a division between the two level transmitters and thus give a division alarm indicating a faulty level signal.</p>	Transnet	EPCM	
c	SS - monitoring	<p>2.) Operators of Buncefield-type sites should, as a priority, review and amend as necessary their management systems for maintenance of equipment and systems to ensure their continuing integrity in operations. This should include, but not be limited to reviews of the following:</p> <ul style="list-style-type: none"> the arrangements and procedures for periodic proof testing of storage tank overfill 	Transnet	EPCM	

ITEM NO.	GENERAL/ SITE SPECIFIC	ENVIRONMENTAL DESIGN REQUIREMENTS AND CRITERIA	Main Responsibility	Support	Method Statement / Procedure
		<p>prevention systems to minimise the likelihood of any failure that could result in loss of containment; any revisions identified pursuant to this review should be put into immediate effect;</p> <ul style="list-style-type: none"> the procedures for implementing changes to equipment and systems to ensure any such changes do not impair the effectiveness of equipment and systems in preventing loss of containment or in providing emergency response. <p>Instrumentation Action: The above proposal will enable the system to perform a self verification. In addition it is recommended that a periodic trip test procedure is implemented.</p>			
d	SS – monitoring	<p>3.) Operators of Buncefield-type sites should protect against loss of containment of petrol and other highly flammable liquids by filling a high integrity, automatic operating overfill prevention system (or a number of such systems, as appropriate) that is physically and electrically operated and independent from the tank gauging system.</p> <p>Such systems should meet the requirements of Part 1 of B8 EN 615111 for the required safety integrity level, as determined by the agreed methodology (see Recommendation 1). Where independent automatic overfill prevention systems are already provided, their efficacy and reality should be reappraised in line with the principles of Part 1 of B8 EN 615111 and for the required safety integrity level, as determined by the agreed methodology (see Recommendation 1).</p> <p>Process Action: High level trips are installed as per SIL review outcomes.</p> <p>Instrumentation Action: To be determined by the SIL review. However, the implementation of the proposed system noted in recommendation one should satisfy the SIL review.</p>	Transnet	EPCM	
e	SS – monitoring	<p>4.) The overfill prevention system (comprising means of level detection, logic control equipment and independent means of flow control) should be engineered, operated and maintained to achieve and maintain an appropriate level of safety integrity in accordance with the requirements of the recognised industry standard for safety instrumented systems, Part 1 of B8 EN 61511.</p> <p>Process Action: Implement SIL review recommendations.</p> <p>Instrumentation action: To be determined by the SIL review. However, the inclusion of level alarms and level set points should be linked to the tank inlet flow control valve thereby slowing the flow down as the vessel reaches a high level state. Failing this the independent levels transmitter should trip an independent and dedicated fall safe inlet on/off valve which is located as close to the tank as possible.</p>	Transnet	EPCM	
f	SS	<p>5.) All elements of an overfill prevention system should be proof tested in accordance with the</p>	Transnet	EPCM	

ITEM NO.	GENERAL/ SITE SPECIFIC	ENVIRONMENTAL DESIGN REQUIREMENTS AND CRITERIA	Main Responsibility	Support	Method Statement / Procedure
		validated arrangements and procedures sufficiently frequently to ensure the specified safety integrity level is maintained in practice in accordance with the requirements of Part 1 of BS EN 61511. Instrumentation Action: Comment as per recommendation two.			
g	SS	6.) The sector should put in place arrangements to ensure the receiving site (as opposed to the transmitting location) has ultimate control of tank filling. The receiving site should be able to safely terminate or divert a transfer (to prevent loss of containment or other dangerous conditions) without depending on the actions of a remote third party, or on the availability of communications to a remote location. These arrangements will need to consider upstream implications for the pipeline network, other facilities on the system and refiners. Process Action: The design of the system and the Operating Procedure must ensure that the receiving site is able to safely terminate or divert a transfer without depending on the actions of a remote third party, or on the availability of communications to a remote location. These arrangements will need to consider upstream implications for the pipeline network, other facilities on the system and refineries specify the necessary interlocks to prevent overfilling of tanks. Instrumentation Action: As per the Process description and possible inclusion of the following – TM1 – The control system should verify and batch the product via the custody valve, flow meter and the vessel flow control valve. In the event of a high level condition, the flow control valve should reduce flow, if the independent “High High” level is reached the fail safe valve on the tank and the Custody valve should be tripped. The feeder lines should be sized to accept possible surge conditions or the suppliers should have a spill back or antisurge system installed. The TM 2 control system should control the flow into the terminal having the ability to shut down the down stream VSD’s. In the event of a high level condition, the flow control valve should reduce flow, if the independent “High High” level is reached the fail safe valve on the tank and the down stream VSD’s should be tripped. Both options should allow for possible flow diversion into alternative tanks.	Transnet	EPCM	
h	SS	7.) In conjunction with Recommendation 6, the sector and the Competent Authority should undertake a review of the adequacy of existing safety arrangements, including communications, employed by those responsible for pipeline transfers of fuel. This work should be signed with implementing Recommendations 19 and 20 on high reliability organisations to ensure major hazard risk controls address the management of critical organisational interfaces.	Transnet	EPCM	
i	SS	8.) The Competent Authority and the sector should jointly review existing standards for secondary and tertiary containment with a view to the Competent Authority producing revised	Transnet	EPCM	

ITEM NO.	GENERAL/ SITE SPECIFIC	ENVIRONMENTAL DESIGN REQUIREMENTS AND CRITERIA	Main Responsibility	Support	Method Statement / Procedure
		<p>guidance by the end of 2007. The review should include, but not be limited to the following:</p> <ul style="list-style-type: none"> • developing a minimum level of performance specification of secondary containment (typically this will be bunding); • developing suitable means for assessing risk so as to prioritise the programme of engineering work in response to the new specification; • formally specifying standards to be achieved so that they may be insisted upon in the event of lack of progress with improvements; • improving firewater management and the installed capability to transfer containment and fires; • providing greater assurance of tertiary containment measures to prevent escape of liquids from site and threatening a major accident to the environment. <p>Civils Action: Main bund walls to accommodate credible failure of largest tank in impoundment with freeboard of all fire weir applications for one hour, intermediate bund walls to contain minimum of 110% within the subdivision. All discharges from the impoundment will pass through an effluent treatment system prior to release into either an effluent trade system or containment and waste land system or into a commercial sewer treatment system or for transport to refinery for re-processing. If required the under flow weir system between the intermediate bunds will allow for early off take of contaminated fire water.</p>			
j	SS	9.) Revised standards should be applied in full to new build sites and to new partial installations. On existing sites, it may not be practicable to fully upgrade building and site drainage. Where this is so operators should develop and agree with the Competent Authority risk-based plans for phased upgrading as close to new plant standards as is reasonable practicable.	Transnet	EPCM	
k	SS - monitoring	<p>10.) The sector should work with the Competent Authority to prepare guidance and/or standards on how to achieve a high reliability industry through placing emphasis on the assurance of human and organisational factors in design, operation, maintenance, and testing. Of particular importance are:</p> <ul style="list-style-type: none"> • understanding and defining the role and responsibilities of the control room operators (including in automated systems) in ensuring safe transfer processes; • providing suitable information and system interfaces for front line staff to enable them to reliably detect, diagnose and respond to potential incidents; • training, experience and competence assurance of staff for safety critical and environmental protection activities; • defining appropriate workload, staffing levels and working conditions for front line personnel; • ensuring robust communications management within and between sites and 	Transnet	EPCM	

ITEM NO.	GENERAL/ SITE SPECIFIC	ENVIRONMENTAL DESIGN REQUIREMENTS AND CRITERIA	Main Responsibility	Support	Method Statement / Procedure
		<p>contractors and with operators of distribution systems and transmitting sites (such as refineries);</p> <ul style="list-style-type: none"> prequalification auditing and operational monitoring of contractors' capabilities to supply, support and maintain high integrity equipment <p>Process Action: The roles and responsibilities of the control room operators will be included in the Operating Manual.</p> <p>Instrumentation Action: Certified Operator training on the control system.</p>			
l	SS	11.) The sector should ensure that the resulting guidance and/or standards is/are implemented fully throughout the sector, including where necessary with the refining and distribution sectors. The Competent Authority should check that this is done.	Transnet	EPCM	
m	SS	12.) The sector should put in place arrangements to ensure that good practice in these areas, incorporating experience from other high hazard sectors, is shared openly between organisations.	Transnet	EPCM	
n	SS	13.) The Competent Authority should ensure that safety reports submitted under the COMAH Regulations contain information to demonstrate that good practice in human and organisation design, operation, maintenance and testing is implemented as rigorously as for control and environmental protection engineering systems.	Transnet	EPCM	
o	SS	<p>14.) The sector should set up arrangements to collate incident data on high potential incidents including overfilling, equipment failure, spills and alarm system defects, evaluate trends, and communicate information on risks, their related solutions and control measures to the industry.</p> <p>Instrumentation Action: The control system Alarming and reporting philosophy should be reviewed during the Safety Integrity Level (SIL) review.</p>	Transnet	EPCM	
p	SS	<p>15.) The arrangements set up to meet Recommendation 23 should include, but not be limited to, the following:</p> <ul style="list-style-type: none"> thorough investigation of root causes of failures and malfunctions of safety and environmental protection critical elements during testing or maintenance, or in service; developing incident databases that can be shared across the entire sector, subject to data protection and other legal requirements. Examples exist of effective voluntary systems that could provide suitable models; collaboration between the workforce and its representatives, duty holders and regulators to ensure lessons are learned from incidents, and best practices are shared. 	Transnet	EPCM	

