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Environmental Impact Assessment: The Proposed Upgrade and new Construction related to the Development of the Swaziland Rail Link Project, for the Davel Rail Yard in Mpumalanga (DEA Reference 14/12/16/3/3/2/551)

Environmental Impact Report - Volume 2

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Title	EAP	Title	Technical Director

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ABBREVIATIONS AND ACRONYMS

AD	Anno Domini
AIA	Air Quality Impact Assessment
BEE	Black Economic Empowerment
BID	Background Information Document
CAPEX	Capital Expenditure
CEMP	Construction Environmental Management Programme
DAFF	Department of Agriculture, Forestry and Fisheries
dB	Decibel
dBA	Sound pressure level that has been A-weighted, or filtered, to match the response of the human ear
DC	Direct current
DEA	Department of Environmental Affairs
DEDET	Department of Economic Development, Environment and Tourism
DEIR	Draft Environment Impact Report
DP	Distributed Power
DRO	Diesel Range Organics
DSR	Draft Scoping Report
DWA	Department of Water Affairs
EA	Environmental Authorisation
EAP	Environmental Assessment Practitioner
ECA	Environment Conservation Act, 73 of 1989
ECO	Environment control officer
EIA	Environmental Impact Assessment
EIA	Early Iron Age
EIR	Environmental Impact Report
EMC	Environmental Management Committee
EMP	Environmental Management Plan
ESA	Early Stone Age
FEL	Front End Loading
GDP	Gross Domestic Product
GFCF	Gross Fixed Capital Formation
GIS	Geographic Information System
GNR	Government Notice
GRO	Gasoline Range Organics
GVA	Gross Value Added
HIA	Heritage Impact Assessment
HIV	Human Immunodeficiency Virus
I&APs	Interested and Affected Parties

IRR	Issues and Response Report
ISO	International Organisation for Standardisation
kV	Kilovolt
LIA	Late Iron Age
LSA	Late Stone Age
MAP	Mean Annual Precipitation
MAR	Mean Annual Run-off
MAT	Mean Annual Temperature
mbgl	meters below ground level
MDEDET	Mpumalanga Department of Economic Development, Environment and Tourism
MEC	Member of Executive Council
MOU	Memorandum of Understanding
MSA	Middle Stone Age
Mtpa	Million tonnes per annum
MTPA	Mpumalanga Tourism and Parks Agency
NEMA	National Environmental Management Act, 107 of 1998
NEM:BA	National Environmental Management Biodiversity Act, 10 of 2004
NEM:WA	National Environmental Management: Waste Act, 59 of 2008
NFEPA	National Freshwater Ecosystem Priority Atlas
NHRA	National Heritage Resources Act, 25 of 1999
NSD	Noise Sensitive Development
NWA	National Water Act, 36 of 1998
OPEX	Operating Expense
PA	Protected Areas
PES	Present Ecological Status
PPP	Public Participation Process
PoSfEIA	Plan of Study for Environmental Impact Assessment
SABS	South African Bureau of Standards
SAHRA	South African Heritage Resource Agency
SANBI	South African National Biodiversity Institute
SANRAL	South African National Roads Agency Limited
SANS	South African National Standard
SAMs	Social Accounting Matrices
SEA	Swaziland Environment Authority
SIA	Social Impact Assessment
SG	Surveyor-General
SNA	Systems of National Accounts
SOC	State-Owned Company
SR	Scoping Report
STD	Sexually Transmitted Disease
Steercom	Steering Committee

TFR	Transnet Freight Rail
USEPA	United States Environmental Protection Agency
VdB	Vibration decibel
WULA	Water Use Licence Application
ZAR	South African Rand

GLOSSARY OF TERMS

Block loads:	A grouping of wagons that are detached or coupled to make up a train.
Cross-overs:	The link between two parallel tracks.
Environment:	The surroundings within which humans exist and that are made up of: (i) The land, water and atmosphere of the earth; (ii) Micro-organisms, plant and animal life; (iii) Any part or combination of (i) and (ii) and the interrelationships among and between them; and (iv) The physical, chemical, aesthetic and cultural properties and conditions of the foregoing that influence human health and wellbeing;
Environmental Impact:	The direct effect of human activities and natural events on the components of the environment.
Environmental Impact Assessment (EIA):	The process of identifying, predicting, evaluating and mitigating the biophysical, social, and other relevant effects of a proposed activity on the environment and the surrounding community prior to major decisions being taken and commitments made.
Environmental Management Plan (EMP):	A document that contains recommendations for the control or management of the potential significant impacts of operations on the environment and recommendations to contain or mitigate actual impacts.
Feasible:	Acceptable, capable of being used or implemented successfully, without unacceptably damaging the environment.
Occupations:	The time duration required to occupy a section of track for maintenance purposes.
Pollution:	Any change in the environment which has an adverse effect on human health or well-being or on the composition, resilience and productivity of natural or managed ecosystems, or on materials useful to people, or will have such an effect in the future.
Public Participation Process:	A process of involving the public in order to identify needs, address concerns, choose options, inform decision making, plan and monitor in terms of a proposed project, programme or development.
Risk:	The scientific judgement of probability and significance of harm to the environment.
Shut:	Refers to the annual shut when maintenance of the infrastructure takes place.
Tie-ins:	The merging of tracks at turn-outs.

EXECUTIVE SUMMARY

INTRODUCTION

Aurecon South Africa (Pty) Ltd have been appointed by Transnet State Owned Company (SOC) Ltd (hereafter referred to as Transnet) to undertake an Environmental Impact Assessment (EIA) process in an effort to obtain environmental authorisation for the proposed Swaziland Railway Link and associated upgrades project.

This document outlines the process followed, describes the proposed development and the context in which it will take place, identifies the potential environmental impacts and prepares mitigation measures to alleviate negative impacts and enhance positive impacts. It presents the identification of key issues or concerns as highlighted by the relevant authorities, Interested and / or Affected Parties (I&APs) and professional judgement of the Environmental Assessment Practitioner (EAP). The results of the specialist studies, a full assessment of the impacts and proposed alternatives form part of this EIA report.

PROJECT BACKGROUND AND MOTIVATION

Transnet in collaboration with Swaziland Railway identified the construction and upgrade of the railway line between Davel in Mpumalanga and Richards Bay in KwaZulu-Natal, connecting via the Swaziland Rail Network, as a strategic project. The aim of the project is to unlock the potential of a multinational strategic rail corridor and divert general freight traffic off the dedicated heavy haul Richards Bay Coal Line which runs from Ermelo through rural KwaZulu-Natal to Richards Bay.

In terms of the National Environmental Management Act, 107 of 1998 the proposed development triggers activities which may significantly impact on the environment. As a result Transnet requires Environmental Authorisation from the competent authority, the Department of Environmental Affairs (DEA) in collaboration with the Mpumalanga Department of Economic Development, Environment and Tourism (MDEDET) to commence with the development.

The project activities will consist of various works, including the upgrading of existing railway sections (including re-building certain sections), construction of an entirely new rail link from Lothair in South Africa to Sidvokodvo in Swaziland and construction of new rail yards. These proposed works trigger a number of listed activities as specified in the National Environmental Management Act (NEMA), 107 of 1998, the National Water Act (NWA), 36 of 1998 and the National Environmental Management: Waste Act (NEM:WA), 59 of 2008.

The project holds significant advantages in relieving the general freight bound pressure on the Richards Bay Coal Line. It provides a strategic link to congested South African export ports, as well as encouraging economic and rail transport growth in Swaziland, thus in turn reducing the need for road transport and minimising damage to roads from heavy vehicles.

ENVIRONMENTAL IMPACT ASSESSMENT REQUIREMENTS

The proposed development involves listed activities, as defined by the National Environmental Management Act, 107 of 1998 (NEMA). The National Department of Environmental Affairs (DEA) is the responsible regulatory authority. Table 5, Table 6 and Table 7 (Chapter 2) summarise the applicable listed activities in terms of NEMA which are being applied for.

PUBLIC PARTICIPATION AND STAKEHOLDER ENGAGEMENT

In order to afford the I&APs the opportunity to become involved and be part of the process the public participation process as set out in the NEMA regulations was followed. During the process I&APs have been afforded the opportunity to raise issues of concern that have been recorded and included in the Final Scoping Report. In addition to this, I&APs will again be afforded an opportunity to comment on the draft Environmental Impact Report (EIR). This ensures that the stakeholder concerns are captured into the final EIR which will be submitted to the DEA for consideration.

The public participation process was initiated by the placement of an advertisement, in the prescribed format, in a regional (The Highvelder, Mpumalanga) and national (Die Beeld, Afrikaans Edition) newspaper on 25 and 27 June 2013. The newspaper advertisements provided details of the activities proposed by Transnet, requested I&APs to register and to become involved in the EIA process of the proposed project. The closing date for submission of comments by I&APs was also indicated.

The commencement of the EIA process for the proposed activities was also advertised by fixing a large number of notice boards in conspicuous places along the proposed alignment. Full detail of these notice boards can be found in Appendix C, Annexure D.

The I&AP database compiled during the EIA process for the proposed project was informed by both the registration of the I&APs through the public notices and notification letters sent to the directly affected landowners. This database was augmented via chain referral and was continually updated as new I&APs were identified throughout the project. A complete list of the I&APs in included in Appendix C, Annexure F.

IDENTIFICATION OF KEY ENVIRONMENTAL ISSUES AND PLAN OF STUDY FOR THE EIR

A baseline description of the environment was gathered through visual inspections of the site and its surroundings, desktop studies as well as specialist findings. This information was used to assess the potential areas of study, as a result of the proposed development.

Construction phase impacts on the physical, biophysical and socio-economic environment that would occur during the construction phase of the proposed project were assessed. They are inherently temporary in duration, but may have longer lasting effects e.g. pollution of a wetland during construction could have effects that may last long after construction is over.

SUMMARY OF THE IMPACT ASSESSMENT CONDUCTED

Impacts were identified as follows:

- An appraisal of the project description and the receiving environment;
- Impacts associated with listed activities as described in Chapter 2;
- Issues highlighted by the Developer and the environmental authorities;
- Findings from the specialist studies; and
- Comments received during public participation.

The following significant environmental impacts associated with the Swaziland Rail Project's Davel Yard upgrade are assessed in this document:

Table 1: Summary table of impacts during the construction phase

CONSTRUCTION PHASE	
Feature	**Impact**
Watercourses	The proposed yard extension falls within a catchment containing two small streams / rivers and the endorheic pan. All of these systems have been classified as part of the National Freshwater Ecosystem Priority Atlas (NFEPA) project. Damage to the catchment can lead to siltation and damage to the riparian habitat, thus adversely affecting aquatic biota.
Hydrology	The rail yard is situated in Quaternary Catchment B11A and the alignment extension that loops around a pan close to KwaDela is in C11F. Impacts on surface waters will occur during rail construction. Pollution from mobilised suspended solids is the major concern particularly for the new alignment that is in close vicinity of the pan at the KwaDela settlement. Potential sources of surface water pollution include: • Wastewater from kitchen and ablution facilities; • Wash bays and workshops; and • Fuelling facilities.
Geohydrology	The local drainage of the area will be in a north-easterly direction (0.01 or 1%) towards an unnamed non-perennial stream which flow into an unnamed Spruit, which flows in a southerly direction. The unnamed Spruit flows into the Vaal River. Potential sources of impact include: • Incorrect disposal of hazardous and non-hazardous materials or waste could contaminate groundwater; • Potential hydrocarbon spillages resulting from a leakage caused by a fracture / crack or rupture in the fuel storage tanks may lead to contamination of groundwater; and • Potential hydrocarbon spillages from equipment, machinery and vehicle storage may lead to contamination of groundwater.
Ecology	The present day land use around the alignment is characterised by rural urban development, KwaDela Township, subsistence agriculture (cattle), large scale commercial crop production and a large modified endorheic pan (depression). Notably the existing rail lines already encroach on this wetland feature. Impacts include the following: • Loss of habitat and removal of vegetation; • Increase in sedimentation and erosion; • Loss of corridors and habitat fragmentation; • Loss of species of special concern; and • The potential spread of alien vegetation.
Heritage	Two sites of heritage and cultural significance are in close proximity to the Davel Yard – the old silos and a graveyard. However, if there is no impact on these structures, no further action would be required by the proponent and no impact on these structures is thus predicted.
Air Quality	The construction phase will be relatively short. It will also result in mainly nuisance impacts in the form of dust. However, the nuisance and other possible impacts should still be managed. Impacts predicted are: • Dust releases from earthworks; and • Construction vehicle exhaust.
Waste	The significant impacts caused by waste are related to hydrocarbon spillages during construction phase, both from the removal and cleaning of contaminated ballast as well as general construction activities.
Noise & Vibration	The main contributors of noise caused by the Davel Yard are night time operations, shunting activities and ballast corrections. Construction phase impacts are considered under the initial day and night scenario impact description.
Social	Positive impacts associated with the project include: • The creation of temporary employment opportunities and social benefits; and • The development of Black Economic Empowerment (BEE) opportunities.

	Negative impacts that may be associated with this phase include: • Influx of job seekers; • Creation of informal settlements; • Possible social pathologies arising from the population influx (such as STDs); • Increase in crime levels; • The need to secure accommodation for construction staff; • Impacts related to traffic and roads; • Impacts related to physical intrusion (i.e. the impacts of dust, noise, etc. on sense of place, etc.); and • Community perceptions and responses.
Socio-economic	The loss of biological assets, forestry plantations and natural vegetation, due to expropriation and reclamation of land as well as the loss of production from such assets could be included in the Capital Expenditure (CAPEX) and Operational Expenditure (OPEX) changes in final demand, respectively. Macro-economic CAPEX on a regional and local scale, and macro-economic OPEX on a regional scale were considered impacts in this specialist field.

Table 2: Summary of impacts during the operational phase

OPERATIONAL PHASE	
Feature	**Impact**
Watercourses	• Impacts associated with rail activities in close proximity to the endorheic pan, such as potential spillages of chemical loads, surface water runoff from contaminated ballast.
Hydrology	Potential sources of surface water pollution include: • Wash bays and workshops; • Fuelling facilities; and • Coal dust and rainfall seepage from the wagons.
Geohydrology	• Potential hydrocarbon spillages resulting from a leakage caused by a fracture / crack or rupture in the fuel storage tanks may lead to contamination of groundwater.
Ecology	• Hydrological impacts on wetlands due to the impediment of flow caused by excess ballast falling into culverts, creating berms; and • Loss of corridors and habitat fragmentation.
Heritage	• Disturbance of cultural and heritage resources.
Air Quality	• Contribution to ambient CO_2; • Contribution to ambient PM_{10}; • Contribution to ambient NO_2; and • Contribution to ambient C_6H_6.
Waste	• Maintenance activities on the yard could lead to hydrocarbon spillages.
Noise & Vibration	The main contributors of noise caused by the Davel Yard are night time operations, shunting activities and ballast corrections. Construction phase impacts are considered under the future day and night scenario impact description.
Social	• Social pathologies arising from population influx (negative); and • Creation / sustaining of employment opportunities (positive);
Socio-economic	The loss of biological assets, forestry plantations and natural vegetation, due to expropriation and reclamation of land as well as the loss of production from such assets could be included in the CAPEX and OPEX changes in final demand, respectively. Macro-economic CAPEX on a regional and local scale, and macro-economic OPEX on a regional scale were considered impacts in this specialist field.