ITEM NO.	GENERAL/ SITE SPECIFIC	ENVIRONMENTAL DESIGN REQUIREMENTS AND CRITERIA	Main Responsibility	Support	Method Statement / Procedure
		Instrumentation Action: Ensure that first up Alarming, time stamping and recording philosophies are adhered to during the implementation of the control system. This will enable accurate and timely reporting of any incident.			
q	SS	16.) In particular, the sector should draw together current knowledge of major hazard events, failure histories of safety and environmental protection critical elements, and developments in new knowledge and innovation to continuously improve the control of risks. This should take advantage of the experience of other high hazard sectors such as chemical processing offshore oil and gas operations, nuclear processing and railways. Instrumentation Action: Ensure that the instrumentation and implementation meets BIL and world best practice recommendations.			

5.2.6 Fire Fighting Capacity coastal Terminal at Island View Complex

ITEM NO.	GENERAL/ SITE SPECIFIC	ENVIRONMENTAL DESIGN REQUIREMENTS AND CRITERIA	Main Responsibility	Support	Method Statement / Procedure
Water Supply:					
a	SS	The water supply to TM 1 will be provided by the existing “Cutler” seawater pump sets and reticulation. There is a high pressure storm water system with large bore (Ø 20”) reticulation routed throughout the Island View complex.	Transnet	EPCM	
b	SS	A Ø 15” spur of the Cutler reticulation terminates at the intersection of Trinidad Road and Bahrain Road, adjacent to TM 1. The water supply to TM 1 will be taken from this point.	Transnet	EPCM	
c	SS	The Cutler system is able to supply the maximum required flow rate at the desired pressure.	Transnet	EPCM	
d	SS	The maximum design water demand has been based on the largest credible fire event. This has been taken to be a fire in one of the large bunds and cooling of half of the circumference of two adjacent tanks.	Transnet	EPCM	
Premix (Foam Concentrate / Water) Supply:					
e	SS	While the Cutler reticulation is normally filled with water, foam premix can be fed into the reticulation when required. This is achieved using the foam concentrate and variable flow proportioners located in the Cutler pump stations. This concentrate is currently AFFF which is suitable for use with the products to be stored at TM 1. Consideration is currently being given to replacing the AFFF with Alcolac.	Transnet	EPCM	
f	SS	As a result of the distance between the Cutler pump stations and the various depots, the Cutler	Transnet	EPCM	

ITEM NO.	GENERAL/ SITE SPECIFIC	ENVIRONMENTAL DESIGN REQUIREMENTS AND CRITERIA	Main Responsibility	Support	Method Statement / Procedure
		committee has provided a 40,000 litre mobile foam injection unit. This comprises a foam tank and variable flow proportioner which is connected in-line in the line feeding the depot. The injection of foam is thus achieved locally until such time as the premix supplied by the Cutler pump stations reaches the depot.			
g	SS	As a result of the arrangement, the same feed lines will be used to supply both water demand (tank cooling) and foam premix demand (bund foam and tank foam). Once premix is being supplied to the site, it will also be used for tank cooling.	Transnet	EPCM	
Hydrant Ring main"					
h	SS	A 16" ring main with 4-header fire hydrants strategically located not more than 90m apart has been provided around the tank farm and manifolds. This ring main also feeds tank cooling facilities and bund and tank foam facilities.	Transnet	EPCM	
i	SS	The ring main has been provided with isolating valves to permit a section of the main to be isolated in the event of damage to a portion of the ring.	Transnet	EPCM	
j	SS	The pressure available at each hydrant will be 10 bar.	Transnet	EPCM	
k	SS	Above-ground steel piping installed on the product piping pipe racks, is proposed. As the system is operating with seawater, the ring main should be internally lined with concrete or epoxy.	Transnet	EPCM	
Foam Concentrate Supply:					
l	SS	As foam premix is supplied to the site from the Cutler system, foam stocks and injection facilities are not provided at the depot.	Transnet	EPCM	
Bund Protection					
m	SS	Sufficient Medium Expansion bund foam pourers are provided to ensure an application rate of 4,1 litres / m2 / min, as per SANS 10089, to each bund.	Transnet	EPCM	
n	SS	The flow to each bund area will be controlled by actuated valves which can be operated locally or remotely at the fire pump station. It is proposed that these valves be located above-ground with heat shields.	Transnet	EPCM	
o	SS	The piping feeding the individual pourers will be run "below ground" within the earth bund walls. Below-ground piping will be externally wrapped steel. As the system is operating with seawater, the bund foam lines should be internally lined with epoxy.	Transnet	EPCM	
p	SS	The maximum foam travel distance on the largest bunds is 30 metres which is acceptable.	Transnet	EPCM	
q	SS	The flow from the bund pourers will be via a gentle slope or directed to the bund to prevent pickup of product as it falls to the ground. The bund walls will be protected from scour.	Transnet	EPCM	
Tank Foam Protection					
r	SS	Fixed top foam pourers supplying medium expansion foam into the storage tanks are proposed. An adequate number of pourers have been provided to ensure an application rate of 4,1 litres / m2 / min as per NFPA for all fixed roof tanks (with or without internal floating	Transnet	EPCM	

ITEM NO.	GENERAL/ SITE SPECIFIC	ENVIRONMENTAL DESIGN REQUIREMENTS AND CRITERIA	Main Responsibility	Support	Method Statement / Procedure
		blankets).			
s	SS	Control of foam to the tank foam pourers will be by manually operated valves located at a safe distance from the tank. A single valve will control the flow to each tank while each pourer will be fed by an individual riser.	Transnet	EPCM	
t	SS	As the system is operating with seawater, the steel tank foam lines should be internally lined with epoxy.	Transnet	EPCM	
Tank Cooling					
u	SS	Fixed cooling spray rings are proposed for all tanks.	Transnet	EPCM	
v	SS	The cooling facilities proposed would comprise a fixed cooling ring at the top of the tank shell.	Transnet	EPCM	
w	SS	The application rate for the shell protection is 30 litres / metre of circumference, as per SANS 10089.	Transnet	EPCM	
x	SS	Flow control to the tank cooling ring would be by an actuated valve which can be operated locally or remotely at the fire pump station. It is proposed that these valves be located above ground with heat shields to permit manual operation. A second (alternative) supply to these facilities on the other side of the bund is not proposed.	Transnet	EPCM	
y	SS	As the system is operating with seawater, the steel tank cooling lines should be internally lined with epoxy.	Transnet	EPCM	
Manifold protection					
z	SS	4500 l/min oscillating foam monitors are provided to distribute low expansion foam to the banded manifold and pump bay areas in the event of a fire. A single hydrant head is provided upstream of the isolating valve on the riser pipe to each monitor.	Transnet	EPCM	
aa	SS	The application rate is 6,5 l/m ² per NFPA requirements for shallow spill fires.	Transnet	EPCM	
bb	SS	Each pair of monitors is each fed by a separate foam premix line and can be activated by push button in the fire station.	Transnet	EPCM	
cc	SS	The monitors will also protect the small slops tank in the manifold area	Transnet	EPCM	
Tanker Loading Area Protection					
dd	SS	A manually directed 1800 l/min foam monitor (normally mounted towards the tanker area) has been provided to protect the tanker loading area.	Transnet	EPCM	
ee	SS	This monitor can be manually activated by push-button in the fire pump station.	Transnet	EPCM	
Portable Equipment					
ff	SS	The following foam equipment has been allowed for at each pump station: <ul style="list-style-type: none"> • Four portable 4,500 litre/min foam monitors • Four portable 4,500 litre/min ground water monitors 	Transnet	EPCM	
Building Protection					

ITEM NO.	GENERAL/ SITE SPECIFIC	ENVIRONMENTAL DESIGN REQUIREMENTS AND CRITERIA	Main Responsibility	Support	Method Statement / Procedure
gg	SS	The form of fire suppression for the buildings has not yet been confirmed.	Transnet	EPCM	
hh	SS	Detection sensors will be provided in the Control Room and the Generator Building, but not the workshop.	Transnet	EPCM	
ii	SS	Hose reels and extinguishers will be provided for all buildings as required by Building Regulations.	Transnet	EPCM	
Alarm System					
jj	SS	Starting the main fire pumps will activate an audible and visual alarm.	Transnet	EPCM	
kk	SS	Any alarm conditions will be linked to the local SCADA system as well as being relayed to the Master Control Centre in Durban.	Transnet	EPCM	

5.2.7 Coastal Terminal at Island View Complex – Associated Infrastructure

ITEM NO.	GENERAL/ SITE SPECIFIC	ENVIRONMENTAL DESIGN REQUIREMENTS AND CRITERIA	Main Responsibility	Support	Method Statement / Procedure
r	SS	A detailed EMP was developed for the installation of the new pipelines and associated infrastructure to Link Engen's Island View B (IVB), Island View C (IVC) and the Island View D (IVD) storage facilities in order to supply fuel products to Transnet's NMPP. The details of the installation of this infrastructure is attached together with the EMP (Annexure E)	Transnet	EPCM	
s	SS	Shell and BP South African Petroleum Refineries (Pty.) Ltd. (SAPREF) currently has a number of fuel storage facilities and associated infrastructure at the Island View Complex, Port of Durban, KwaZulu-Natal. The development of Transnet's New Multi Product Pipeline (NMPP) requires that SAPREF undertakes changes to their storage and transfer facilities at Island View. The activities will entail the relocation of SAPREF's Bayhead B tanks to Bayhead A, and the installation of associated piping; as well as the replacement of the current Mogas, AGO and Jet feeder lines to the NMPP Island View Terminal with above ground lines. (Annexure F)	Transnet	EPCM	

5.2.8 Pump Stations – Quantified Risk Assessment Mitigation

ITEM NO.	GENERAL/ SITE SPECIFIC	ENVIRONMENTAL DESIGN REQUIREMENTS AND CRITERIA	Main Responsibility	Support	Method Statement / Procedure
General					
a	SS	The Emergency Plans for the different Pump Stations must be compiled to deal with the potential incidents outlined in the specialist risk assessment and other potential emergencies identified as part of the Transnet Risk management policies and procedures.	Transnet	EPCM	√
b	SS	It is critical that the Local Authorities in whose areas the Pump Stations are located, and who would be expected to render emergency services to the Transnet Pump Station in the event of an incident are fully conversant with the risks on these Pump Stations.	Transnet	EPCM	
c	SS	As far as fire fighting is concerned on each of the Pump Stations, the Engineering Contractor will propose a fire fighting capability method:	Transnet	EPCM	
Water Supply					
d	SS	Water storage facilities to provide for one hour's supply at the maximum design demand have been provided. Once the source(s) of supply and potential rate of make-up supplies have been determined, a risk assessment is to be carried out to determine if the volume of water to be stored should be increased. An open reinforced concrete water reservoir is proposed, all necessary authorisations and permits should be in place.	Transnet	EPCM	
e	SS	The maximum design water demand has been based on the largest credible fire event. This has been taken to be all four monitors at the manifold operating simultaneously, but not the spill basin protection concurrently.	Transnet	EPCM	
f	SS	A single, diesel engine driven fire water pump capable of delivering the design flow rate at the required pressure has been proposed. It will be housed in a blast resistant (structure) fire pump station building.	Transnet	EPCM	
g	SS	Fire fighting pump start signals may be generated: <ul style="list-style-type: none"> • By push-button in the fire pump station. • By push-button in the control room. • By push-button in the security kiosk. • On activation of the detection system in the manifold area. 	Transnet	EPCM	
h	SS	The fire fighting pump set can only be stopped in the fire pump station.	Transnet	EPCM	
i	SS	A Fire Department connection has been allowed for.	Transnet	EPCM	
Hydrant Ring main					
j	SS	A 4" firewater ring main with 2-header fire hydrants strategically located not more than 90m apart has been provided. Below ground HDPE piping is proposed.	Transnet	EPCM	
k	SS	The ring main has been provided with isolating valves to permit a section of the main to be isolated in the event of damage to a portion of the ring.	Transnet	EPCM	

ITEM NO.	GENERAL/ SITE SPECIFIC	ENVIRONMENTAL DESIGN REQUIREMENTS AND CRITERIA	Main Responsibility	Support	Method Statement / Procedure
l	SS	The pressure available at each hydrant will be 10 bar.	Transnet	EPCM	
Foam Concentrate Supply					
m	SS	Sufficient foam concentrate storage for one hour of operation of foam facilities at the design flow rate has been allowed for. In the event that the water storage volume is increased to more than one hour, consideration should be given to increasing the volume of foam concentrate stored. A steel foam concentrate tank is proposed.	Transnet	EPCM	
n	SS	The maximum foam concentrate demand has been based on all four manifold monitors operating simultaneously, but not the spill basin concurrently. The foam induction ratio allowed for is 3%.	Transnet	EPCM	
o	SS	Multi-purpose foam (suitable for products containing alcohol or polar solvents) will be used. This will be suitable for fuels with up to 5% alcohol content. If it is possible that the alcohol content could exceed 5% in the future the proportioner(s) must be ordered with a 3% / 6% selector and the foam stocks would have to be increased when these fuels are handled.	Transnet	EPCM	
p	SS	A progressive cavity positive displacement foam pump is provided to deliver foam concentrate at the correct flow rate and pressure, to the balanced pressure proportioner (BPP) which then supplies foam premix to the manifold monitors, tanker loading monitor and spill basin pourers. A suction strainer has not been provided as the type of pump proposed is able to deal with solids.	Transnet	EPCM	
q	SS	In order to ensure that a backflow of water via the BPP to the foam concentrate tank does not occur, a motorized trunnion mounted ball valve with automatic body bleed is provided in addition to the check valve in the foam concentrate feed to the BPP. A "test" button will be provided to ensure that this valve remains closed when the system is being tested.	Transnet	EPCM	
r	SS	The foam concentrate tank, pump and BPP will be located in the fire pump station building.	Transnet	EPCM	
Manifold Protection					
s	SS	Four 3000 l/min oscillating foam monitors are provided to distribute low expansion foam to the banded manifold area in the event of a fire. A single hydrant head is provided upstream of the isolating valve on the riser pipe to each monitor.	Transnet	EPCM	
t	SS	The application rate is 6.5l/m ² per NFPA requirements for shallow spill fires.	Transnet	EPCM	
u	SS	The two pairs of monitors are each fed by a separate foam premix line. Either of these pairs of monitors (or both pairs) can be activated (started and stopped): <ul style="list-style-type: none"> • By push-button in the fire pump station. • By push-button in the control room. • By push-button in the security kiosk. • On activation of the detection system in the manifold area (start only). 	Transnet	EPCM	
v	SS	The monitors should be connected in diagonal pairs so that if one system fails there is still effective fire fighting even if there is wind.	Transnet	EPCM	

ITEM NO.	GENERAL/ SITE SPECIFIC	ENVIRONMENTAL DESIGN REQUIREMENTS AND CRITERIA	Main Responsibility	Support	Method Statement / Procedure
w	SS	The monitors should also protect the small slops tank in the manifold area.	Transnet	EPCM	
Tanker Loading Area Protection					
x	SS	A manually directed 1800 l/min foam monitor (normally mounted towards the tanker area) has been provided to protect the tanker loading area.	Transnet	EPCM	
y	SS	This monitor can be manually activated (started and stopped): By push-button in the fire pump station. By push-button in the control room. By push-button in the security kiosk.	Transnet	EPCM	
Spill Basin Protection					
z	SS	Two medium expansion (MEX) powers have been provided to protect the spill basin, one MEX 1800 for the main chamber and one MEX 450 for the two small chambers.	Transnet	EPCM	
aa	SS	The application rate is 6,5 l/m ² /min as per NFPA and SANS 10089.	Transnet	EPCM	
bb	SS	The MEX pourers can be manually activated (started and stopped): <ul style="list-style-type: none"> • By push-button in the fire pump station. • By push-button in the control room. • By push-button in the security kiosk. 	Transnet	EPCM	
cc	SS	In the event of the manifold monitors being activated while the spill basin MEX pourers are operating, the MEX pourers will be shut down.	Transnet	EPCM	
Portable Equipment					
dd	SS	The following foam equipment has been allowed for at each pump station: <ul style="list-style-type: none"> • Two portable 4,500 litre/min foam monitors. • Two portable 4,500 litre/min ground water monitors. 	Transnet	EPCM	
Building Protection					
ee	SS	The form of fire suppression for the buildings has not yet been confirmed.	Transnet	EPCM	
ff	SS	Building detection sensors will be provided in the Control Room and the Generator Building, but not the workshop.	Transnet	EPCM	
gg	SS	Hose reels and extinguishers will be provided for all buildings as required by Building Regulations.	Transnet	EPCM	
Detection System					
hh	SS	Ultra-violet / Infra-red (UV/IR) fire detection sensors are proposed. In order to activate any of the fire fighting systems or alarms, a “double knock” will be required. This will be achieved by requiring two sensors to be activated in order to start the fire fighting system and a single knock to sound an alarm. The sensors will be located taking cognizance of the equipment installed in the area.	Transnet	EPCM	
ii	SS	The detectors in the manifold area will start the fire pumps, activate both pairs of foam monitors and sound an alarm.	Transnet	EPCM	