CONCLUSION AND EAP IMPACT STATEMENT

The DEIR provides a description of the feasible alternatives and potential impacts identified during the Scoping and Environmental Phases. It also contains additional information on the affected environment, mostly drawn from the specialist studies conducted. There is a description and assessment of the potential impacts associated with the various feasible alternatives as well as an indication of potential mitigation measures, conclusions and various recommendations with regard to the way forward. A series of Appendices and Annexures containing relevant information, including the various specialist studies is attached to this report.

It is the opinion of the Environmental Assessment Practitioner (EAP) that once final, the information contained in this report and the documentation attached thereto, will be sufficient for the Department of Environmental Affairs (DEA) to make an informed decision regarding the EIA for the proposed upgrade and new construction related to the development of the Swaziland Rail Link Project for the Davel Yard in Mpumalanga. Mitigation measures are proposed to limit the potential negative impacts and to enhance the potential positive impacts.

This report provides an assessment of both benefits and potential negative impacts anticipated as a result of the proposed new Davel Railway Yard. The findings of the assessment conclude that identified significant impacts can be addressed with relevant mitigation measures, therefore, in view of the EAP, no environmental fatal flaws should prevent the proposed project from proceeding.

RECOMMENDATIONS

In order to achieve appropriate environmental management standards and ensure that the findings of the environmental studies are implemented through practical measures, the recommendations of this DEIR have been included in an Environmental Management Plan (EMP). It is recommended the EMP be updated once the final alignment of the Davel Railway Yard has been identified and surveyed. The EMP should be included in the contract of the contractor(s) appointed to construct the Davel Railway Yard. The EMP would be used to monitor compliance with environmental specifications and management guidelines. The implementation of the EMP is crucial for the life cycle of the project and is fundamental in achieving the environmental management standards as set out in this report.

In order to maintain involvement of the community in the implementation of the project, it is recommended that the current communication with the local community and adjacent landowners be maintained during the construction and operational phases of the project by means of an Environmental Management Committee (EMC).

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Appendices

Figures

Tables

1 INTRODUCTION

Aurecon South Africa (Pty) Ltd was appointed by Transnet to provide the environmental services for the Environmental Impact Assessment (EIA) of the proposed upgrade and new construction of the Davel Rail Yard in Mpumalanga. The details of the Environmental Assessment Practitioner (EAP) is summarised below.

1.1 Context of this report

To ensure that the requirements of NEMA are met, the EIR contains the following information as per Section 31(2) of GN R543:

Table 3: EIR contents and chapters

GN R543	CONTENT AS REQUIRED BY NEMA	CHAPTER/ ANNEXURE
31(2) (a)	*Details of (i) the EAP who compiled the report; and*	*Before Executive Summary*
	Details (ii) the expertise of the EAP to carry out an scoping procedures;	*Appendix A*
31(2) (b)	*A detailed description of the proposed activity;*	*Chapter 1*
31(2) (c)	*A description of the property on which the activity is to be undertaken and the location of the activity on the property, or if it is –*	*Chapter 1*
	(i) A linear activity, a description of the route of the activity; or	*Chapter 1*
	(ii) An ocean-based activity, the coordinates where the activity is to be undertaken;	*Not Applicable*
31(2) (d)	*A description of the environment that may be affected by the activity and the manner in which the physical, biological, social, economic and cultural aspects of the environment may be affected by the proposed activity;*	*Chapter 5 (baseline environment) and Chapter 8 (assessment of potential impacts)*
31(2) (e)	*Details of the public participation process conducted in terms of regulation 27(a), including –*	*Chapter 4*
	(i) Steps undertaken in accordance with the plan of study;	*Chapter 4 (PPP) and ToR in Appendix B, Annexure J*
	(ii) A list of persons, organisations and organs of state that were identified	*Appendix C*

	and registered in terms of regulation 55 as interested and affected parties;	
	(iii) A summary of comments and issues raised by registered interested and affected parties, the date of receipt of these comments and the response of the EAP to those comments; and	*Appendix C*
	(iv) Copies of any representations and comments received from registered interested and affected parties;	*Appendix C*
31(2) (f)	*A description of the need and desirability of the proposed activity;*	*Chapter 1*
31(2) (g)	*A description of identified potential alternatives to the proposed activity, including advantages and disadvantages that the proposed activity or alternatives may have on the environment and the community that may be affected by the activity;*	*Chapter 1*
31(2) (h)	*An indication of the methodology used in determining the significance of potential environmental impacts;*	*The complete methodologies for each specialist assessment of the potential impacts are in the specialist report in Appendix B. Methodologies used for interpreting the significance – Chapter 7*
31(2) (i)	*A description and comparative assessment of all alternatives identified during the environmental impact assessment process;*	*Chapter 1*
31(2) (j)	*A summary of findings and recommendations of any specialist report or report on a specialised process;*	*Throughout Chapter 8 and also Chapter 9. Specialist reports – Appendix B*
31(2) (k)	*A description of all environmental issues that were identified during the environmental impact assessment process, an assessment of the significance of each issue and an indication of the extent to which the issue could be addressed by the adoption of mitigation measures;*	*Chapter 8*
31(2) (l)	*An assessment of each identified potentially significant impact, including -*	*Chapter 8*
	(i) Cumulative impacts;	
	(ii) The nature of the impact;	

	(iii) The extent and duration of the impact;	
	(iv) The probability of the impact occurring;	
	(v) The degree to which the impact can be reversed;	
	(vi) The degree to which the impact may cause irreplaceable loss of resources; and	
	(vii) The degree to which the impact can be mitigated;	
31(2) (m)	*A description of any assumptions, uncertainties and gaps in knowledge;*	*Specialist reports contained in Appendix B*
31(2) (n)	*A reasoned opinion as to whether the activity should or should not be authorised, and if the opinion is that it should be authorised, any conditions that should be made in respect of that authorisation;*	*Chapter 9*
31(2) (o)	*An environmental impact statement which contains -*	*Chapter 9*
	(i) A summary of the key findings of the environmental impact assessment; and	
	(ii) A comparative assessment of the positive and negative implications of the proposed activity and identified alternatives;	
31(2) (p)	*Draft environmental management programme containing the aspects contemplated in regulation 33;*	*Appendix E*
31(2) (q)	*Copies of any specialist reports and reports on specialised processes complying with regulation 32;*	*Appendix B*
31(2) (r)	*Any specific information that may be required by the competent authority; and*	*Not applicable*
31(2) (s)	*Any other matters required in terms of sections 24(4) (a) and (b) of the Act.*	*Not applicable*

1.2 Details of the EAP

The Environmental Assessment Practitioner for the project is Dr Pieter Botha. Dr Botha is assisted by Mrs Candice Dürr (environmental scientist) and Ms Elise Vermeulen (public participation practitioner). A summary of their experience and roles in the project is given below. Their full CVs can be found in Appendix A.

Dr Pieter Botha

Project Leader

Dr Pieter Botha holds a DSc from the North West University, Potchefstroom Campus (1981). He is a registered professional natural scientist with the South African Council for Natural Scientific Professions. Dr Botha is also registered as an Environmental Assessment Practitioner with the International Institution for Impact Assessment (South Africa).

Dr Botha joined Aurecon's Environmental Department in May 2010 as a Senior Environmental Practitioner, and has since been involved in various projects. These have included projects such as Front End Loading (FEL) 1 and 2 studies of the Sishen-Saldanha ore line expansion project, and an EIA for the Isundu-Mbewu power line project awarded to Aurecon by Eskom and the FEL-1 and 2 studies for the expansion of the Port of Richards Bay.

Following a career of three decades in the public sector, he established his own consultancy with a view to make a contribution in the area of natural resources management, environmental protection and agriculture in respect of policy and legislation formulation and review, as well as the provision of capacity building in the same areas. He has also undertaken and managed a variety of complex land restitution projects for the Commission on Restitution of Land Rights in Mpumalanga and North West Provinces.

Dr Botha has managed various sections and divisions during his tenure in the public sector, and has, in this regard, been responsible for personnel management, financial management and strategic leadership.

Research has formed a vital part of the projects he has been involved in. Dr Botha started his research career as a range management research officer in the Karoo Region and learnt about the dynamics of the arid areas of South Africa and, in particular, the agricultural systems applied in those areas.

He has over three decades of experience in environmental research, policy development and implementation in South Africa, as well as writing various environmental reports. He also has knowledge and experience relating to biodiversity conservation and utilisation in the southern African region. Dr Botha has also been involved in the development and drafting of policy and subsequent legislation in various facets of the environmental field relating to biodiversity conservation, utilisation and rural development.

An important component of his varied expertise is his involvement in the public participation process (PPP) as a principal element of his diverse projects, engaging with many, different and challenging stakeholders at various different levels of engagement.

Dr Botha has led or been part of delegations in various international meetings and conferences on behalf of South Africa. This required a comprehensive in-depth knowledge of relevant subjects and policies, as well as good negotiation skills.

A copy of Dr Pieter Botha's CV is attached in **Appendix A (annexure A)**.

Mrs Candice Dürr

Assist in conducting and managing the Environmental Assessment Process. Compilation and submission of the Final EIA and EMP to the relevant authority. Liaise with authorities, stakeholders and specialists. Compilation of the water use licenses for the entire alignment.

Mrs Dürr's main focus is on environmental management of related issues within a wide range of infrastructure development which includes environmental impact assessments and environmental management plans for listed activities under the various agencies' environmental legislation. To date Mrs Dürr has gained experience on various projects located in South Africa, including the Eskom Kusile Power Station Project. Mrs Dürr is a qualified Environmental specialist and obtained her Bachelor of Science from the North West University. She is currently enrolled for the final year of her BSc Honours degree in Environmental Management at the University of South Africa.

A copy of Mrs Candice Dürr's CV is attached in **Appendix A (annexure B)**.

Ms Elise Vermeulen

Assist in compilation and submission of the Final EIA's and EMP to the relevant authority. Co-ordinate and liaise with authorities, stakeholders and IAP's. Compilation of the Environmental Management Programmes for the Borrow Pits.

Ms Vermeulen is a qualified Environmental Assessment Practitioner with five year's experience. She obtained a Bachelor of Science degree from the University of Pretoria and an honours degree, with specialisation in Environmental Management from the University of South Africa. Her main focus is on the environmental management of related issues within a wide range of infrastructure development, which includes conducting Environmental Impact Assessments and the compilation and enforcement of Environmental Management Programmes for listed activities under the various agencies' environmental legislation. To date Ms Vermeulen has gained significant experience while working on various projects located in South Africa and Australia.

A copy of Ms Vermeulen's CV is attached in **Appendix A (annexure C)**.

1.3 Introduction to the Project Team

The table below indicates the EIA project team, including the specialists, involved.

Table 4: Details of the EIA project team

Role in Project Team	Name	Company
Project Director	Mr Barend Smit	Aurecon
Project Manager and lead EAP	Dr Pieter Botha	Aurecon
EAP Assistant	Mrs Candice Dürr	Aurecon
Public Participation Practitioner	Mrs Claudia Neethling	Aurecon
Heritage Impact Assessor	Dr Johnny van Schalkwyk	*Private*
Ecological Impact Assessor	Dr Brian Colloty	Scherman Colloty & Associates
Air Quality Impact Assessor	Mr Roelof Burger Dr Martin van Nierop Mrs Anja van Basten	Gondwana Environmental Solutions
Geohydrological Impact Assessor	Mr Louis Stroebel Mr Marius Terblanche	Aurecon
Hydrological Impact Assessor	Dr Nicolas Walker	Aurecon
Noise and Vibration Impact Assessor	Mr Morne de Jager	Enviro-Acoustic Research
Social Impact Assessor	Mr Tebogo Sebego Mrs Noeleen Greyling	Aurecon
Socio-economic Impact Assessor	Dr Stephan Jooste Mr Eben Vos Ms Justine Barnard	Aurecon

1.4 Project Background

Transnet SOC Limited (hereafter referred to as Transnet) is a government (state) owned company (SOC) and is the custodian of South Africa's railway, ports and pipelines, thereby responsible for delivering reliable freight transport and handling services that satisfy customer demand.

As such, Transnet in collaboration with Swaziland Railway identified the construction and upgrade of the railway line between Davel in Mpumalanga and Richards Bay in KwaZulu-Natal, connecting via the Swaziland rail network, as a strategic project. The aim of the project is to unlock the potential of a multinational strategic rail corridor and divert general freight traffic off the dedicated heavy haul Richards Bay coal line which runs from Ermelo through rural KwaZulu-Natal to Richards Bay.

In terms of the National Environmental Management Act, 107 of 1998 the proposed development triggers activities which may significantly impact on the environment. As a result Transnet requires Environmental Authorisation from the competent authority, the Department of Environmental Affairs (DEA) in

collaboration with the Mpumalanga Department of Economic Development, Environment and Tourism (MDEDET) to commence with the development.

The project activities will consist of various works, including the upgrading of existing railway sections (including re-building certain sections), construction of an entirely new rail link from Lothair in South Africa to Sidvokodvo in Swaziland and construction of new rail yards. These proposed works trigger a number of listed activities as specified in the National Environmental Management Act (NEMA), 107 of 1998, the National Water Act (NWA), 36 of 1998 and the National Environmental Management: Waste Act (NEM:WA), 59 of 2008.

Due to the magnitude of the proposed project, which stretches over a distance of approximately 570 km including Swaziland (see figure 1), it was decided that three applications will be compiled as follows:

1. Davel Yard and connections, DEA ref no 14 / 12 / 16 / 3 / 3 / 2 / 551;
2. Mpumalanga Rail Line from Davel to Nerston, DEA ref no 14 / 12 / 16 / 3 / 3 / 2 / 553; and
3. KwaZulu-Natal Railway Line from Golela to Nsezi, DEA ref no 14 / 12 / 16 / 3 / 3 / 2 / 552.

Each of the three sections will go through the EIA process separately, although concurrently (as far as possible) in order to simplify the public participation process and to reduce any potential confusion. **This report specifically pertains to application 1 as mentioned above, i.e. the Davel Yard and connections (ref no: 14/12/16/3/3/2/551).**

Aurecon South Africa (Pty) Ltd was appointed by Transnet to provide the environmental services for the EIA of the proposed Swaziland Rail Link from Davel in Mpumalanga, through Swaziland to Nsezi in Richards Bay (Figure 1).

Figure 1: General layout of the entire Swaziland Railway Link from Davel to Nsezi, The red and purple lines indicates the new link alternatives from Lothair to Sidvokodvo. The blue line represents upgrade and construction sections of the existing railway line

1.5 Need for the Project

Transnet commissioned a concept level study in 2011 to investigate the provision of a new rail link between Lothair (Mpumalanga, South Africa) and a suitable tie-in location along the existing Swaziland Railway Network. The concept unlocks the potential for a multinational strategic rail corridor, while at the same time relieving pressure from the heavy haul Richards Bay Coal Line and the general freight Eastern Mainline to Maputo.

Regional support for this project was confirmed by the signing of the Inter-Governmental Memorandum of Understanding (MOU) between the South African Government represented by the Department of Public Enterprises and the Kingdom of Swaziland represented by the Department of Transport on 2 August 2012. The MOU addresses the governance of a number of matters of commercial interest to both parties, including the Swaziland Rail Link project. The multinational governance of this MOU is vested in an Executive Steering Committee (Steercom).

The signing of the Memorandum of Understanding (MOU) at inter-railway level between South Africa (Transnet) and the Kingdom of Swaziland (Swaziland Railway) on 23 November 2012 reinforced the cooperation and relationship at business and technical levels. The MOU cements the areas addressed in terms of the project structure, governance and accountability at Management (policy, control and governance) levels as well as the functional and discipline-specific fields described in terms of project work streams. The governance of the inter-railway agreement is vested in an inter-railway Steercom.

Inter-governmental and inter-railway cooperation has been applied in the development stage of the Swazi Rail Link project through, amongst others:

- Inter-government meetings and cooperation, culminating in the formal signing of the MOU on August 2012;
- Media presentations in South Africa and Swaziland;
- Inter-railway Steercom and joint Project Steercom meetings on a regular basis; and
- Inter-railway workshops and work stream technical collaboration meeting in South Africa as well as Swaziland.

The creation of a strategic link between South Africa and the export ports of Richards Bay, and Maputo through Swaziland has been found to be technically feasible, with certain risks attached.

The additional demand on parts of the network brought about by increases in traffic volume from sources other than Mpumalanga and central Gauteng make upgrades of the network a critical planning driver. Network upgrades required to achieve the full capacity potential of the project are critical, extensive and expensive, with costs estimated at billions of South African Rands.

The project holds significant advantages in relieving the general freight bound pressure on the Richards Bay Coal Line. It provides a strategic link to congested South African Export Ports, as well as encouraging economic and rail transport growth in Swaziland, thus in turn reducing the need for road transport and minimising damage to roads from heavy vehicles.

1.6 Project Description

The following information was made available to Aurecon by Transnet. Detailed information regarding the location of construction roads, bridges etc. were not available at the time of the compilation of this report.

The new transport node created at Davel is of great significance in both the infrastructure layout as well as operational context of the project. The Transnet operating ideal envisages consolidation of loads into the maximum length consist allowable as close as possible to the source siding(s). Currently loads can vary in length from 40 wagon block loads, through 50 and 60 up to 75 / 80 and 100 wagon trains. Until such time as this operating concept is realised, Davel is designed to fulfil the role of consolidating traffic into optimised lengths suitable for the new Swaziland Rail Link system, i.e. from 75 / 80 to 150 / 160 and 200 wagon trains. The reverse (de-consolidation) has been planned for traffic returning from the export ports.

Davel by definition is focussed on yard construction. There are a number of structures involved, including two major rail over rail bridges forming part of the connecting lines.

Construction interface operations

Davel Yard per se will be constructed clear from existing railway lines but there are tie-ins to existing railway lines:

- Up and down coal lines (during 10 day shut);
- Cross-over on the Hamelfontein Trichardt Line (normal occupations); and
- Tie-ins at the existing Davel Station (Trichardt side) (normal occupations).

Viewing the Swaziland Rail Link system in isolation and taking cognisance of the preferred fuelling method, the most appropriate single fuelling location is arguably at Davel. Modern locomotives have enough diesel capacity to perform round trips between Davel and both Nsezi and Beluluane. Davel is also the origin of most of the consolidated loaded trains and the changeover point from electrical to diesel traction and *vice versa*. Davel will have secondary fuelling facilities, both in-service on the bypass line as well as at the diesel locomotive provisioning facility.

The new transport node created at Davel is of great significance in both the infrastructure layout as well as operational context of the project. A diagrammatic representation of the Davel Yard and links is provided in Figure 2 below.

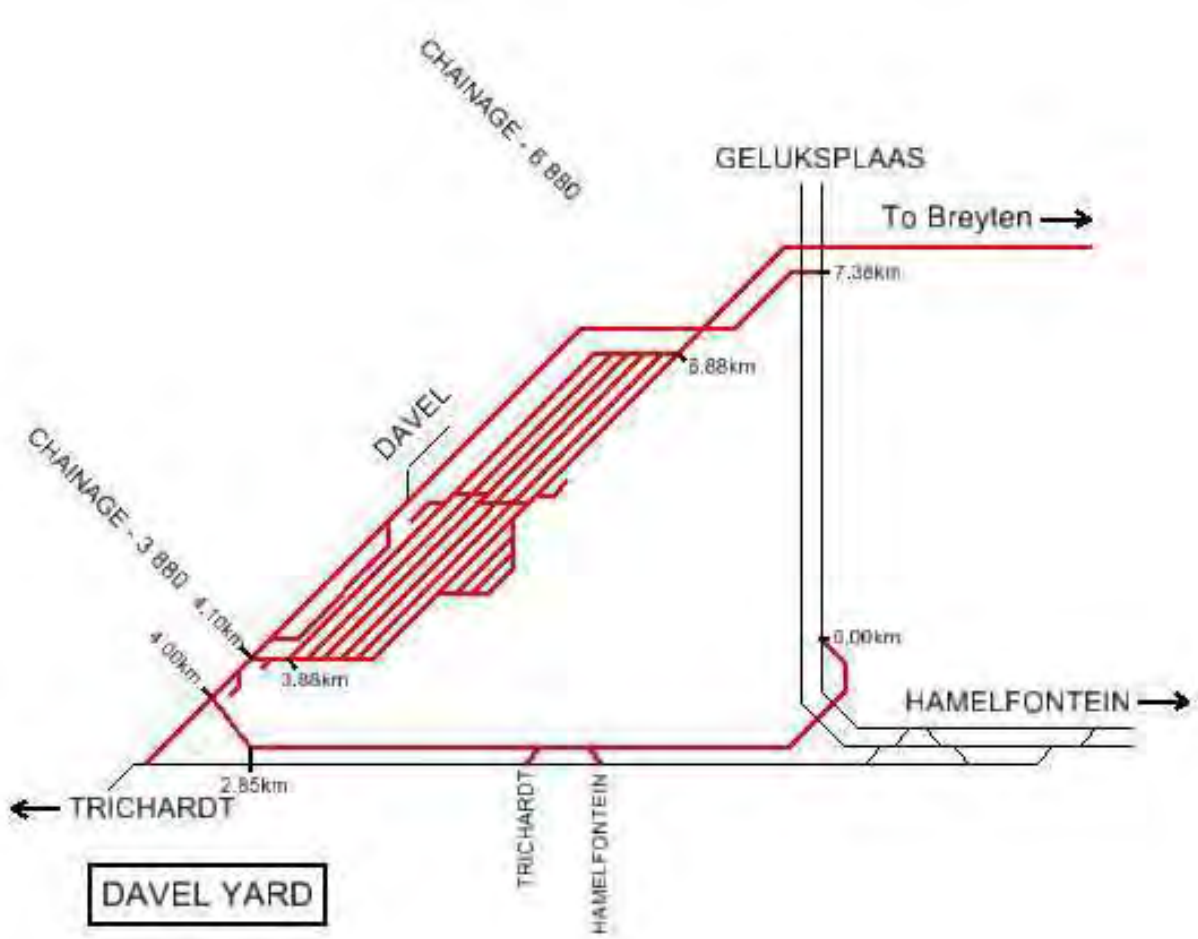


Figure 2: Diagrammatic layout of the Davel Yard and connections

The yard forms a unique nexus between the Coal Line (Webbsrus-Hamelfontein), the Eastern Mainline (Machadodorp-Breyten) as well as the Central Basin (Trichardt). The Transnet operating ideal envisages consolidation of loads into the maximum length allowable as close as possible to the source siding(s). Currently loads can vary in length from 40 wagon block loads, through 50 and 60 up to 75 / 80 and 100 wagon GF trains. Until such time as this operating concept is realised, Davel is designed to fulfil the role of consolidating traffic into optimised lengths suitable for the new Swaziland Rail Link system, i.e. from 75 / 80 to 150 / 160 and 200 wagon trains. The reverse (de-consolidation) has been planned for traffic returning from the export ports.

Crewing and locomotive provisioning depot

Davel functions as major crew facility, with flexibility for multinational competency and allows:

- Scheduled slot allocation;
- System stabilization;
- Centralised operations control; and
- Standardised train design.

Infrastructure features

The yard will include the following infrastructure capabilities:

- Traction change capability - 3 kV DC electric to diesel;
- 200 wagon yard; and
- Distributed Power (DP) network and track layout.

Allowance is also made in the yard design to perform provisioning and light maintenance of electrical locomotives in future, if required.

Davel Yard is for all intents and purposes the start / end of the Swaziland Rail Link system with the majority of trains being re-compiled and dispatched and / or terminated here. The yard will be equipped with a yard automation / points indicator movement control system.

A wagon repair facility will also be provided at Davel Yard. This facility will have the capability to carry out emergency running repairs up to the level of a bogie change-out. The yard layout will allow for the removal of defective wagons as well as a wagon repair line.

The Davel Yard and link lines lie within a fairly complex social and operational environment. Due to the grades of the various railway lines involved, extensive link lines are required to achieve connectivity to the terminus of the new Swaziland Rail Link system. These links traverse areas of biological sensitivity in the form of a large dam, as well as the (present) outskirts of social settlements.

The following functions will be performed at Davel Yard:

- Act as a system regulator by dispatching trains according to the prevailing train plan;
- Traction changeover from / to the 3 kV DC electrical system to / from diesel traction;
- Reconfiguring of traction and appropriate placement of diesel locomotives for DP working;
- Consolidation of wagon rakes into longer trains for transit via the link system;
- Breaking-up of long trains from the link system into applicable lengths and compositions for further transit on TFR's Network;
- Provisioning of diesel locomotives;
- Light (daily) maintenance of diesel locomotives;
- Locomotive fuelling (top-up fuelling only if required);
- Train crewing;
- Train dispatching, including technical / safety inspections; and
- Light, in-service wagon repairs if required.

Although the option of electrifying the rail route will not be considered in this study, allowance is also made in the yard design to perform provisioning and light maintenance of electrical locomotives in future, if required.

During construction as well as the operational phase, the project will endeavour to utilise existing service roads as far as possible. However, it is very likely that new roads for construction purposes as well as maintenance purposes will be constructed. Gravel maintenance roads will typically be 4 m wide, generally following the natural ground level.

New roads to serve as access roads for neighbouring landowners may also be required, depending on the conditions agreed upon between the landowners and Transnet during the land acquisition process. Access roads will also be constructed as gravel roads at a 6 m width, with vertical curves based on design speed.

These roads will be constructed as far from sensitive areas as possible.

Due to the fact that Davel is the origin of most of the consolidated loaded trains and the changeover point from electrical to diesel traction and vice versa, the Davel Yard will be equipped with secondary fuelling facilities, both in-service on the bypass line as well as at the diesel locomotive provisioning facility.

1.6.1 Borrow pits

Transnet envisages the need of a number of borrow pits along the Swaziland Rail Link alignment for construction requirements. It is assumed that a borrow pit near the Davel Yard will also be required to prevent the long haul of materials needed for construction purposes. However, detail of the location and size of the borrow pits is not yet known. Once the detail has been made available, an application for authorisation of borrow pits will be made to the Department of Mineral Resources. All concerns, issues and mitigation measures identified by the specialists during the impact assessments will be taken into consideration during the planning of the location and operations of the borrow pits.

1.7 Proposed alignment alternatives for the Swaziland Railway Link Project

During the FEL 1 feasibility assessments conducted by Transnet and their appointed engineering consultants, the alternatives for establishing a network connection point for the Swaziland Railway Line were considered. Three options were put forward for further feasibility investigations, namely:

- Utilising the existing Ermelo Yard;
- Upgrading the existing Davel Yard; and
- “No Go” alternative.

Utilising the existing Ermelo Yard

Ermelo has been considered as a point of consolidation for all the rail lines from the coal fields to the east coast deep water port of Richards Bay. This was rejected because the Ermelo Yard is a complex convergence point for general freight and export coal trains and under severe operational pressure affecting the achievement of the coal line capacity.

Utilising the Ermelo Yard would require that the Ermelo-Buhrmanskop route would need to be followed in order to reach Lothair. This line has a 3.5 km long section of 1:50 gradients (opposed to the required 1:66 gradients) against loaded trains as well as three road crossings which cannot be easily eliminated. Train length would be limited to 50 wagons as opposed to the desired 200 wagon length train.

The Ermelo-Buhrmanskop Line is presently served only via Ermelo Yard. Traffic anywhere near the target tonnage of 15 Mtpa will materially affect the same coal line heavy haul traffic the project is attempting to ease.

For these reasons the utilisation of the Ermelo Yard as a network connection point is deemed fatally flawed.

Upgrading the existing Davel Yard:

Davel provides an outstanding network connection point, after the provision of connecting links. It functions as a traction change yard and diverts traffic from the coal line 45 km before Ermelo, thus keeping additional traffic away from the busy coal line.

During feasibility investigations the current proposed upgrade for the Davel Yard (as shown in Figure 3) was found to be the only feasible manner in which to upgrade the yard in order for it to become compatible with the remaining proposed alignment upgrades as described in Chapter 1.1.

Therefore, this layout (Figure 3) for the Davel Yard will be taken forward into the EIA phase.

The “No Go” alternative

The “No Go” alternative, that is to retain the Davel Yard as it currently is, was also assessed during the EIA process. This assessment takes into account the impacts that could occur should the project not take place. Over and above the fact that the existing yard cannot accommodate the intended increase in trains that will be travelling along the route, it has a number of negative impacts. These will include social and financial impacts at a local, regional, national and international level due to the strategic importance of the project (as mentioned earlier). Due to these reasons the “No Go” alternative is deemed not feasible as it would be against the strategic decision of rail transportation from South Africa through Swaziland to the port of Richards Bay.