ITEM NO.	GENERAL/ SITE SPECIFIC	ENVIRONMENTAL DESIGN REQUIREMENTS AND CRITERIA	Main Responsibility	Support	Method Statement / Procedure
jj	SS	The detectors at the spill basin and tanker loading area will merely sound an alarm.	Transnet	EPCM	
kk	SS	In the event of the detectors in the manifold area being activated while the foam pourers at the spill basin are operating, the valve controlling foam premix flow to the spill basin will be closed, giving priority to the manifold protection.	Transnet	EPCM	
ll	SS	A fire detection system will be provided in the Control Room and the Generator Building. These systems will sound an alarm.	Transnet	EPCM	
mm	SS	Any alarm conditions will be linked to the local SCADA system as well as being relayed to the Master Control Centre in Durban.	Transnet	EPCM	

5.2.9 Emergency Response Capability

ITEM NO.	PROJECT COMPONENT	MITIGATION MEASURES	Main Responsibility	Support	Method Statement / Procedure
a	All	<p>Transnet shall establish an Operational Emergency Plan that will govern all activities related to the response to an emergency. The Emergency Plan shall in accordance with the National Environmental Management Act (Act 107 of 1998) Section 30(3) notify the Director General, the relevant provincial head of the Department in which the incident occurred, the local municipal authorities and police, traffic police, fire departments, local medical and ambulance. Further measures should include the establishment of a network of communication between Transnet and farmers associations, conservancies, farmer neighbourhood watches, etc.</p> <p>Where emergency incidents related to water resources occur such shall be reported to the above agencies as well as DWAF, in accordance with Section 20 of the National Water Act (Act 36 of 1998).</p>	Transnet		√
b	All	<p>Furthermore the plan shall:</p> <ul style="list-style-type: none"> • Establish a system for receiving, identifying and classifying emergencies which require immediate response by the operating company; • Identify specific emergency response authorities along the route, with all emergency contact details and the procedures necessary to ensure rapid and effective response from these authorities. • Identify emergency response resources, including specialised equipment and materials, to be deployed to assist emergency response authorities in the case of an accident. • Establish a procedure to ensure prompt and adequate handling of all calls which concern emergencies whether they are from customers, the public, company employees, or other sources. 	Transnet		

ITEM NO.	PROJECT COMPONENT	MITIGATION MEASURES	Main Responsibility	Support	Method Statement / Procedure
		<ul style="list-style-type: none"> • Establish a procedure to ensure the prompt and effective response to a notice of each type of emergency including the action to be taken by all personnel involved and the first employee at the scene; • Indicate clearly the responsibility for training employees to respond effectively and in accordance with the emergency procedures; • Indicate clearly those responsible for updating the information contained in the emergency plan; • Establish a procedure for responding to community and media enquiries and to the disseminate information to the public; • Establish reporting procedures for documenting an emergency. 			
c	All	The emergency preparedness plan must be ready for implementation at all times should an emergency situation arise.	Transnet		
d	All	An awareness campaign must be undertaken to inform landowners/residents affected by the pipeline of the existence of the pipeline and of the emergency contact details.	Transnet		
e	Pipeline	Pipeline Monitoring shall be supported by the ATMOS leak detection system. Remote controlled and/or manual shut off valves placed at regular intervals along the pipeline will be activated to limit the hazard and damage from an accidental discharge.	Transnet		
f	All	In the event of an accidental spillage or discharge, all free product must immediately be recovered. In the event of a major spill a geo-hydrologist specialist must assess the spill site and conduct a risk assessment of the affected area. If considered to be necessary by the geohydrologist, other specialists shall also be involved in order to make a proper assessment of the impact and remediation requirements. If indicated to be necessary by the risk assessment, all contaminated soil must be excavated and be disposed of at a licensed hazardous waste disposal facility. All further measures required by the assessment must be implemented as soon as is possible and the site must be rehabilitated to the satisfaction of DWAF. All organisations and emergency services as required by the National Environmental Management Act (Act 107 of 1998) Section 30(3) .The opportunity for the onsite remediation and reuse of contaminated soil must be investigated prior to disposal and DWAF informed in this regard. Monitoring boreholes must be installed at such sites to monitor whether the spill has resulted in groundwater contamination and all private boreholes within a radius of 500 metres from the spill should be monitored bi-annually for the presence of organic substances.	Transnet		
g	All	Excavation of contaminated soil must involve careful removal of soil using appropriate tools/machinery to storage containers until treated or disposed of at a licensed hazardous landfill site.	Transnet		
h	All	The Environmental Managers must determine the precise method of treatment of polluted soil. This could involve the application of soil absorbent materials as well as oil-digestive	Transnet		

ITEM NO.	PROJECT COMPONENT	MITIGATION MEASURES	Main Responsibility	Support	Method Statement / Procedure
		powders to the contaminated soil. Transnet could also employ a reliable company who specialise in spill remediation.			
i	All	If a spill occurs on an impermeable surface such as cement or concrete, the surface spill must be contained using oil absorbent material.	Transnet		
j	All	If necessary, oil absorbent sheets or pads must be attached to leaky machinery or infrastructure.	Transnet		
k	All	Materials used for the remediation of petrochemical spills must be used according to product specifications and guidance for use.	Transnet		
l	All	Contaminated remediation materials must be carefully removed from the area of the spill so as to prevent further release of petrochemicals to the environment, and stored in adequate containers until appropriate disposal.	Transnet		

5.2.10 Noise

ITEM NO.	PROJECT COMPONENT	MITIGATION MEASURES	Main Responsibility	Support	Method Statement / Procedure
a	Pump stations Terminals	Mitigation implemented to reduce the impact of sound generated by the pumps at the eight pump stations and the two terminals shall be in accordance with the requirements specified Attached in the Noise Specialist Study (<i>FINAL EIA Specialist Study 11</i>) with reference to the findings in the EIA.	Transnet	EPCM	
b	Pump stations Terminals	The effectiveness of acoustic mitigation shall be verified, once each facility is operational, by means of acoustic monitoring of sound levels at the sensitive receptors around the pumps stations and terminals. The monitoring is to be conducted by an independent acoustician using recognised acoustic methodologies (CONCAWE, SANS 10103).	Transnet	EPCM	

5.2.11 Aesthetics

ITEM NO.	PROJECT COMPONENT	MITIGATION MEASURES	Main Responsibility	Support	Method Statement / Procedure
a	SS	All of the site specific measures described in Visual Aesthetics Study (<i>FINAL EIA Specialist Study 17</i>) shall be implemented for each pump station and terminal and shall be considered in consultation with the relevant Local Municipalities if necessary, prior to construction commencing.	Transnet	EPCM	

ITEM NO.	PROJECT COMPONENT	MITIGATION MEASURES	Main Responsibility	Support	Method Statement / Procedure
b	GEN	The cut and fill slopes of all embankments that are to be constructed at all Terminal and Pump Station sites shall be shaped to angles and forms that are reflected in the adjacent landscape in order to reduce the visual impact. The edges of embankments shall be blended with the existing landforms, in order to reduce the impression that the project has been 'engineered' through the landscape. Due to the multitude of different scenarios that will be required, the engineer will be required to provide on-site direction wherever required. In specific areas of application, a qualified landscape architect shall be appointed to design contextually appropriate mitigation measures. These may include, but not necessarily be limited to, all sections where the alignment passes through residential areas, sections that are highly visible or regularly frequented by a large number of people.	Transnet	EPCM	
c	GEN	The materials selected for all building roofing and walls shall be of a nature which does not reflect or deflect sunlight or artificial light during the day or night due to their colour or texture. All building surfaces shall, within the bounds of financial and operational practicality and which shall be demonstrated by the Contractor, have matt-textured finished, and shall not be glossy, so as to reduce reflection and glare from the surfaces. Roof material shall not be a silver colour (e.g. unpainted galvanised corrugated iron) or be glossy to the extent that it can reflect the sun or artificial light.	Transnet	EPCM	
d	GEN	The colours of all building and structures surfaces shall be complementary to the colours in the surrounding landscape, and shall, within the bounds of financial and operational practicality and which shall be demonstrated by the Contractor, be olive green with buff trim, light grey, grey green, blue grey, dark buff, rust, ochre or any other natural tones such as variations of tan to be accepted by the Transnet. Furthermore the existing blue roofs of Pump Station 6 at Van Reenen should be painted a more neutral colour such as tan.	Transnet	EPCM	
e	GEN	The building forms should be broken by roof overhangs and steps in the façade. This will create shadow lines which, in turn, assist in the mottling or breaking up of the visible building form.	Transnet	EPCM	
f	GEN	Large and long shed-like structures must be designed to have their bulk visually broken up by vertical bands or blocks of appropriate colour. Alternatively the façade could be made visually less imposing by the placement of other smaller buildings in front of it, the creation of shadows from roof overhangs and the stepping of the surface to accommodate other necessary elements of the buildings function.	Transnet	EPCM	
g	GEN	Transnet shall ensure that the minimum amount of light required to ensure safety at night is utilised at all new pump station sites. Lights shall be so positioned and directed that they do not cause light pollution into adjacent properties.	Transnet	EPCM	
h	GEN	Where allowable, security lighting that is movement activated rather than permanently switched on, shall be utilized to prevent unnecessary constant illumination.	Transnet	EPCM	
i	GEN	All security lighting shall have 'blinkers' or be specifically designed to ensure light is	Transnet	EPCM	