1.8 Project Location

The Davel Yard and its associated infrastructure and connections are proposed to be situated within the existing Davel Yard in Mpumalanga, approximately 20km east of the town of Bethal and approximately 33km west of the town of Ermelo, Mpumalanga. Approximate central coordinates are 26°26'26.69"S and 29°40'16.25"E.

Figure 3: Davel Yard and associated connections

2 LEGISLATIVE FRAMEWORK

The management and mitigation of the environmental impacts experienced during construction and operation is governed by environmental legislation. It is of utmost importance that this project is constructed and operated in compliance with all relevant environmental legislation whether national, provincial and / or local.

The environmental legislative framework and components for South Africa can best be unpacked and summarised as follows.

2.1 National Legislation

2.1.1 The Constitution

Section 24 of the Constitution of the Republic of South Africa Act, 108 of 1996 provides the basic right to an environment which is not harmful to a person's health or well-being, as well as to have the environment protected through legislation and any measures which:

- Prevent pollution and / ecological degradation;
- Promote conservation;
- Secures ecological sustainable development; and
- The sustainable use of resources.

At the same time, Section 25 of the Constitution guarantees everyone the right of access to information which is essential for them to exercise their Constitutional right including any information pertinent to the Environmental Assessment (EA) or EIA process. For this reason, public participation is considered an essential mechanism for informing stakeholders of their rights and obligations in terms of the project.

2.1.2 The National Environmental Management Act, 107 of 1998 (NEMA)

The National Environmental Management Act (NEMA) creates the fundamental legal framework that gives effect to the environmental right guaranteed in Section 24 of the Constitution and sets out the fundamental principles that apply to environmental decision making.

2.1.2.1 The Principles of NEMA

The Principles of NEMA (Chapter 1) not only serve as a framework upon which Environmental Management is based (Section 2(1)(b)), but ensures that people and their needs are always considered (Section 2(2)). This is achieved through avoiding and minimising:

- Disturbance on ecosystems or loss of biological diversity (Section 2(4)(a)(i));
- Pollution and degradation of the environment (Section 2(4)(a)(ii)); and
- Negative impacts on the environment and people's environmental rights (Section 2(4)(a)(viii));

The principles of NEMA further require that a cautious, methodological approach be applied which takes into account knowledge or information gaps (Section 2(4)(a)(vii)) so that, as far as possible, all positive or negative impacts on the environment are considered and assessed in order to facilitate the decision-making process in mitigating these adverse impacts (Section 2(4)(a)(i)).

2.1.2.2 Integrated Environmental Management (Chapter 5)

Section 24(1) of NEMA requires that the potential impacts of projects or activities must be considered, investigated, assessed and reported to the Competent Authority, while Section 24(2) empowers the Minister (or MEC) to identify such projects or activities which require authorisation. These activities are listed in Government Notice R (GNR) 544 of 18 June 2010 (activities requiring Basic Assessment); GNR 545 of 18 June 2010 (activities requiring full Environmental Impact Assessment) and GNR 546 of 18 June 2010 (activities requiring Basic Assessment dependent on provincial requirements) published in terms of Section 24D of NEMA. Section 24 (5) of NEMA empowers the Minister (or MEC) to draft regulations which provide a framework for the authorisation process, and which is provided in GNR 543 of 18 June 2010.

In terms of Section 24F, failure to obtain environmental authorisation for listed activities constitutes an offence and, either jointly or severally, convicted persons can be fined up to R5 000 000 as well as face imprisonment for up to ten years.

2.1.3 Additional Acts and Frameworks

In addition to NEMA, the following Acts have some bearing on the proposed activities:

- Hazardous Substances Act, 15 of 1973;
- The Conservation of Agricultural Resources Act, 43 of 1983;
- Occupational Health and Safety Act, 85 of 1993;
- Development Facilitation Act, 67 of 1995;
- National Road Transport Act, 93 of 1996;
- Extension of Security Tenure Act, 62 of 1997;
- Basic Conditions of Employment Act, 75 of 1997;
- Prevention of Illegal Eviction from and Unlawful Occupation of Land Act, 19 of 1998;
- The National Water Act, 36 of 1998;
- South Africa National Road Agency and National Roads Act, 7 of 1998;
- The National Heritage Resources Act, 25 of 1999;
- Promotion for Administrative Justice Act, 3 of 2000;
- Mineral Petroleum Resources Development Act, 28 of 2002;
- The National Environmental Management: Protected Areas Act, 57 of 2003;
- The National Environmental Management: Biodiversity Act, 10 of 2004;
- The National Environmental Management: Waste Act, 59 of 2008;
- Traditional Leadership and Governance Framework Amendment Act, 23 of 2009; and
- National Railway Safety Regulator Act, 16 of 2002.

Application to the DEA for Environmental Authorisation in terms of NEMA does however not absolve the applicant from complying with other statutory requirements, and in addition the following national and provincial legislation will apply inter alia to the project.

It should also be noted that the Swaziland section of the project will also follow a separate EIA process undertaken in terms of the Swaziland legislation. This process commenced in June 2013 in collaboration with Swaziland Railway and the Swaziland Environment Authority (SEA).

2.1.4 GN R 543 – The Environmental Authorisation process

The Scoping and Environmental Impact Assessment process is identified in Part 3 of Chapter 3 (regulations 26 to 35), which prescribes the process to be followed as well as the content of the Scoping, Plan of Study for EIA (PoSfEIA) and EIA Reports. The contents of all specialist reports as well as the EMP are specified in Regulations 32 and 33 respectively, while the public participation process is described in detail in Chapter 6 of GNR 543.

Based on NEMA and GNR 543 Transnet requires Environmental Authorisation from the Competent Authority, the Department of Environmental Affairs. The Provincial Environmental Authority, the MDEDET will function as a commenting authority.

Application to the DEA for Environmental Authorisation in terms of NEMA does however not absolve the applicant from complying with the above mentioned statutory requirements. In this regard the following national and provincial legislation will apply inter alia to the project.

2.1.5 GNR 545 – Activities requiring an EIA

The proposed project and activities are listed in GNR 545, specifically:

Table 5: GN No 545 listed activities

Number and date of relevant notice	Activity No (s) (in terms of the relevant notice)	Description of listed activity as per the project description
GN No. R 545	11	This section of the proposed project is basically the construction of railway line from Davel to the Swaziland border in Mpumalanga.

Other listed activities listed in GNR 544 and 546 are also triggered. Activities are listed in GNR 544 (activities requiring a Basic Assessment), specifically:

Table 6: GN No 544 listed activities

Number and date of relevant notice	Activity No (s) (in terms of the relevant notice)	Description of listed activity as per the project description
GN No. R 544	9 (i) & (ii)	Storm water management facilities will be installed in some areas of the railway. It is expected that the facilities will exceed the 1000 m length.

GN No. R 544	11 (ii), (iii), (x) & (xi	The proposed project will entail the construction of facilities as well as associated infrastructure (bridges, channels, buildings and infrastructure & structures) of the railway line of more than 50 m^2 within a watercourse or within 32 metres of a watercourse.
GN No. R 544	13	Facilities for the storage of diesel will be established along the line for refuelling purposes. The total volume of diesel to be stored at each of the storage facilities is expected to be more than 80 m^3 but less than 500 m^3.
GN N0. R 544	18 (i)	Material shall be removed from watercourses and concrete material introduced during construction of the bridges for the proposed railway link.
GN N0. R 544	20	The upgrade and construction of the Transnet-Swazi Rail Link will require fill material to be sourced from borrow pits. Establishment and operation of borrow pits require mining permits in terms of the Mineral Petroleum Resources Development Act, 2002 (Act No. 28 of 2002) or renewal thereof.
GN No. R 544	37 (a) & (b)	An extension to existing storm water facilities and sewage lines may be required. A total extension of more than 1000 m and increase of throughput by 10 % or more can be expected.
GN N0. R 544	39 (iii)	The proposed project will require the upgrade, expansion or replacement of existing bridges and/or other structures. The upgrade will take place outside the existing servitude which in turn will increase the current footprint.
GN No. R 544	40 (iii) & (iv	The proposed project will entail the upgrading of existing facilities as well as associated infrastructure by more than 50 m^2 within a watercourse or within 32 metres of a watercourse.
GN No. R 544	49 (i), (ii) & (iii)	The proposed project may include the expansion of facilities or infrastructure for the bulk transportation of dangerous goods, namely industrial chemicals, in gas, liquid or solid form, outside an industrial complex or zone by an increased throughput capacity of 50 m^3 or more per day.
GN No. R 544	53 (i) & (iii)	The proposed Transnet-Swazi Rail Link entails the upgrade of the existing railway line. The entire upgrade will take place outside an industrial area. It is

		envisaged that parts of the upgrade will be outside the reserve of the existing railway lines.

The proposed project and activities are listed in GNR 546 (activities requiring Basic Assessment on provincial requirements), specifically:

Table 7: GN No 546 listed activities

Number and date of relevant notice	Activity No (s) (in terms of the relevant notice)	Description of listed activity as per the project description
GN No. R 546	3 a(ii) – aa, cc & ee	The proposed railway link will include establishment of a number of masts along the line for communication purposes which might occur in the geographical areas identified in the listing notice, this will be confirmed through specialist studies.
GN No. R 546	4 a(ii) – aa, cc & ee	The proposed construction and upgrade of the Transnet-Swazi Rail Link will include the building of gravel maintenance roads that may be wider than 4 m. These roads might occur in the geographical areas identified in the listing notice. This will be confirmed through specialist studies.
GN No. R 546	10 a(ii) – aa, cc, ee & ii	There will be areas of refuelling along the line. This will constitute storage of diesel in volumes less than 80 m^3 which might occur within the geographical areas identified in the listing notice. This will be confirmed through specialist studies.
GN No. R 546	12 (a) & (b)	The construction and the upgrade of the railway line will constitute removal of indigenous vegetation in areas that exceed 300 m^2. The affected areas may include critically endangered ecosystems depending on the alignment; this will be confirmed through the specialist studies.
GN No. R 546	13 c(ii) – aa, cc & ee	Construction and upgrade of the proposed railway will involve clearing of areas more than 1ha where indigenous vegetation can constitute more than 75 % of the total vegetation cleared which might fall within the geographical areas identified in the listing notice. This will be confirmed through the specialist studies.
GN No. R 546	14 a(i)	The construction and the upgrade of the railway line will constitute removal indigenous vegetation with the

		total area that exceeds 5 ha which might fall within the geographical areas identified in the listing notice. This will be confirmed through the specialist studies.
GN No. R 546	16 (iv) a(ii) – aa, dd & ff	The proposed railway line and associated infrastructure will include the construction of buildings and infrastructure exceeding or covering 10 m^2 or more within a watercourse or within 32 metres of a watercourse.
GN No. R 546	19 a(ii) – aa, cc, ee & ii	The planned roads for construction will require the lengthening of a road by more than 1 kilometre, and possibly the widening of a road by more than 4 metres.
GN No. R 546	23 a(ii) – aa, cc & ii	The project may involve upgrade of the diesel storage areas that are currently in operation along the railway line and which could fall within the geographical areas identified in the listing notice. This will be confirmed through the specialist studies.
GN No. R 546	24 a(ii) – aa, cc & ee	The project may also involve the expansion of buildings or infrastructure, expanded by 10 m^2 or more within a watercourse or within 32 metres of a watercourse.

2.2 Provincial Legislation

The following Mpumalanga provincial legislation will be taken into account during the EIA process:

- Mpumalanga Nature Conservation Act , 10 of 1998; and
- Mpumalanga Tourism and Park Agency Act, 5 of 1998.

3 THE EIA PROCESS DESCRIPTION

3.1 Objectives of the EIA

The objectives of the EIA are as follows:

- To ensure compliance with relevant environmental legislation and objectives;
- To identify and address significant issues and concerns through public participation;
- To describe the status quo (biophysical, physical and social) of the environment;
- To objectively assess various alternatives for the project;
- To evaluate the potential impact of the project, specific components of the project or activities to be conducted in an objective, independent manner based on the status quo environment; and
- To propose mitigation of these impacts and the implementation of the proposed measures, in the form of an Environmental Management Plan (EMP), which will conform to international and national best practise and environmental objectives.

Figure 4 below illustrates the EIA process and includes the dates of submissions and notifications conducted during the scoping phase.

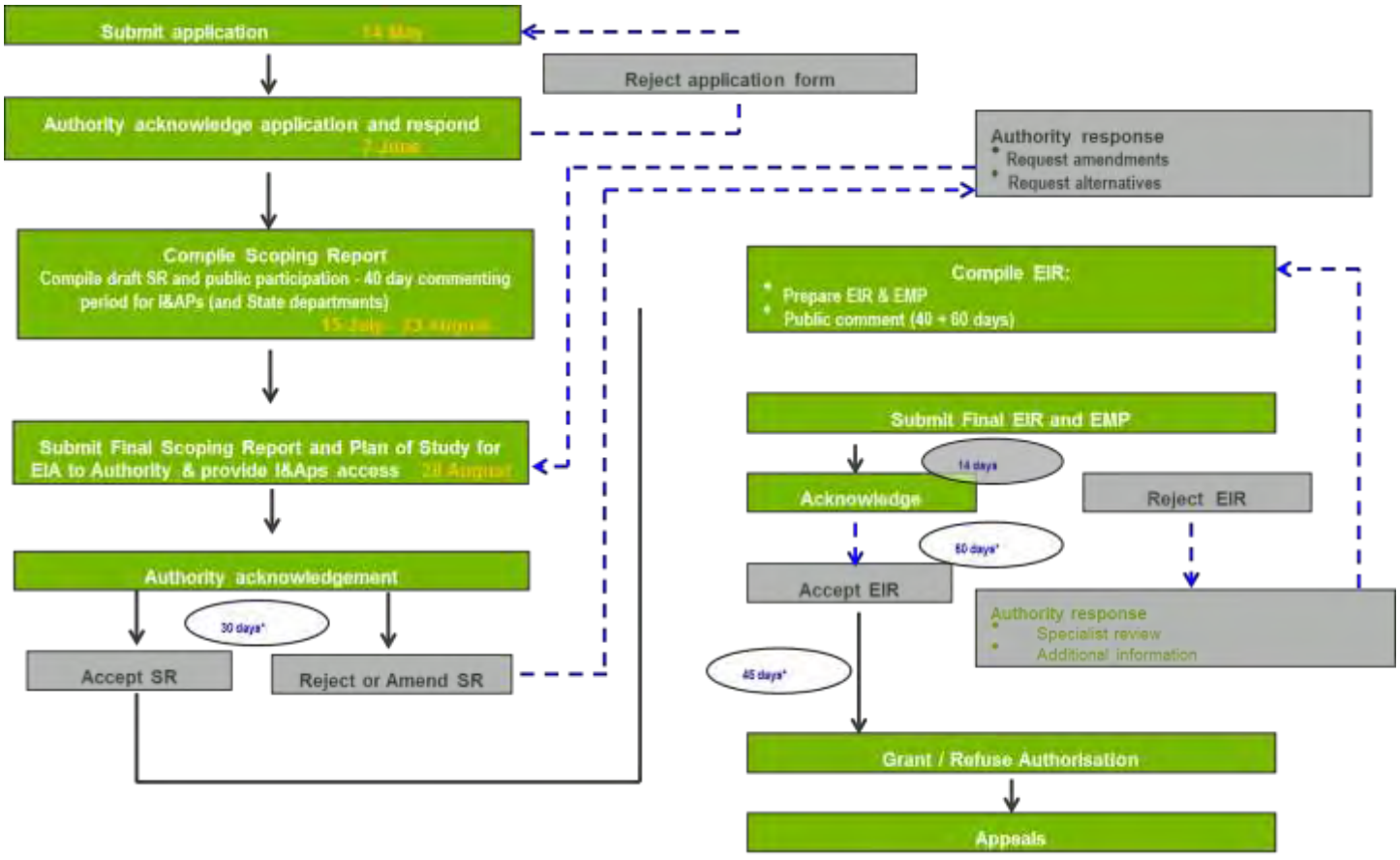


Figure 4: Flow chart of the NEMA EIA process

3.2 Assumptions and Limitations

In undertaking this investigation and compiling this Draft Environmental Impact Assessment Report (DEIR) the following has been assumed or are limitations of the study, unless otherwise indicated:

- Identification of all landowners and / or occupiers of land potentially affected by the development is still in process due to incomplete available SG information. In certain instances there is also no owner information available from the Deeds office. Landowner identification and notification is on-going.

Notwithstanding the aforementioned limitations, this study is consistent with the requirements of content of SR as stipulated in the NEMA 2010, EIA Regulations.

3.3 Authority Involvement

Aurecon, on behalf of Transnet, applied to the DEA for a deviation from regulation 15(1) on 09 April 2013. As no response was received from the DEA, and thus Aurecon submitted the application forms for the Davel Yard upgrade activities of the Swaziland Railway Link project on 14 May 2013, attaching the above mentioned request for deviation thereto. The Department responded on 28 May 2013, rejecting the application forms on the grounds of rejection of the application for deviation from regulation 15(1). However, after a meeting between Transnet and the DEA on 29 May 2013, the DEA issued the project with an acceptance letter dated 07 June 2013. The acceptance of the applications was on condition that regulation 15(1) is fulfilled and proof of notification to landowners submitted to the Department no later than 30 June 2013. This condition has been complied with and the proof of such notification has been submitted to DEA on 28 June 2013. This has been accepted by the DEA. The MDEDET was also informed of the submitted application.

4 THE PUBLIC PARTICIPATION PROCESS (PPP)

4.1 Introduction

Consultation with the public forms an integral component of the environmental authorisation process. The PPP in particular allows Interested & Affected Parties (I&APs) and other identified stakeholders to be informed about potential decisions that may affect them, and it affords them the opportunity to influence those decisions. Through effective Public Participation informed decision making by the Competent Authority is ensured, as the views of all parties affected regarding a proposed activity have been considered.

As per the Integrated Environmental Management Guidelines Series 7 (2010), published by the Department of Environmental Affairs, the benefits of public participation include the following:

- It provides an opportunity for I&APs, EAP's and the Competent Authority to obtain clear, accurate and understandable information about the environmental impacts associated with the proposed activity or implications of a decision;
- It provides I&APs with an opportunity to voice their support, concerns and questions regarding the project, application or decision;
- It provides I&APs with the opportunity of suggesting ways for reducing or mitigating any negative impacts of the project and for enhancing its positive impacts;
- It enables an applicant to incorporate the needs, preferences and values of affected parties into its application;
- It provides opportunities for clearing up misunderstandings about technical issues, resolving disputes and reconciling conflicting interests, it is an important aspect of securing transparency and accountability in decision-making; and
- It contributes toward maintaining a healthy, vibrant democracy.

4.2 Approach to the Public Participation Process

The approach followed for the PPP to date and which will continue throughout the EIA Process is as per Chapter 6 of the Environmental Impact Assessment Regulations, 2010 published in Government Notice No 543 of 18 June 2010.

The following Guideline Documents published by the DEA are also being utilised to inform the public participation process;

- Integrated Environmental Management Guideline Series 7 – Public Participation in the EIA Process, Department of Environmental Affairs (2010); and
- Public Participation Guidelines, Guideline Document 4 (DEA, 2006).

4.3 Public Participation Process to date

The public participation process commenced in June 2013 and included the activities as listed below.

4.3.1 Placement of Advertisements

A legal notice was placed in one local newspaper and in one national paper as the project extends into the provincial boundaries of both Mpumalanga and KwaZulu-Natal. The content of the legal notice published in English, Afrikaans and IsiZulu included:

- Details regarding the application;
- The nature and location of the proposed activity;
- Where further information on the application or activity can be obtained from; and
- Manner in which representations in respect of the application may be made and details of the applicable contact person.

The notices appeared as follows:

- **The Highvelder** (Mpumalanga): 27 June 2013 (English); and
- **Die Beeld** (Afrikaans Edition, National): 25 & 27 June 2013 (Afrikaans).

Refer to Newspaper Advertisements: date of publication (Annexure C of Appendix C)

4.3.2 Process to Date

The activities conducted to date in the Environmental Impact Assessment are indicated in Table 8.

Table 8: EIA activities to date

Activity	Timeframes
Lodging of application with DEA	**14 May 2013**
Registration of Project with DEA	**07 June 2013**
Initial notification and registration of stakeholders	**21 June 2013**
Draft Scoping Report review period	**15 July 2013 – 23 August 2013**
Draft Scoping Report submitted to the DEA	**24 July 2013**
Notification of Stakeholder and I&AP meetings	**15 July 2013**
Stakeholder and I&AP meetings	**1 August 2013**
Submit Final Scoping Report	**2 September 2013**
Final Scoping Report review period	**3 September – 25 September 2013**
Submit Final Amended Scoping Report	**10 October 2013**
Final Amended Scoping Report review period	**11 October – 31 October 2013**
Approval of Final Amended Scoping Report from DEA	**7 November 2013**
Draft Environmental Impact Report review period	**12 December 2013 – 6 February 2014**

Activity	Timeframes
Stakeholder and I&AP meeting	**23 January 2014**

4.3.3 Direct notification of landowners and other identified I&APs

In conjunction with the placement of newspaper advertisements a Background Information Document (BID) with comment and registration sheet and a notification letter was compiled and distributed through registered post to directly affected landowners along the route alignment. These documents were also distributed to other I&APs which have been identified. The BID was also available for download from the Aurecon and Transnet websites. A copy of the BID and notification letters is included in **Annexure A of Appendix C.** Proof of notification of landowners is included in **Annexure B of Appendix C.**

Affected land owners were identified following receipt of a Transnet stakeholder database which was based on existing railway line servitude information. Aurecon then proceeded to overlay the proposed alignment / corridor onto digital cadastral Surveyor General (SG) Information in order to identify parent farms and farm portion boundaries which were affected by the railway alignment. Some of the available SG information was incomplete. Once a complete list of the affected properties was compiled, deed searches were undertaken in order to obtain postal addresses for the owners of affected land. Contact details for the owners of certain of the properties were however not available through the deed searches. Property descriptions, where no owner contact details was available, were sent to the local municipality and to the Local Farmers Associations in order to determine who the land owners of these portions of land are. Proof of these requests is included in **Annexure E of Appendix C**. However following submission of these requests there still remained some properties for which no contact details were available. From past experiences it is noted here that it is not always practically possible to hand deliver notification letters due to the nature of certain of the properties (e.g. no one resides on the property, locked gates prevent access). A **land owner and I&AP database** have been compiled and are included in **Annexure F of Appendix C.**

Other stakeholders identified and notified other than directly affected property owners included:

- Organs of state which have jurisdiction in respect of the activity (National, Provincial and Local Authorities);
- Parastatals such as Eskom who may be affected by the proposed activity;
- Non-government organisations such as the Endangered Wildlife Trust and the Mpumalanga Wetland Forum;
- Local communities and Farmers Associations; and
- Other organisations potentially affected by the activity.

A register (I&AP database) has been opened and is being maintained which contains the contact details of:

- All persons / institutions / organisations and associations that have been notified;
- All persons / institutions that have requested to be included in the database; and
- All organs of State which have jurisdiction in respect of the activity.

The I&AP database can be found in **Annexure F of Appendix C**.

4.3.4 Site Notice Boards

In order to notify the surrounding communities and adjacent landowners of the proposed development, and to invite them to participate in the EIA Process site notices were erected in conspicuous locations in and around the town of Davel. To ensure adequate notification of potential stakeholders, notice boards were also erected at public facilities such as Municipal Buildings, Public Libraries and popular shopping centres frequented by local residents. The notices were prepared in English and Afrikaans.

Refer to Annexure D of Appendix C for a complete list indicating the locations at which the notice boards were erected, also included is a photographic record of the notice boards.

4.3.5 Issues and Response Trail

Issues, comments and concerns raised during the public participation process (refer to **Annexure K of Appendix C**) are compiled into an Issues and Response Report. All comments received up to date have been captured and distributed to members of the project team for further consideration. Responses have been provided on comments which have been received. The Issues and Response Report is used for the evaluation of environmental impacts and serves to identify issues which require further scrutiny during the EIA investigation.

4.3.6 Submission of the Draft Scoping Report

The Draft Scoping Report was submitted to the DEA on 24 July 2013. The report was also made available for review and comment by registered I&APs and key stakeholders between 15 July - 23 August 2013. The report with appendices was available for download from the Aurecon and Transnet websites. A hard copy of the report was available for viewing at the Ermelo Public Library.

Registered I&APs were notified of the availability of the Draft Scoping Report through post, facsimile and email.

The following organs of state received copies of the Draft Scoping Report:

- Department of Environmental Affairs;
- Department of Water Affairs;
- MDEDET;
- Provincial Roads Authorities;
- Department Public Works;
- Department Agriculture and Land Administration;
- Gert Sibande District Municipality;
- Affected Municipalities: Msukaligwa and Mkhondo Local Municipalities;
- Eskom;
- Mpumalanga Tourism and Parks Agency (MTPA);
- South African National Roads Agency Limited (SANRAL); and
- Department of Agriculture, Forestry and Fisheries (DAFF).

Refer to **Annexure H of Appendix C** for the proof of notification.

All comments received on the Draft Scoping Report have been included in the Issues and Response Report.

4.3.7 Submission of Final Scoping Report

The Final Scoping Report was submitted to the National Department of Environmental Affairs on the 2 September 2013. Registered I&APs were afforded an opportunity to review the report during the period of 3 September to 25 September 2013, and were requested to submit their comments directly to the DEA as per the requirements of Regulation 56. I&APs were requested to submit copies of their comments to Aurecon. The report was available on the Aurecon and Transnet websites. Refer to **Annexure I of Appendix C** for the proof of notification. All comments received by Aurecon have been included in the Issues and Response Report.

4.3.8 Submission of Final Amended Scoping Report

Following a request from the DEA to include additional information the Final Scoping Report was amended and again made available to registered I&APs for the submission of their comments to DEA. The report was available during the period of 11 October to 31 October 2013 on the Aurecon and Transnet websites. The Final Amended Scoping Report was submitted to DEA on the 10th of October 2013. All comments received by Aurecon have been included in the Issues and Response Report. Refer to **Annexure J of Appendix C** for the proof of notification.

The Final Amended Scoping Report and Plan of Study was approved by DEA on 7 November 2013 (refer to **Appendix D**)

4.3.9 Submission of Draft Environmental Impact Report

The Draft Environmental Impact Report was made available for review and comment by registered I&APs and key stakeholders from 12 December 2013 to 6 February 2014. Refer to **Annexure O of Appendix C** for the proof of notification. The report with appendices was available for download from the Aurecon and Transnet websites. A hard copy of the report was available for viewing at the Davel Yard Primary School and Ermelo Public Library. A copy of the report was also sent to the Davel Community Development Worker. All comments submitted on the report have been captured and included in the Issues and Response Report for submission to the DEA as part of the Final EIA Report.

Registered I&APs as well as the following organs of state were notified of the availability of the Draft Environmental Impact Report through post, facsimile and email:

- Department of Environmental Affairs;
- Department of Water Affairs;
- Ermelo Public Library;
- MDEDET;
- Provincial Roads Authorities;
- Department Public Works;
- Department Agriculture and Land Administration;
- Gert Sibande District Municipality;
- Affected Municipalities: Msukaligwa and Mkhondo Local Municipalities;
- Eskom;
- Mpumalanga Tourism and Parks Agency (MTPA);
- South African National Roads Agency Limited (SANRAL); and
- Department of Agriculture, Forestry and Fisheries (DAFF).

Refer to **Annexure O of Appendix C** for the proof of notification.

4.3.10 Submission of Final Environmental Impact Report

The Final Environmental Impact Report will be submitted to the National Department of Environmental Affairs on the 6 March 2014. Registered I&APs will be afforded an opportunity to review the report during the period of 6 March 2014 to 4 April 2014, and will be requested to submit their comments directly to the DEA as per the requirements of Regulation 56. I&APs will be requested to also submit copies of their comments to Aurecon. The report will be available on the Aurecon and Transnet websites.

4.4 Public Consultation

Public consultation up to date has included the following:

- Public Meeting held at the Davel Primary School on 1 August 2013 between 17:00 - 20:00.
- Public Meeting held at the Davel Primary School on 23 January 2014 between 17:00 – 19:30

The original public meeting to present the findings of the Draft Environmental Impact Report scheduled for 17 January 2014 was postponed until 23 January 2014 as the venue at the school was not available. Refer to **Annexure N of Appendix C** for the notification sent to the I&AP's of the change in date for the meeting.

Refer to **Annexure L of Appendix C** for copies of the attendance registers for these meetings and **Annexure M of Appendix C** for copies of the presentations which were delivered at the meeting.

The purpose of the meeting was to afford I&APs an opportunity to discuss the findings of the Draft Scoping Report with members of the project team and to provide more project information where available. Furthermore the meeting also provided an opportunity for the EAP to describe the EIA Process and to ensure that I&APs were aware of the importance of their participation. It also served to identify some additional stakeholders that would be contacted and invited to participate in the process. **Refer to Annexure G of Appendix C** for a record of the comments and responses made at these meetings.

4.5 Notification of the Environmental Authorisation

On issuing of a decision by DEA, notices will be sent to all registered Interested and Affected Parties that the Environmental Authorisation (EA) has been granted or refused and that it is available for review. These notices will indicate the process required to lodge an appeal, as well as the prescribed timeframes in which documentation should be submitted.