ITEM NO.	PROJECT COMPONENT	MITIGATION MEASURES	Main Responsibility	Support	Method Statement / Procedure
		directed downwards while preventing side spill. Manufacturers have such lights in their catalogues. This may require that light pole numbers will increase to give the required illumination on the ground. Lighting for security and safety must be directed downwards and towards the structures to reduce light spill beyond the property boundary.			
j	GEN	Area lighting on tall masts should be confined to the lower landform elevations. Tall structures such as towers will by law (aviation requirements) have to be fitted with a red flashing light if they exceed a certain height. These structures should be limited to a minimum height to reduce having to comply with aviation requirements.	Transnet	EPCM	
k	GEN	To limit the visual impact of the facilities on the adjacent community and from the roads close to the site, screening berms should be constructed from material removed from the site. These berms must be of sufficient height and be vegetated with indigenous vegetation. To be effective, the berms should be constructed as close as possible to the viewer. The forms of the berms should be organic (non-geometric). A geometrically-shaped berm will impose an additional visual impact on the landscape by contrasting with the flowing forms of the landscape, thereby defeating its purpose.	Transnet	EPCM	
l	GEN	The Contractor shall ensure that all existing large trees, if any are present, which fall outside the earthworks area on any construction site, are retained, to act as visual screening element.	Transnet	EPCM	
m	GEN	Wherever possible, existing vegetation beyond the site's perimeter should be supplemented if it will improve the screening of the Terminals and Pump Stations from the adjacent land uses. This should be considered, particularly where the land use is residential.	Transnet	EPCM	
n	GEN	The colour of the visible portion of the tanks at the Pump Stations and Terminal sites shall be two-tone, subject to approval from Transnet. The top portion seen against the sky shall be grey or light grey while the lower portion shall be olive green or rust coloured.	Transnet	EPCM	
o	GEN monitoring	The rehabilitation and stabilisation by vegetation of all new landforms e.g. platform side slopes, road fill or cut slopes must be done as soon as the forms are complete. The monitoring and management of the vegetation programme is important to ensure that problems (erosion, die back and lack of grass cover) are identified early so that corrective measures can be taken.	Transnet	EPCM	

5.2.12 Groundwater Pollution – Inland Terminal

ITEM NO.	PROJECT COMPONENT	MITIGATION MEASURES	Main Responsibility	Support	Method Statement / Procedure
a	Inland terminal	Catastrophic failure of the storage facilities resulting in leakage of hydrocarbon fuels is a potentially severe impact to groundwater surrounding ecosystems. The facility should be designed in such a way that any leakage is contained, or in the event of total failure, does not flow towards or seep into the pan situated to the north of the site.	Transnet	EPCM	
b	Inland terminal	Before borehole BH 1 (Annexure D) is included for long-term systematic monitoring purposes, it is recommended that it is purged by pumping it dry repeatedly to ensure that all the contingent contamination is flushed out.	Transnet	EPCM	
c	Inland terminal	An additional monitoring borehole should be drilled up-gradient from the site in order to compare up-gradient concentrations with the concentrations obtained in boreholes BH1 and BH6 (newly drilled borehole). (Annexure D). Monitoring of the boreholes will verify the existing water quality within the aquifer and will also identify any alteration of water quality over time.	Transnet	EPCM	
d	Inland terminal	Monitoring of the boreholes should be undertaken on a quarterly basis to verify the efficiency of the secondary containment structures, as discussed in the relevant specialist report. The hydrocarbon contaminants for which monitoring should be undertaken are listed in Specialist Study 6 of the Final EIA.	Transnet		√

5.2.13 Surface Water Pollution – Inland Terminal

ITEM NO.	GENERAL/ SITE SPECIFIC	ENVIRONMENTAL DESIGN REQUIREMENTS AND CRITERIA	Main Responsibility	Support	Method Statement / Procedure
a	SS	Transnet shall ensure that the design of the water management facilities includes sufficient storage in the final spill basin to permit a reduction in the release rate of treated effluent to less than the maximum proposed rate of 30l/s, should this prove to be necessary once operational monitoring is underway.	Transnet	EPCM	
b	SS	Transnet shall ensure that the outlet from the final spilling basin to the environment makes provision to vary the release at intervals below the maximum flow rate.	Transnet	EPCM	
c	SS	Design an artificial wetland into which the discharge is proposed with the involvement of an expert thoroughly familiar with the functioning of such systems. It is important that this wetland is managed and its effectiveness monitored and not seen as a walk away technology.	Transnet	EPCM	
d	SS	Transnet shall develop a detailed water and waste management plan in which the approach, control methods and day to day management and monitoring commitments are clearly specified. This should include details of the proposals specified in the Effluent Management Philosophy to capture oils and grease products to be stored, treat them to an acceptable water	Transnet	EPCM	

ITEM NO.	GENERAL/ SITE SPECIFIC	ENVIRONMENTAL DESIGN REQUIREMENTS AND CRITERIA	Main Responsibility	Support	Method Statement / Procedure
		quality, and remove the residue to an appropriate waste site or for reprocessing. The proposed philosophy for Transnet's inland terminal (NMPP Alliance, Drainage and Effluent Philosophy, 28 July 2008, Doc. No. 2684358-U-AA00-PR-PH-005) will need to be refined and thereafter form the basis of detailed design and management requirements. Details needed: <ul style="list-style-type: none"> • expected discharge rates from the site (daily time step); • volumes of the storage facility including the final; • water treatment options; and • release strategies (where, when and how including details of the artificial wetland). 			
e	SS	Prior to first operation of the terminal, Transnet shall conduct a series of definitive ecotoxicity tests, based on the most representative sample possible, including traces of any other possible contaminants such as foam products used for fire fighting. The tests are to be prepared by an accredited laboratory and submitted to DWAF.	Transnet	EPCM	
f	SS Monitoring	Transnet shall undertake quarterly in-stream bio-monitoring (ecotoxicity monitoring), both upstream and downstream of the discharge point once the terminal is operational. Include site observations of sediment and water appearance for possible oil contamination. Bio-monitoring is to be undertaken by an accredited laboratory. Results are to be analysed and evaluated and the full reports submitted to DWAF, the local municipality, Gauteng Nature Conservation and the Rivers database on a monthly basis.	Transnet		
g	SS Monitoring	Transnet shall develop a record of the relationship between releases from the terminal's final spilling basin and flows in the Blesbokspruit. This will necessitate the development of rating curves and regular measurement of flows at a convenient point in the Blesbokspruit, such as the river bridge on the Poortjie Road. It will also require records to be kept of the rate of release of effluent from the final spilling basin. This release monitoring programme should be continued for a minimum of 3 years and until there is sufficient data to determine a flow dilution curve that can be used to minimise potential ecological impacts in the Blesbokspruit. Subject to an absence of significant impact the monitoring can be discontinued at this point.	Transnet		
h	SS Monitoring	Transnet shall consider the use of biological indicators, such as Daphnia, as a quick method of checking water quality in the final spilling basin prior to release. This will obviate the need for extensive laboratory testing, since portable instruments are not available to test as low as concentrations as 2.5mg/l. The possibility of using this method is to be developed further and included within the final operational water and waste management plan for the terminal.	Transnet		

5.2.14 Inland Terminal – Conservation Offsets

ITEM NO.	PROJECT COMPONENT	MITIGATION MEASURES	Main Responsibility	Support	Method Statement / Procedure
a	Inland Terminal	Due to the combined impacts of current and proposed developments at the Inland Terminal, an area between the R42, the road to Poortje, the Blesbokspruit and a tributary of the Blesbokspruit in the east is proposed as a conservation offset to accommodate the Giant Bullfrogs and associated amphibians and reptiles. The conservation offset is intended as a means of ensuring the survival of a viable population of the threatened species in this area, as well as providing a refuge for other important wildlife. The offset area is approximately 300 ha which includes the Terminal area. It is proposed that this area should be protected.	Transnet		
b	Inland Terminal	If it is made available for the grazing of livestock, stocking capacity must be strictly controlled to increase above ground plant biomass. No termite mounds that occur outside of the terminal construction area should be destroyed. In order to be effective, cultivation around the pan which is the Bullfrog breeding site must cease. This is important for both juvenile and adult frogs, but perhaps more so for the former which may not burrow as deep as the adult.	Transnet		
c	Inland Terminal	<p>Transnet shall continue to negotiate with the Lesedi Local Municipality and GDACE and come to an agreement as to how the conservation may be implemented and managed. It is understood that there are some constraints affecting the alienation of the land which would require the approval of the Premier of the province to alter. The negotiations necessary to settle this matter with the Provincial Authorities, the Lesedi Municipality and the lessees of the Commonage are not a part of this EIA. However, the benefits of such a land management proposal, with agreed compensation for lost agricultural land would be:</p> <ul style="list-style-type: none"> • A guarantee of conservation of the Bullfrog breeding colony at the pan. • Much improved ecological conditions between the pan and the Blesbokspruit, with a guarantee of conserved habitat for threatened species such as the Grass Owl. • An opportunity to create linkages between the conservation area and other areas along the Blesbokspruit, which is an objective of the Lesedi Environmental Management Framework. • An occupant (Transnet) to assist in the maintenance of the conservation area, which would help resolve one of the problems GDACE faces in respect of the management of a small but important conservation areas. • Fair replacement of the lost agricultural land and farming infrastructure or other agreed means of ensuring the Department of Land Affairs and Municipal goals for expansion of community agriculture are not compromised and that the current lessees of the land are not placed at any disadvantage compared with 	Transnet		

ITEM NO.	PROJECT COMPONENT	MITIGATION MEASURES	Main Responsibility	Support	Method Statement / Procedure
		<p>their current circumstances.</p> <p>It is emphasised that the above proposals are made as a basis for discussion between the major parties and are not intended as binding requirements of a Record of Decision. It is understood that Transnet, Lesedi Municipality and GDACE have recently determined that a final agreement will be entered into, based on a Memorandum of Understanding (MOU) between the three parties. In support of the MOU, it will be necessary to:</p> <ul style="list-style-type: none"> • Determine the critical factors that are required to make this conservation scheme a success (an Environmental Sustainability Study). Such a study must include an assessment of the carrying capacity of the land proposed for conservation purposes, a review of management requirements for the conservation area with particular reference to actions necessary to facilitate a reduction in threat to the Bullfrog community, and determination of ways of encouraging grass owls and other threatened species. • Establish the final parameters of the environmental offset required by GDACE, including the obligations of each party to the scheme and its administration and management, and all other requirements to make the proposal workable and sustainable. • Define the most appropriate way of compensating the Municipality for the loss of land and of providing alternative means of meeting Municipal objectives to provide grazing and arable land to previously disadvantaged communities. The MOU shall also establish appropriate means of compensating existing leaseholders for any losses incurred as a result of the Transnet NMPP facility and the establishment of the larger conservation area. 			
d	Inland Terminal	<p>The breeding success of the African Bullfrog and Grass Owl occurrence and breeding in the Conservation Area shall be monitored at intervals that are agreed with Lesedi Municipality and GDACE. The schedule shall be included in the Management Framework for the Conservation Area, to be determined through discussion between the three parties. Monitoring should be undertaken as a part of the range management and stocking programme, managed by an ecologist.</p>	Transnet		

5.3 Servitude Maintenance and Repairs

5.3.1 Soil, Surface and Groundwater

ITEM NO.	PROJECT COMPONENT	MITIGATION MEASURES	Main Responsibility	Support	Method Statement / Procedure
a	Pipeline	Transnet shall maintain a full record of landowner communications after construction during the operational phase. If any complaints are logged about lost soil productivity, prepare a follow-up audit and record the nature of the problem and whether it has been resolved. These records are to be made available for independent audit.	Transnet		
b	All	If water within a stream / wetland is to be diverted for operational maintenance or repair reasons, the construction of dams and the impeding of flow must be authorised by the Department of Water Affairs and Forestry as part of the permitting process under the National Water Act (Act 36 of 1998).	Transnet		
c	All	Any dam / impoundment constructed should only be a temporary structure and must be completely removed once the repair of the pipeline has been completed. The area covered by the dam wall, and by any water impounded behind this structure, including any vegetation that is disturbed must be completely rehabilitated.	Transnet		
d	All	Transnet shall undertake diligent aftercare with maintenance crews visiting the site after every major storm, at least in the first summer and until stability and resilience are attained, and damage is repaired (ie rills and gullies are filled, smoothed and re-grassed).	Transnet		

5.3.2 Air Quality and Noise

ITEM NO.	PROJECT COMPONENT	MITIGATION MEASURES	Main Responsibility	Support	Method Statement / Procedure
a	All	Dust suppression shall be employed wherever maintenance or repair of any component of the project, including the pipeline and associated installations, Pump Stations or Terminals require vegetation removal. Dust levels shall be controlled to the extent that adjacent parties are not adversely affected. Where complaints are received immediate remedial action shall be taken to ensure that the problem does not persist.	Transnet		
b	All	Transnet Pipelines must ensure that noise levels at the Pump Stations and Terminals adhere to the relevant noise regulations. Ambient operational noise levels must be within the operational parameters established for the project and all applicable legislation pertaining to noise must be adhered to. Wherever local authorities have determined maximum allowable ceiling noise levels for certain areas, these levels shall be adhered to.	Transnet		

5.3.3 Biodiversity

ITEM NO.	PROJECT COMPONENT	MITIGATION MEASURES	Main Responsibility	Support	Method Statement / Procedure
a	Pipeline	Transnet shall be responsible to the implementation of a Rehabilitation Plan for the Construction Right of Way after the Contractor defects period is over. This Plan shall include a detailed 'monitoring programme' intended to monitor the success of re-vegetation and enable the recommendation of management interventions were necessary. Such monitoring should be conducted over a period of at least 5 years. Annual site inspections carried out by suitably qualified specialists and photographic surveys summarised in periodic assessment reports shall be carried out.	Transnet		√
b	Pipeline	In accordance with the document entitled 'GDACE Requirements for Biodiversity Assessments' (GDACE, 2006), an ongoing monitoring and eradication programme for all invasive plant species growing within the pipeline servitude must be implemented by Transnet.	Transnet		
c	Pipeline	Indigenous vegetation must be maintained within the permanent pipeline servitude. Any area that is disturbed by Transnet Pipelines must be re-vegetated and rehabilitated. A vegetation / rehabilitation specialist might be used to advice on the most appropriate measures for re-vegetation. Natural vegetative conditions should be encouraged.	Transnet		
d	All	No roads related to operational maintenance of the pipeline should be constructed through wetlands.	Transnet		
e	All	Rehabilitation must be executed in such a manner that surface run-off will not cause erosion of disturbed areas during and following rehabilitation.	Transnet		

ITEM NO.	PROJECT COMPONENT	MITIGATION MEASURES	Main Responsibility	Support	Method Statement / Procedure
f	All	No faunal species occurring either within the permanent pipeline servitude or on adjacent properties may be intentionally harmed by maintenance staff during any routine maintenance of the pipeline. The setting of snares will be strictly prohibited and Transnet shall take stringent actions against any individual found to be guilty of such offence.	Transnet		

5.3.4 Wetlands

ITEM NO.	PROJECT COMPONENT	MITIGATION MEASURES	Main Responsibility	Support	Method Statement / Procedure
a	Pipeline	<p>As a general principle, wetland soils should not be disturbed through any maintenance or repairs work. However, if the pipeline section within a wetland needs to be accessed for emergency repairs, the mitigation below must be applied:</p> <p>Erosion Control</p> <ul style="list-style-type: none"> • Where possible, silt barriers or other relevant measures shall be installed along the edge of streams and wetlands, to prevent soil erosion and sedimentation from the maintenance works into the adjacent water body. • If any signs of erosion develop wherever the pipeline passes through a wetland or riparian area, the maintenance and repair Contractor or Transnet shall immediately refer the matter to an agricultural engineer. • Every effort must be taken to ensure that wherever a trench is excavated, it is backfilled and vegetation blocks re-instated in as short a time as possible. <p>Trenching</p> <ul style="list-style-type: none"> • Where trenching is done, soils removed must be separately stored and returned in the reverse order as they were removed to reinstate any subsurface layering of the profiles. All soils shall be stored in such a manner and position that it is not disturbed by construction activities. • Topsoil shall be protected from wash away and shall be covered with Hessian sheets or similar acceptable cover if it will be stockpiled for a period of two weeks or longer. • Where trenches are dug through seasonal and permanent sections of wetlands (where seepage is thus likely to be a factor) the sides of trenches should be stabilised through shoring up or battering back, to ensure that the trenches do not collapse. • Where they occur within wetlands, impermeable clay layers or hard plinthites must be restored to ensure that perched water tables supporting wetland habitats are 	Transnet		