5 BASELINE ENVIRONMENTAL DESCRIPTION

5.1 Physical Environment

5.1.1 Regional Vegetation Types

Mucina and Rutherford (2006) describe the climate in the two regional vegetation types present along the rail line route (Figure 5), as illustrated in the two boxes below:

Soweto Highveld Grassland (Gm 8)

The term "grassland" refers to herbaceous vegetation of relatively short and simple structure that is dominated by graminoids, usually of the family Poaceae. Woody plants are rare (usually low or medium-sized shrubs) or absent or are confined to specific habitats, such as smaller escarpments or koppies, Core grassland areas usually have deep, fertile soils although a wide spectrum of soil types occurs.

The Soweto Highveld Grassland is classified as "GM 8" in Mucina and Rutherford (2006). The "GM" refers to the Mesic Highveld Grassland units.

Climate

The cold, dry conditions of the Highveld region are the result of the high elevation and inland continental aspect of these areas. These aspects are important in defining the current climate of these areas. The temperate grasslands of southern Africa occur where there is summer to strong summer rainfall and winter drought. Frost is a common occurrence; the coldest periods (June – August) are exacerbated by aridity or along an increasing elevation gradient.

The Soweto Highveld Grassland region is a summer rainfall area with a mean annual rainfall (MAR) of 662 mm and cool-temperate climate with high extremes between maximum summer and minimum winter temperatures, with frequent occurrence of frost (mean number of frost days 41) and large thermal diurnal differences especially in autumn and spring.

Geology and soils

Shale, sandstone or mudstone of the Madzaringwe Formation (Karoo Supergroup) or the intrusive Karoo Suite dolerites which feature prominently in the area. Soils are deep, reddish on flat plains and are typically Ea, Ba and Bb land types.

Vegetation and landscape features

Gently to moderately undulating landscape on the Highveld plateau supporting short to medium-high, dense, tufted grassland dominated almost entirely by *Themeda triandra* and accompanied by a variety of other grasses such as *Elionurus muticus, Eragrostis racemosa, Heteropogon contortus and Tristachya leucothrix*. In places not disturbed, only scattered small wetlands, narrow stream alluvia, pans and occasional ridges or rocky outcrops interrupt the continuous grassland cover.

Eastern Temperate Freshwater Wetlands (AZf 3)

Freshwater wetlands form a system of archipelagos of small and highly fragmented patches, embedded within all mainland biomes of South Africa. The typical freshwater wetlands are vleis, which form in the catchment areas of Highveld streams (spruits), where a sufficiently shallow gradient permits the soils to remain wet without being eroded by flowing water. Many of the vleis on the Highveld are peat forming, especially where the dominant species is the reed *Phragmites australis*.

The principle threats to wetlands include the conversion of a wetland from one form to another (changing the status of the wetland) and reduction in size, often resulting in the total demise of the wetland habitat. Conversion usually involves the erection of structures within the wetland, typically dams. Impounding causes changes in the functioning of the wetland by reducing the flow of water downstream while increasing the inundation period and/or depth of inundation. Excessive water pollution results in shifts from oligotrophic (usually very diverse habitats of high conservation value) to eutrophic wetlands, often dominated by single ubiquitous species choked by algal blooms.

Drainage of a wetland involves both diversion of water away from the wetland, as well as the extraction of water from the wetland itself via drains. This results in changes in the species composition from wetland species to a habitat dominated by purely terrestrial species, as well as changes in the soils from typically anaerobic to aerobic.

The main pollution threats to wetlands are petrochemical spills, unprocessed or semi processed sewage, fertiliser and pesticide runoff, and dumping, both of garbage and rubble.

The Eastern Temperate Freshwater Wetlands is classified as “AZf 3” in Mucina and Rutherford (2006). The “AZf” refers to the Azonal Freshwater vegetation units.

Climate

Exclusively summer-rainfall region with a mean annual precipitation (MAP) range of 421 – 915 mm. Cool-temperate pattern with mean annual temperature (MAT) ranging between 12.6 ºC and 16.7 ºC. Due to high elevation, frost is a frequent phenomenon.

Geology and soils

Found on younger Pleistocene to recent sediments overlying fine-grained sedimentary rocks of the Karoo Supergroup (on sediments of both Ecca and Beaufort Groups due to the large extent of the area of occurrence) as well as of the much older dolomites of the Malmani Subgroup of the Transvaal Supergroup in the northwest. Especially the areas built by Karoo Supergroup sediments are associated with the occurrence of Jurassic Karoo dolerite dykes having a profound influence on run-off. Soils are peaty (Champagne soil form) to vertic (Rensberg soil form). The vleis form where flow of water is impeded by impermeable soils and/or by erosion resistant features such as dolerite intrusions. Many vleis and pans of this type of freshwater wetlands are inundated and/or saturated only during the summer rainfall season, and form some months after this into the middle of the dry winter season, but they may remain saturated all year round. Surface water inundation may be present at any point while the wetland is saturated and some plant species will be present only under inundated conditions, or under permanently saturated conditions, or under permanently saturated conditions. The presence of standing water should not be taken as a sign of permanent wet conditions.

Vegetation and landscape feature

Flat landscape or shallow depressions filled with (temporary) water bodies supporting zoned systems of aquatic and hygrophilous vegetation of temporarily flooded grasslands and ephemeral herblands.

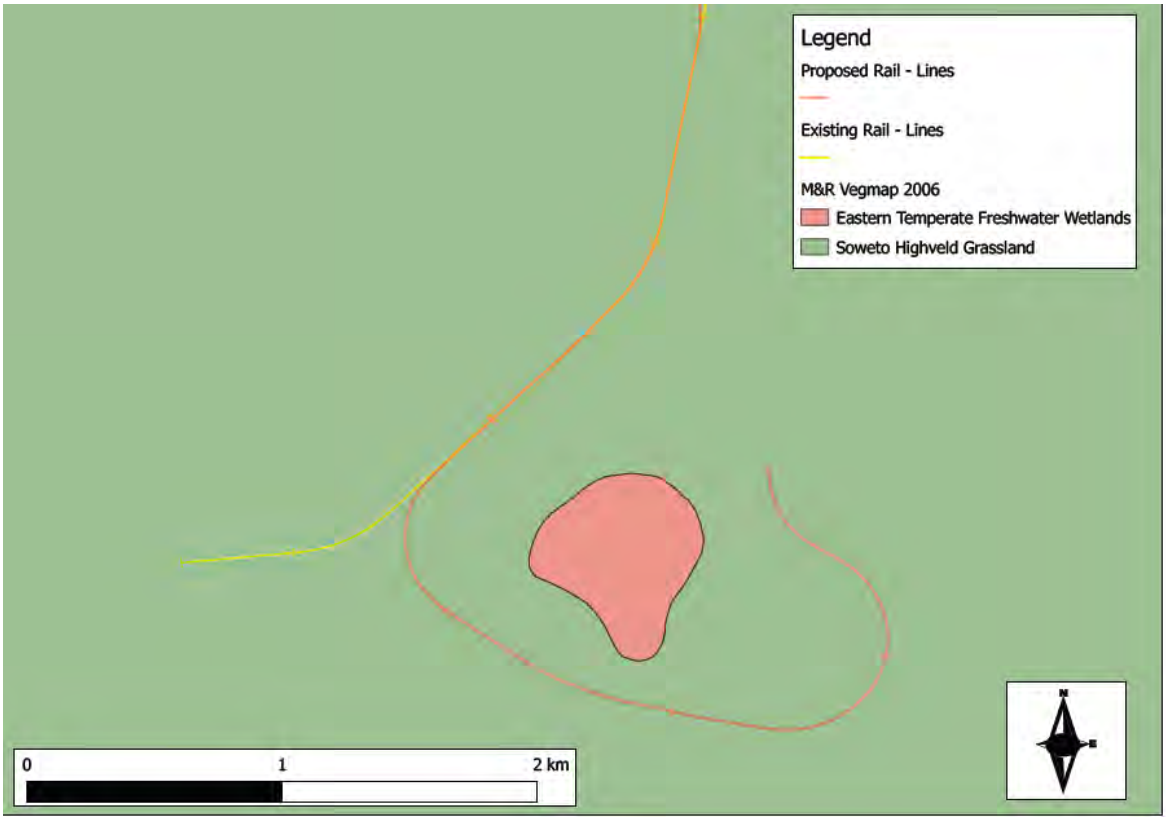


Figure 5: The position of the Davel Yard in relation to the regional vegetation types as defined by Mucina & Rutherford (2006) and considered Vulnerable by NEM:BA

5.1.2 Noise and Vibration

According to the GNR 154 of 1992, section 2C, a local authority may:

"if a noise emanating from a building, premises, vehicle, recreational vehicle or street is a disturbing noise or noise nuisance, or may in the opinion of the local authority concerned be a disturbing noise or noise nuisance, instruct in writing the person causing such noise or who is responsible therefor, or the owner or occupant of such building or premises from which or from where such noise emanates or may emanate, or all such persons, to discontinue or cause to be discontinued such noise, or to take steps to lower the level of the noise to a level conforming to the requirements of these Regulations within the period stipulated in the instruction: Provided that the provisions of this paragraph shall not apply in respect of a disturbing noise or noise nuisance caused by rail vehicles or aircraft which are not used as recreational vehicles;"

Railway locomotives are thus exempt from these requirements. However, the impact assessment conducted proposes mitigation measures to minimise the impact of noise on the environment as described in the baseline description below.

The Davel Yard and associated infrastructure is located within the Davel town and thus in close proximity to the community. It is thus imperative that the noise and vibration impact on this community be thoroughly assessed.

The surrounding area is mainly used for dryland agricultural and cattle ranching activities. The most important road in the area is the N17 that traverse the site to the south. The Trichardt – Hamelfontein – Geluksplaas – Breyten railway connections passes through Davel town.

The site falls within the grassland biome, with surrounding natural vegetation being Themeda Veld (Turf Highveld). Much of the natural vegetation has been disturbed by agricultural and other developments. Taking into consideration available information the ground conditions could be classified as medium in terms of acoustics (slightly acoustically absorbent). This specifically relates to the way that the ground surface influence the propagation of the sound from the development as the fraction of sound that is reflected from the ground would be influenced as certain frequencies would be absorbed by the ground surface.

Besides the roads and railway lines there are few other identifiable significant contributors to noise in the study area. Being located within and close to a developed community there will be numerous unidentifiable sound sources such as voices, domestic animals, radios and TVs and other sounds typical of a residential area.

Potentially sensitive receptors, also known as noise-sensitive developments (NSDs) were initially identified using Google Earth® and is illustrated in Figure 6.

Ambient sound levels are expected to be higher than the sound levels in a similar town due to the presence of the railway lines.

Figure 6: Noise sensitive receptors for the receiving environment

5.2 Biophysical Environment

The present day land use around the alignment is characterised by rural urban development, KwaDela Township, subsistence agriculture (cattle), large scale commercial crop production and a large modified endorheic pan (depression). Notably the existing rail lines already encroach on this wetland feature (Figure 7).

Figure 7: Inset indicating the wetland encroachment by the Davel Rail Yard

The study area is dominated by a mixture of urban and agricultural development, with the associated infrastructure such as roads, dams and the nearby Waste Water Treatment Works.

The provincial conservation authority together with a broad range of stakeholders assessed the conservation status of the province using the GIS based C-Plan Conservation Planning System (Ferrar & Lötter, 2007). This produced a conservation map of the province (Figure 8).

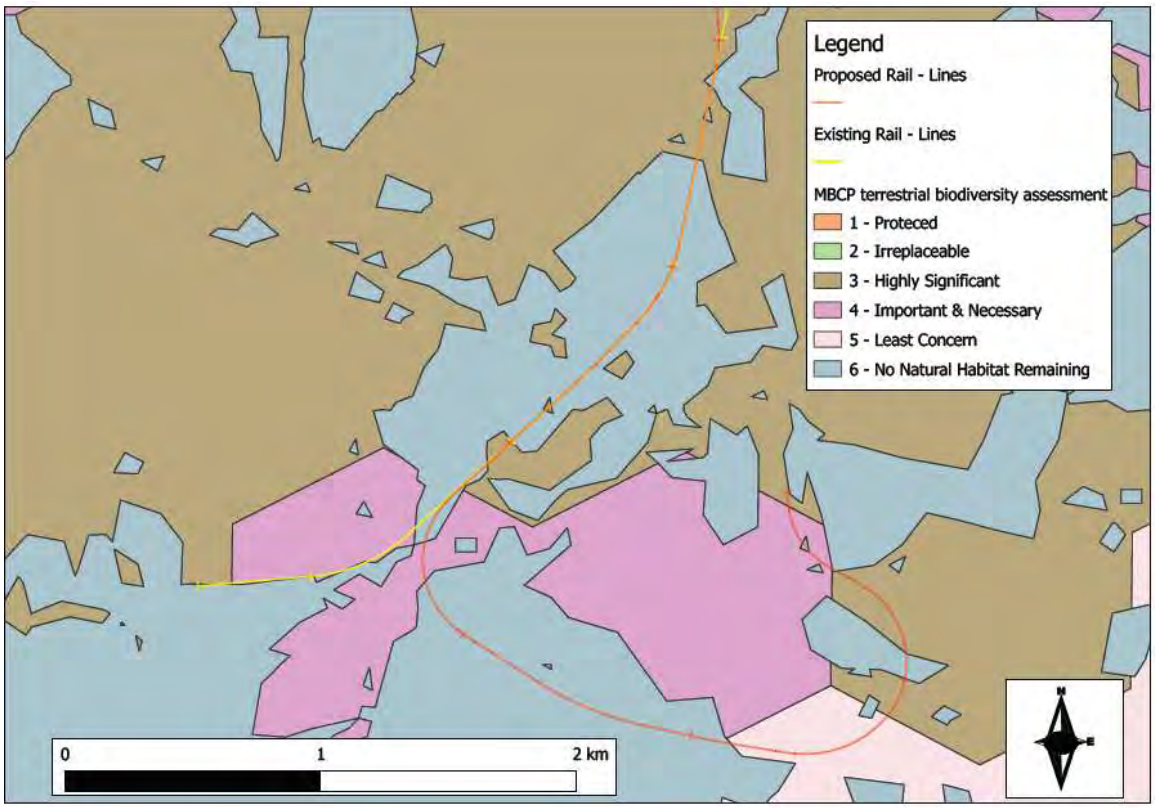


Figure 8: A map illustrating the results of the Mpumalanga Biodiversity Conservation Plan results for the terrestrial environment (Ferrar & Lötter, 2007)

It is also important to note that this information was also used in determining the status of the NEM:BA Threatened Ecosystems discussed above for the province.

The Davel Yard line will traverse a number of important habitats, which are shown in Figure 8 as either:

- Highly significant – development criteria = “linear developments are restricted”; and
- Important or necessary (ecosystem functioning or corridors) - development criteria = “linear developments are restricted”.

The remaining areas were categorised as follows:

- No Natural habitat remaining - development criteria = “linear developments are permitted”; and
- Least concern - development criteria = “linear developments are permitted”.

Figure 9 indicates that a portion of the line falls within a Highly Significant catchment. This is possibly due to this catchment forming part of the catchment divide between the Vaal River (Renosterloopspruit – C11F) and the Olifants (Viskuile – B11A). Most of these rivers are categorised with a Present Ecological State (PES) score Class C or Moderately Modified, which is a rather unique occurrence considering the general landscape change that has occurred over time.

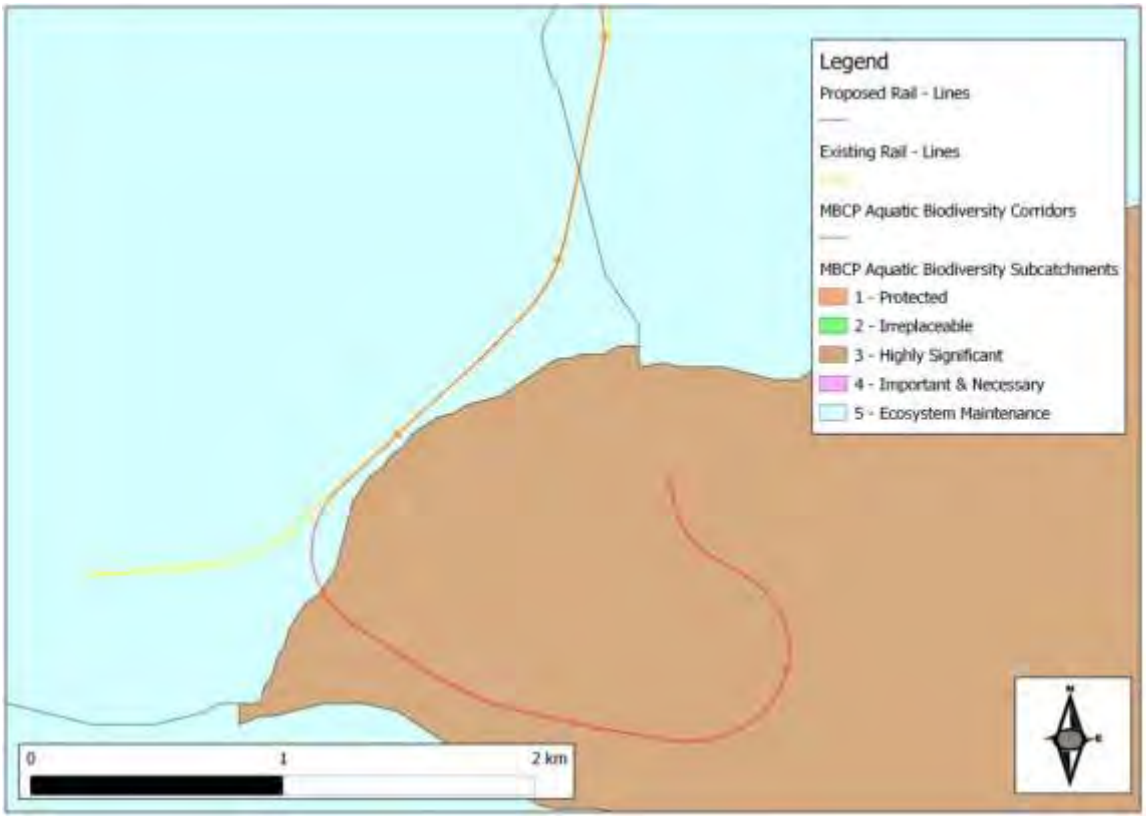


Figure 9: A map illustrating the results of the Mpumalanga Biodiversity Conservation Plan results for the aquatic environment (Ferrar & Lötter, 2007)

During the EIA phase, intensive habitat matching was conducted and ground-truthed to determine the exact status and importance of the habitats observed at a finer scale as well as identify the presence any Species of Special Concern (Faunal & Floral). The results of the assessment are captured in Chapter 8 of this report.

5.2.1 Aquatic environment

The proposed yard extension falls within a catchment containing two small streams / rivers and the endorheic pan. All of these systems have been classified as part of the National Freshwater Ecosystem Priority Atlas (NFEPA) project (Nel *et al*., 2012).

Most of the wetlands systems, although forming part of the important Highveld Grassland Wetland Cluster, would be considered man-made or artificial and thus have a conservation rating score of Z1 or Z2, i.e. low conservation importance (**Figure 10**). However several wetland areas associated with the local streams were rated as A / B or C, i.e. Pristine to moderately modified or largely modified respectively (Nel *et al*., 2012). These was then considered carefully in the EIA phase, firstly to establish their exact form and function through delineation and then determine their PES. This is also a requirement by the Department of Water Affairs as the proposed development falls within 500m of a wetland boundary. Construction activities will therefore require a Water Use License Application for a Section 21 c & i use as required by the National Water Act, 36 of 1998 (NWA).

Notably the Endorheic pan found circled by the proposed line is shown to be highly modified and with little or no function (Nel *et al*., 2012 – metadata). This is possibly due to all the surrounding developments and is evident in the aerial images (Figure 10).

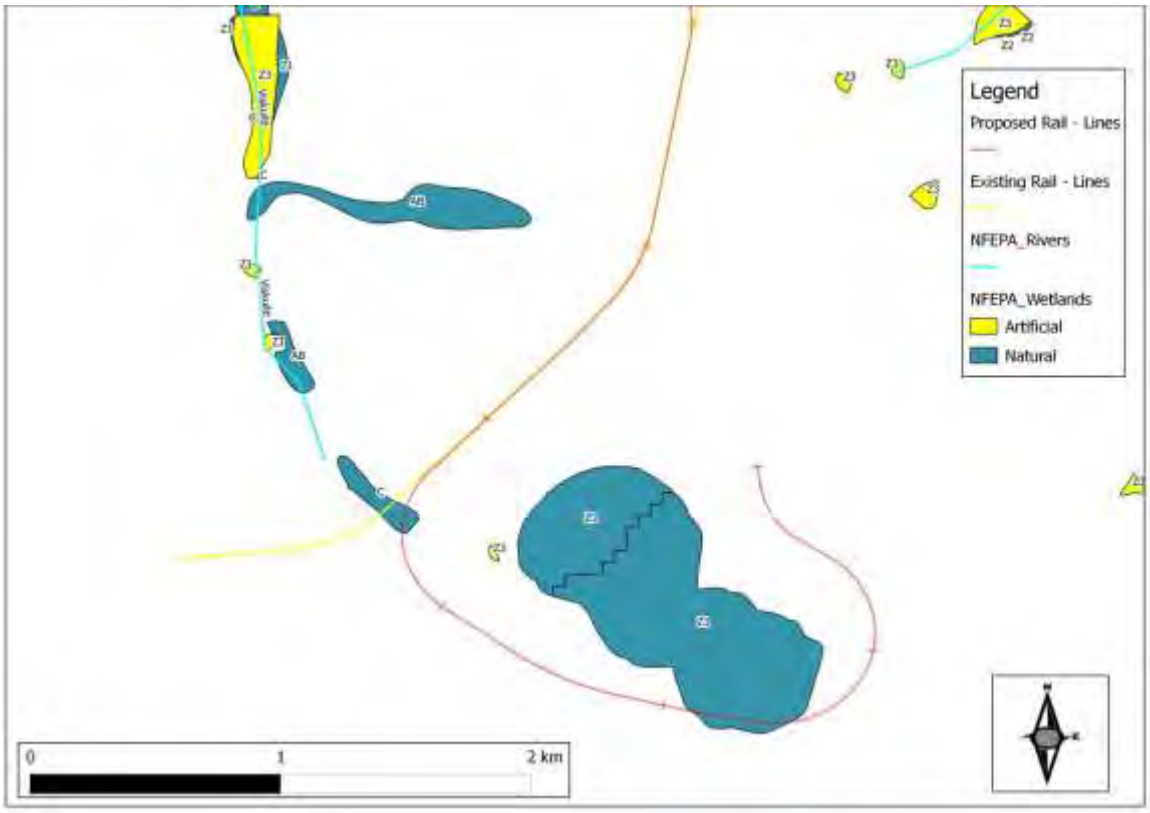


Figure 10: A map illustrating the major rivers and wetlands areas within the study region

5.2.2 Fauna

In a desktop assessment of various taxonomic databases approximately 70 known fish and invertebrate species are expected to occur within the region, while mammals and herpetofauna (snakes and frogs) possibly contribute another 10 – 20 species. The expected bird species within the study area is expected to be around 50 – 190 species depending on the type of available habitat within the study area.

Although the likelihood of these species occurring is low due to the presence of the railway and associated infrastructure, the following species, amongst others will be searched for:

Table 9: Red data species which might be present on site

Species	Red Data Status	Preferred Habitat
Birds		
Anthropoides paradiseus **(Blue Crane)**	Vulnerable	Prefers open pristine grasslands, as well as wetland habitats.
Circus macrourus **(Pallid Harrier)**	Near-threatened	Considered a vagrant to South Africa.
Circus ranivorus **(African Marsh Harrier)**	Vulnerable	Restricted to permanent wetlands with extensive reedbeds.
Circus maurus **(Black Harrier)**	Near-threatened	Generally confined to the clay grassland of the southern part of Mpumalanga
Eupodotis senegalensis **(White-bellied Korhaan)**	Vulnerable	Prefers transitional habitat between grassland and savanna.
Eupodotis caerulescens **(Blue Korhaan)**	Near-threatened	Prefers extensive open short grassland and cultivated land.
Falco naumanni **(Lesser Kestrel)**	Vulnerable	The open grassland patches provide foraging habitat.
Geronticus calvus **(Southern Bald Ibis)**	Vulnerable	A species restricted to montane grassland (especially when burned) and breed/nest on steep cliffs.
Glareola nordmanni **(Black-winged Pratincole)**	Near-threatened	A species of extensive open grassland, usually near wetlands. Often forages over agricultural fields.
Mycteria ibis **(Yellow-billed Stork)**	Near-threatened	Prefers shoreline habitat bordering large impoundments and extensive wetland systems.
Phoenicopterus minor **(Lesser Flamingo)**	Near-threatened	Restricted to large alkaline pans and other inland water bodies.
Phoenicopterus ruber **(Greater Flamingo)**	Near-threatened	Restricted to large saline pans and other inland water bodies.
Sagittarius serpentarius **(Secretary bird)**	Near-threatened	Prefers open grassland or lightly wooded habitat.
Tyto capensis **(African Grass Owl)**	Vulnerable	Prefers rank moist grassland that borders drainage lines or wetlands.
Invertebrates		
Metisella meninx **(Marsh Slyph) - butterfly**	Vulnerable	Wetland grasslands containing *Leersia hexandra*
Herpetofauna		
Acontias g. gracilicauda	Rare	Burrows underground

5.2.3 Flora

The National Environmental Management: Biodiversity Act, 10 of 2004, lists 225 threatened ecosystems based on vegetation type (Vegmap). Both vegetation types (section 2.1.1) present along the rail alignment are listed by this Act as Vulnerable. Therefore as a minimum, the Act stipulates that a Basic Assessment must be conducted when an activity is proposed within these ecosystems.

Present maps only indicate the original extent of these ecosystems; therefore the assessment of these ecosystems, their current extent and status formed a major focus of the EIA field visit, especially since the majority of the study region has been transformed to some degree. Therefore it is imperative that any remaining functional habitats are properly identified, in order to minimise any further impact to these areas. Refer to Chapter 8 for a detailed description of the specialist assessments of potential impacts of the project.

5.3 Social Environment

The project runs through the Gert Sibande District Municipality and more specifically through the Msukaligwa Local Municipality (Figure 11).

The baseline social conditions of a community (community profiles) are the existing conditions and past trends associated with the human environment in which the proposed activity is to take place. The description of baseline conditions includes the relationship with the biophysical environment, historical background, social resources, culture, attitudes and social conditions, economic and population characteristics.

The social parameters of the Msukaligwa Local Municipality are described below.

Msukaligwa Local Municipality

Davel Yard (WP2) is located in the Msukaligwa Local Municipality. The Msukaligwa Local Municipality is situated in the Gert Sibande District Municipality with Ermelo as the Seat of the municipality. The municipality has an area of 6,016 km$^{2.}$ Table 10 below provides the demographic characteristics of the population in the municipality.

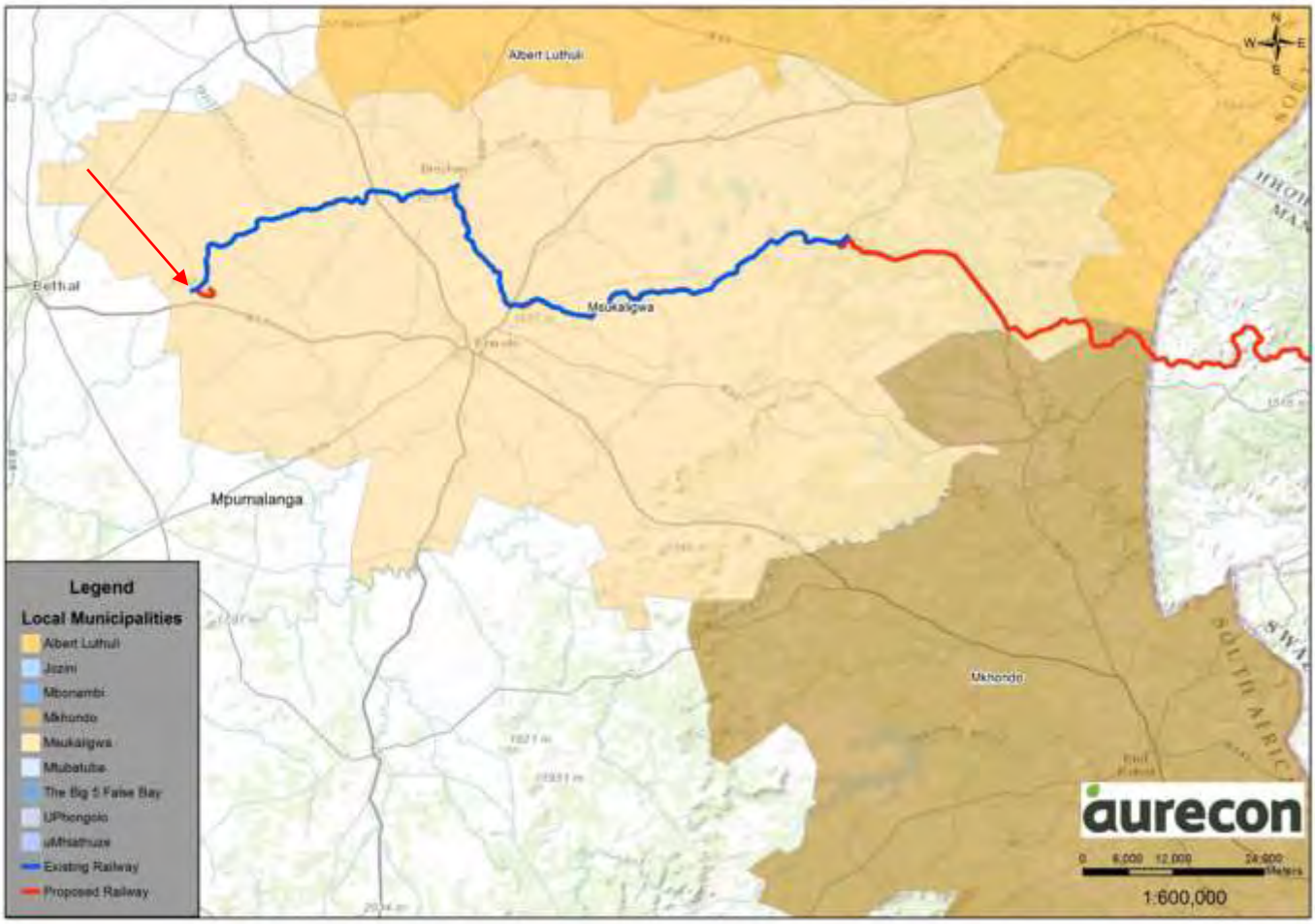


Figure 11: The Msukaligwa Local Municipality in relation to the bigger Gert Sibande District Municipality. The Davel Yard is indicated by the red arrow

Table 10: Msukaligwa Local Municipality.