ITEM NO.	PROJECT COMPONENT	MITIGATION MEASURES	Main Responsibility	Support	Method Statement / Procedure
		<p>kept intact. Impermeable layers encountered within the wetland, and their depths must be noted. In the event of the need to disrupt a previously impermeable layer such as ferricrete, measures must be taken to ensure that the non-permeability of this layer is restored.</p> <ul style="list-style-type: none"> • All trench breakers that are temporarily disturbed as a result of maintenance and / or repair activities shall be reinstated prior to back filling. Where trenching required for maintenance may potentially increase the risk of preferential subsurface drainage routes, additional trench breakers shall be installed. • Clay material for clay plugs (if these are used) shall not be sourced from the servitude, adjacent areas or wetland / riparian habitat, but from a commercial source. • The working right of way limit must be restricted to the minimum required to complete the work. This will limit compaction of the soils by the heavy machinery and prevent the vehicles from sinking in to the wet/moist soil 			
b	Pipeline	Where possible, any required pipeline rehabilitation during operation and maintenance in wetland and rivers should occur during dry (winter months) when water levels and seepage are at their lowest.	Transnet		
c	Pipeline	Vegetation removal within any wetland or riparian habitat area shall be done as described in elsewhere in this the DEMP.	Transnet		

5.3.5 Waste Management

ITEM NO.	PROJECT COMPONENT	MITIGATION MEASURES	Main Responsibility	Support	Method Statement / Procedure
a	Pump stations, Terminals	Transnet shall ensure that to whatever extent is practicable, solid waste generated at all Pump Station and Terminals installations is separated into recyclable and non-recyclable items and that recycling takes place.	Transnet		
b	Pump stations, Terminals	Transnet shall ensure that solid waste collection and sanitation is managed effectively at all Pump Stations and Terminals in order to avoid the possibility of ground and surface water pollution.	Transnet		

6 Decommissioning Phase– Generic

6.1 Pipeline Decommissioning

6.1.1 Abandonment Plan

ITEM NO.	GENERAL/ SITE SPECIFIC	MITIGATION MEASURES	Main Responsibility	Support	Method Statement / Procedure
a	GEN	Transnet shall prepare an Abandonment Plan for submission to the regulatory authorities, at least three years ahead of abandonment. The appropriate authorities and the laws that must be complied with shall be those applicable at the time.	Transnet		√

6.1.2 Abandonment Options

ITEM NO.	GENERAL/ SITE SPECIFIC	MITIGATION MEASURES	Main Responsibility	Support	Method Statement / Procedure
a	GEN	Transnet shall determine whether there are any practical options to re-use the pipeline in preference to abandoning it. These shall be discussed with the regulatory authority(s). Assuming that there are no such options, the specifications below shall apply.	Transnet		
b	GEN	Two basic options that Transnet shall consider are: <ul style="list-style-type: none"> • abandonment-in-place and • pipeline removal. In the former case, the cathodic protection of the pipeline shall be removed. In addition to these options, any further options that are relevant at the time shall be considered, taking into account existing and future land use around the pipeline. These may include the opportunity to re-use the pipeline for other purposes.	Transnet		
c	GEN	The abandonment techniques described in this EMP are confined to those possible using currently available technology. As pipeline abandonment's become more prevalent, improved abandonment methods will probably be developed. Transnet shall comply with the prevailing best practice in the petroleum industry to determine and implement abandonment options.	Transnet		

6.1.3 Development and Implementation of an Abandonment Plan

ITEM NO.	GENERAL/ SITE SPECIFIC	MITIGATION MEASURES	Main Responsibility	Support	Method Statement / Procedure
a	GEN	Transnet shall prepare a site specific analysis in order to develop the Abandonment Plan. The analysis shall include an assessment of any relevant environmental and land use issues applicable at the time.	Transnet		
b	GEN	Transnet shall consider whether cost-effective alternatives are feasible for the various sections of pipeline. One abandonment technique may not be employed for the entire pipeline, and Transnet shall determine whether different options exist for the various sections of pipe.	Transnet		
c	GEN	Transnet shall provide an opportunity for meaningful input into the planning process by the affected stakeholders, as defined by the scope of the project. In particular, landowners and land managers shall be consulted in this process, in accordance with a recognized guideline such as the Department of Environmental Affairs and Tourism Guideline Series on Integrated Environmental Management (1992).	Transnet		
d	GEN	Transnet shall review the legal framework under which the pipeline is operated at the time. Beyond the requirements of the principal regulatory authorities, Transnet shall determine any other legislation that may affect the abandonment project (for example, municipal requirements) and this shall be considered and complied with.	Transnet		
e	GEN	Transnet shall review the servitude agreements with landowners to verify whether any terms and conditions in the agreements have a bearing on the abandonment decision-making process.	Transnet		
f	GEN	Transnet shall secure landowner and authority approvals, as required at the time, for the pipeline abandonment and site rehabilitation and shall implement the Abandonment Plan, the scope of which should include post-abandonment responsibilities.	Transnet		
g	GEN	On completion of the abandonment project, Transnet shall secure final authority release.	Transnet		

6.1.4 Post - Abandonment Responsibilities

ITEM NO.	GENERAL/ SITE SPECIFIC	MITIGATION MEASURES	Main Responsibility	Support	Method Statement / Procedure
a	GEN monitoring	Once the pipeline has been abandoned, Transnet may retain a number of responsibilities. These may include responsibility for ensuring that the right-of-way and any facilities left in place remain free of problems associated with the abandonment. If required by the regulatory authorities, a Right-of-Way monitoring program shall be included in the Post-Abandonment Plan and accounted for in the abandonment budget.	Transnet		
b	GEN monitoring	In developing a monitoring plan, Transnet shall consider the effects of each abandonment issue for each segment of the pipeline being abandoned. Specific monitoring requirements shall be included for potentially sensitive areas.	Transnet		

6.1.5 Key environmental issues during Pipeline Abandonment

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a	GEN	Abandonment issues arise from the need to address public safety, environmental protection, and future land use. The primary environmental issues that typically need to be considered are as follows: <ul style="list-style-type: none"> • land use management; • ground subsidence; • soil and groundwater contamination; • pipe cleanliness; • water crossings; • erosion; • creation of water conduits. 	Transnet		
b	GEN	Most issues are not unique to the abandonment phase of the pipeline life-cycle, but could involve an altered scope, varied timeline, or additional stakeholders when compared to the issues of pipeline installation and operation. In order to responsibly abandon a pipeline, the owner must consider all of the issues and determine how they relate to the pipeline under consideration, in addition to addressing stakeholder concerns and incorporating collected input.	Transnet		
c	GEN	It is possible that a combination of both the abandonment-in-place and removal options will be used, based on site-specific requirements. Thus, it is important that all aspects	Transnet		

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		of the abandonment issues be considered. The abandonment in-place option does not necessarily eliminate the need for land disturbance or field activity, while pipeline removal need not necessarily encompass the same level of disturbance or activity as that of pipeline construction.			
Land Use Management					
d	GEN	Land use is the most important factor to consider in determining whether a pipeline section should be abandoned in place or removed. Therefore, an understanding of the current and potential land uses along the pipeline Right-of-Way is necessary to make informed decisions about available abandonment options.	Transnet		
e	GEN	Of particular concern with respect to land use management are areas sensitive to land disturbance, such as pristine natural habitat, parks, unstable or highly erodible slopes, areas susceptible to severe wind erosion and irrigated land, particularly flood irrigation systems. Additionally, land improvements such as the installation of drainage systems, landscaping, and permanent structure installations could be affected by a proponent's decision to abandon a line.	Transnet		
f	GEN	Future land use should be considered because a pipeline abandoned in place could become a physical obstruction to development, such as excavation for foundations, pilings, or ongoing management practices such as deep ploughing or the installation of sub-drains. It is important that input be gathered from appropriate sources such as landowners, land managers, and local authority's sites to support the decision to abandon in place. In addition, sufficient documentation must be kept to allow for detailed location information for future developers or owners.	Transnet		
g	GEN	<p>The decision to abandon in place or through removal should be made on the basis of a comprehensive site-specific assessment. In this context, the land management characteristics that may be better suited to pipeline abandonment-in-place include:</p> <ul style="list-style-type: none"> • natural areas; • unstable or highly erodible surfaces; • river crossings; • flood irrigated fields; • road and railway crossings; • foreign pipeline crossings; • areas of pristine habitat; • wetlands; • areas exhibiting poor and/or limited access. 	Transnet		
h	GEN	The key environmental protection measures to be considered when a pipeline is to be	Transnet		

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	monitoring	abandoned in place are as follows: <ul style="list-style-type: none"> • minimal disruption to ongoing or future land management activities; • a complete and documented pipeline cleaning procedure; • the clean-up of any spills or contaminated sites to prevailing regulatory requirements; • a re-vegetation strategy to achieve pre-abandonment conditions, keeping erosion control and soil stability as a priority; • topsoil conservation for all areas disturbed during the abandonment process; • reclamation of all site access roads; • documented as-built information for future reference; and • a monitoring program acceptable to all affected parties to ensure a process to complete remediation. 			
i	GEN	Proper environmental protection measures should be implemented, including appropriate soil handling procedures and contingency plans (e.g. for spills and wind or water erosion), protection of cultural features, weed control, and site reclamation.	Transnet		
j	GEN	Prior to the commencement of field activity, rehabilitation criteria should be agreed upon with the regulatory authorities and landowners. The rehabilitation programme will normally be designed to ensure that the condition of the right-of-way land surface is made at least equivalent to that existing just prior to the commencement of abandonment activities, and as close as circumstances permit to the condition of the land that existed prior to pipeline installation, and may entail: <ul style="list-style-type: none"> • removing, storing, and replacing topsoil; • soil contamination analysis and-clean up, if required; • contouring disturbed land to control drainage; • seeding affected areas to prevent erosion and establish vegetation; • removal of all structures to a minimum depth of one metre below final contour elevation; • scarifying and/or compacting excavated areas to compensate for future settlement; and • site-specific environmental requirements. 	Transnet		
k	GEN monitoring	A right-of-way monitoring plan should be developed to ensure that reclamation efforts are successful and that no problems arise.	Transnet		

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Ground Subsidence					
l	GEN	The long-term structural deterioration of a pipeline abandoned in place may lead to some measure of ground subsidence. This is a primary issue to consider for larger-diameter pipelines because of potential environmental and safety concerns. More particularly, ground subsidence could create the potential for water channelling and subsequent erosion, lead to topsoil loss, impact on land use and land aesthetics, and/or pose a safety hazard.	Transnet		
m	GEN	The acceptable subsidence limits and the potential factors affecting those limits are significant areas requiring attention in the development of any abandonment plan. Erosion may cause direct siltation to a watercourse, or cause slope failures and subsequent siltation. Where potential siltation is an issue, the owner must be prepared to deal with protection measures for aquatic species.	Transnet		
Soil and Groundwater Contamination					
n	GEN	The Abandonment Plan should address the potential for contamination associated with the abandonment activities, as well as the need to eliminate any contamination that may already exist, and include the appropriate pipe cleaning or pigging procedure. Any contamination noted prior to abandonment activity should be cleaned up to the applicable legal standards prior to full project disturbance, unless it is more economical to include the cleanup in the scope of abandonment activity and it can be demonstrated that environmental damage will not be amplified.	Transnet		
o	GEN	Typical sources of contamination that need to be considered are: <ul style="list-style-type: none"> • the substances produced from the reservoir in the hydrocarbon stream and deposited on the walls of the pipeline; • pipeline coatings and their degradation products • historical leaks and spills of product that were not cleaned to current standards 	Transnet		
Pipe Cleanliness					
p	GEN	In light of potential contamination concerns, the cleanliness of the pipeline is an issue for both abandonment techniques. Pipe that is to be removed should be cleaned to a level where any remaining residues will not cause harm in any future intended use of the pipe. Removed pipe that may eventually be put to some alternative use (e.g. pilings) may require more study to determine the appropriate cleanliness requirements for the future use. For pipe that is targeted for disposal, existing disposal or land filling guidelines will determine the required cleanliness of the pipe.	Transnet		
q	GEN	For pipe that will be abandoned in place, the issue of pipe cleanliness is related to corrosion and the creation of water conduits. Eventually the pipe will corrode until perforated and the structural integrity of the pipe will suffer. Whether the rate of	Transnet		

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		deterioration will be greater than the life of the contaminants left as internal residue of the pipe will depend on local circumstances and will need to be considered. Similarly, the rate and structural location of any corrosion must be considered, in that it may allow water to infiltrate the abandoned pipe and transport pipe residues to some other exit point.			
Water Crossings					
r	GEN + SS	There are many factors to consider in deciding whether a section of pipeline crossing a water body or wetland should be abandoned in place or removed. More specifically, the risks associated with abandoning the pipeline in place, including the potential for contamination and pipe exposure, have to be weighed against the cost and environmental impact of removal.	Transnet		
s	GEN	These trade-offs should be assessed on a site-specific basis, taking into account the size and dynamics of the water body, the design of the pipeline crossing, soil characteristics, slope stability, and environmental sensitivities. While these issues must be evaluated, in most cases it can be expected that abandonment-in-place will be the preferred option.	Transnet		
t	GEN	If the pipeline crossing is to be abandoned in place, the pipe should be left in as clean a state as possible to minimize the potential for contamination of the water body should the eventual perforation and failure of the pipe allow any internal residues to escape. The strategic placement of caps and plugs will also help mitigate this concern by interrupting the movement of potential contaminants through the abandoned pipe.	Transnet		
u	GEN	The risk of pipe exposure is two-fold. First, the pipeline could become exposed if the overlying soil is gradually eroded or washed away because of the dynamics of the water body (e.g. stream bank migration, scour, or flood conditions). Secondly, an empty pipeline crossing a water body or wet area could float toward the surface if buoyancy control mechanisms fail (e.g. if concrete saddle weights slide off). In either case, the probability that the pipeline could become exposed and the impacts that exposure would entail should be assessed.	Transnet		
v	GEN	If the pipeline is to be removed in whole or in part, the issues would be similar in many ways to those associated with initial construction across the water body or wetland. More specifically, many of the same construction techniques and environmental protection measures would apply. Aspects to address include fisheries spawning times, habitat protection, sediment control, vehicle and equipment crossing methods, backfill material specifications, erosion control measures (both short term and long term), and bank restoration. Damage to any existing bank stabilization structures or destabilization of previously stable banks should be considered.	Transnet		

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w	GEN	It is important that the pipe be as clean as possible prior to excavation to minimize the potential for contamination of the water body should the pipe be damaged and spills occur during the removal procedure.	Transnet		
Erosion					
x	GEN + SS	Soil erosion is a concern during all phases of the pipeline life-cycle, particularly as it relates to slope stability. Leaving a pipeline in the ground may entail a certain amount of activity along the right-of-way to ensure responsible abandonment, such as excavations to confirm cleaning quality and the installation of caps or plugs. The potential impact of the ensuing right-of-way disturbance will vary greatly with the geographic location of the activity.	Transnet		
y	GEN + SS	If the pipe is to be removed, erosion and slope stability concerns will be similar to those for pipeline construction. For example, traffic, soil compaction, and the water erosion of disturbed soil may be of concern. In addition, the pipeline may have become a structural support to many slopes over time, and its removal may affect the integrity of the slope.	Transnet		
z	GEN + SS	When developing an Abandonment Plan for the pipeline any erosion remediation that has occurred over the operating life of the pipeline should be reviewed. If erosion control measures have been regularly required at specific locations, it may be necessary to implement longer term erosion control measures.	Transnet		
aa	GEN + SS	If the abandonment activities necessitate disturbing erosion-prone areas including slopes, protection measures designed to current standards should be implemented. In addition, the integrity and effectiveness of any existing ditch plugs, sub-drains, berms, or other installations should be reviewed.	Transnet		
bb	GEN	It is usually more appropriate to abandon pipe at unstable slopes in place, due to the potential requirement for extensive remediation if the pipeline is removed.	Transnet		
Creation of Water Conduits					
cc	GEN	The potential to create water conduits as a result of the abandonment process must be considered as it could lead to concentrated drainage and material transport. This issue is primarily of concern when a pipeline is abandoned in place, since water will eventually infiltrate the pipe through perforations in the pipe wall caused by corrosion.	Transnet		
dd	GEN	Unless water pathways through the pipeline are interrupted, this could lead to the unnatural drainage of areas such as wetlands, thus affecting the natural balance of the ecosystem. Similarly, a previously stable low area could be flooded by volumes of water exiting from a perforated pipeline. If water infiltrates the pipeline, the potential exists for that water to carry any residual contaminants left in the abandoned pipeline to some point of exit. The point of exit could be a watercourse, thereby contaminating the	Transnet		

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		watercourse if contaminant levels are sufficiently great in volume and concentration at the point of exit. The possibility of soil contamination may also exist.			
ee	GEN	Plugs should be considered at appropriate spacers to ensure that changes in surface and ground water conditions will not result in water flow through the pipeline.	Transnet		