Population Characteristics	
Male	74,113
Female	75,264
Total	149,377
Households	40,932
Average Household Size	3.5
Female Headed Households	37,8%
Formal Dwellings	30,827
Population Age Distribution (percent)	**Total number**
0-15	40.46 %
15-64	55.45 %
65+	4.06 %
Population density (p/km^2)	24.8 p/km^2
Population growth (%)	1.80 % p.a.
Unemployment rate	36.20 %
Youth unemployment rate	34.50 %
Household services	**Percentage**
Flush toilet connected to sewerage	73.64 %
Weekly Refuse Removal	66.93 %
Piped Water Inside Dwelling	78.17 %
Electricity For Lighting	74.66 %

Source: Census 2011 Municipal Fact Sheet, published by Statistics South Africa

5.3.1 Socio-economic environment

Labour and economic analysis

In the analysis of the labour and employment situation in municipal areas, it is necessary to focus attention on the size and spatial distribution of the labour force. Secondly, the characteristics of the labour market should be analysed. To this end, it is necessary to examine the supply of labour, which is derived from figures on the economically active population in a municipal area. The demand for labour, on the other hand, is an indication of employment opportunities, which are determined by the economic structure of an area along with the level and growth in economic activities. Unemployment, and in a sense trans frontier commuting, provides an indication of the difference between supply and demand and implies that equilibrium in the labour market necessitates both expansion of economic activity and the curtailment of population growth.

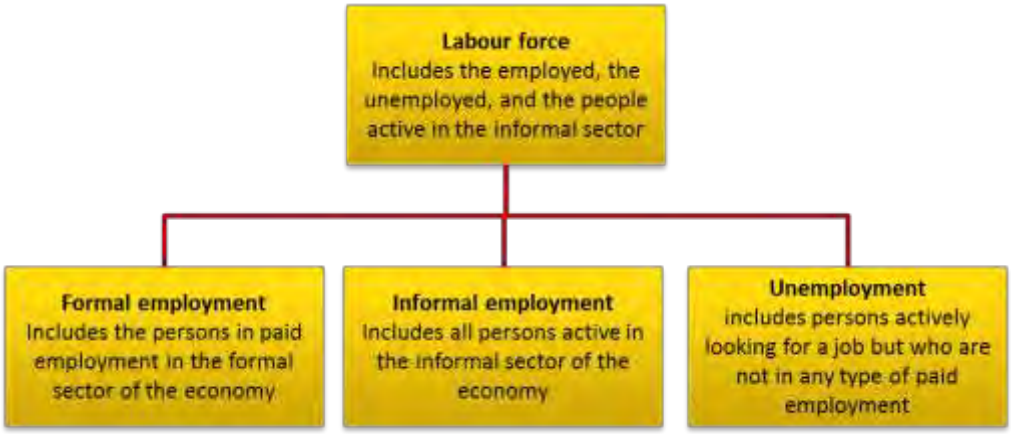


Figure 12: Composition of the labour force

A third issue that should be addressed is involvement in the peripheral sector, as not all potential workers are active in the labour market. Finally, the quality of the labour force needs to be analysed as it provides information on the employability of the workers.

The term labour force refers to those people who are available for employment in a certain area. **Figure 12** illustrates the different components of the labour force and the relationship between them.

Formally employed refers to people who are selling their labour or who are self-employed in the formal sector of the economy, for pay or profit. *Informally employed* includes all people who are active, for pay or profit, in the informal or unregistered sector of the economy. *Unemployed* are persons actively looking for a job, but who are not in any type of paid employment.

5.3.1.1 Description of the Msukaligwa Local Municipality Labour force

Table 11: Msukaligwa Local Municipality Labour force (Census 2011).

Description	Number
Economically active	63,075
Formal and informal (Total)	36,971
Formal	26,104
Formal - Highly skilled	4,402
Formal - Skilled	10,739
Formal - Semi- and unskilled	10,963
Informal	10,867
Unemployed	3,033
Unemployment rate (Percentage)	20.80 %
Labour force participation rate (Percentage)	57.27 %

Table 11 describes the local municipality's labour force. According to the 2011 data acquired from the Quantec database Msukaligwa Local Municipality has 63 075 economically active persons. 26,104 people in the municipality are employed in the formal sector while 10,867 people are active in the informal sector of the economy. 3,033 are

shown to be unemployed. The municipality has an unemployment rate of 20.80 % and a labour force participation rate of 57.27 %.

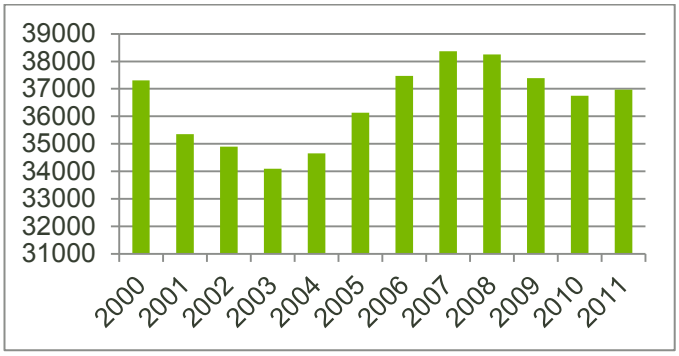
The size of the informal sector includes subsistence agriculture (not necessarily applicable in the municipal area), is difficult to establish with a reasonable degree of accuracy and can easily be under-estimated. One reason for this is that people involved in informal activity often classify themselves as unemployed.

Obtaining the participation rates, involves calculating the labour force or the economically active population relative to the potential labour force, (i.e. the population in the age group 15 to 64 years). These rates reflect the percentages of the said population that are actually economically active.

The following figures describe each of the most important elements over time. This is done to establish patterns in the labour force and to assess any changes that might have taken place.

Economic active population

Figure 13: Change in economic active population (No. of people)

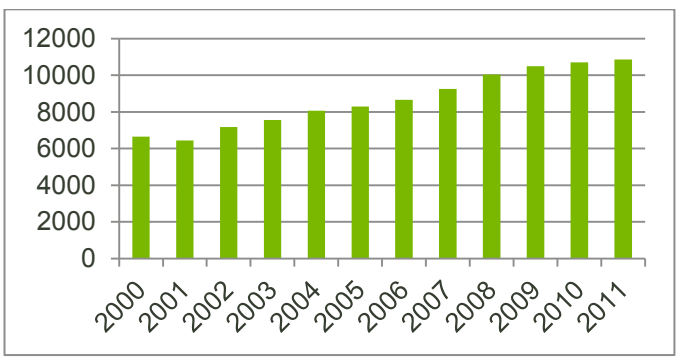


Includes the formally employed, the unemployed, and those persons active in the informal/ unregistered sector. The terms 'supply of labour' and the 'labour force' are used as synonyms for the economically active population.

The number of people in the economically active population has declined over time as indicated in Figure 13. There has been quite a drastic decrease in this figure since 2002 but it seems that the 2011 figure shows a slight increase. The flow of the chart does correlate to the economic down turn experienced in 2008.

Formal employment

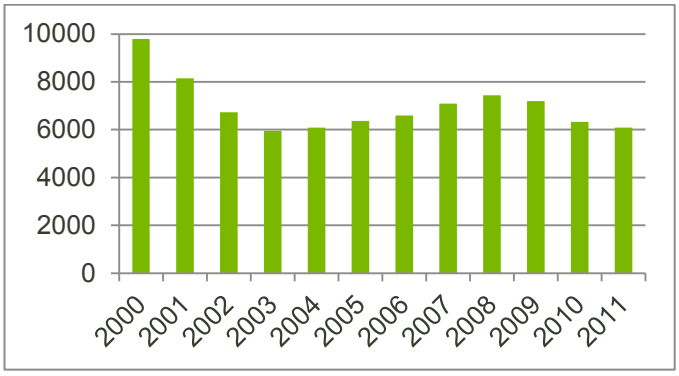
Figure 14: Change of informal employment (No. of People)



The informal employment graph, depicted in Figure 14 shows a decrease in people employed informally from 2000 to 2004. From 2004 to 2007 the number of people increases and then slightly decreases again. 2011 figures seem to indicate a slight rise in the number of people employed in this sector.

Unemployment

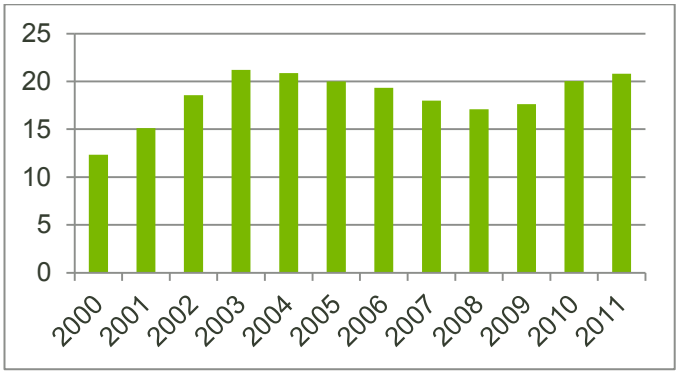
Figure 15: Change in unemployment (No. of people)



The change in the unemployed section of the labour force shows a steep rise from 1995 to 2003 / 2004 and then a decline from that period to 2010. The decline in employment corresponds with the increase in employment in both the formal and informal sectors but the impact of the economic decline is also evident in the trend towards the end of the period. It can be expected that it will start to increase as the current economic conditions prevail.

Unemployment Rate

Figure 16: Change in unemployment rate (%)

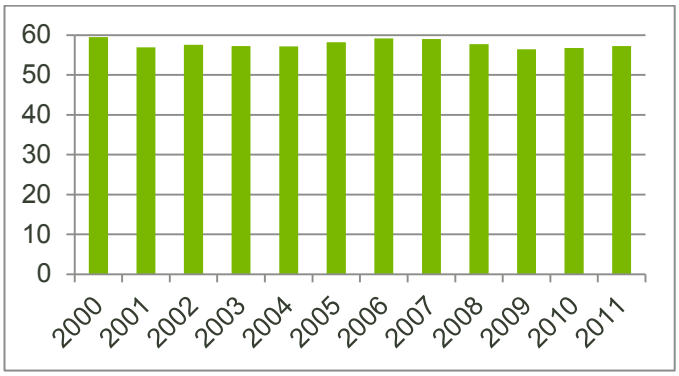


The unemployment rate indicates the number of people unemployed as a percentage of the total economically active population (labour force).

The unemployment rate follows much the same pattern as the change in the unemployed. The 2009 figure would suggest a rise in the unemployment rate. This can again be explained by the economic recession.

Labour force participation rate

Figure 17: Change in labour force participation rate (%)



Labour force participation rate indicates the labour force (economically active population) as a percentage of the population in the age group 15 – 64 years.

An increase in the participation rate can be the result of more women entering the labour market or the outflow of the potential economically active people from a municipal area due to harsh economic conditions, which would 'artificially' increase the participation rate. A low participation rate in a municipal area can be ascribed to the large number of male migrant workers moving out of the municipal area or the proliferation of peripheral activities in the municipal area.

Land use

This section will provide a general discussion of settlement patterns and major land uses in the Gert Sibande District Municipality.

The Gert Sibande District is the home of major industrial complexes in the province, such as the petro-chemical industries. This district also has a large agricultural sector with strong service centres like Standerton, Ermelo, Bethal and Piet Retief. The settlement pattern in this area has developed in orientation to the resource base and economic potential of the area. The agricultural sector, petrochemical industries and mining activities in the area have led to the distribution of service centres varying in size and function throughout the area. Informal settlements are also found scattered in this district municipality (CSIR, 2007).

The Mpumalanga Land Use Management Plan (Sisonke Development Planners, 2005est.) identified the following important settlements in the Gert Sibande District:

Table 12: Important settlements in the Gert Sibande District

Settlement Type	Town / City	Development Directive
Major Urban Centre	• Bethal; • Carolina; • Embalenhle; • Ermelo; • Evander; • Piet Retief; • Secunda; • Standerton; and	Aim of centres is to retain the current engineering, social, economic and institutional infrastructure and to strengthen and diversify the economy in order to achieve growth, prosperity and sustainability. The following industrial clustering opportunities should be explored: agriculture, chemical, forestry and mining.

	• Volksrust.	
Rural Settlement Hubs	A total of 39 rural settlement hubs were identified.	Hubs should fulfill a rural support function. Each hub must accommodate the primary range of social and economic services. The hubs must provide accessibility to the hinterland, not only in the form of roads but also public transport facilities.

The Gert Sibande area has a strong agricultural sector that produces maize, sunflower, grain, sorghum, beef, dairy, wool, sheep and wheat. Other types of crops produced in the area incorporate potatoes, oil, seeds, maize and soybeans.

The area between Carolina, Bethal and Ermelo is one of the largest wool-producing areas in the country. The Standerton area is known for its large dairy industry and maize agriculture. The area of Ogies shows high soil potential for irrigation farming.

The district has an estimate of 1,750 commercial farmers, 2,300 emerging, and 5,300 subsistence farmers (MDALA, 2007b).

The area is also well endowed with coal and other mineral deposits and has some of the largest coal mines in South Africa. The major areas for coal in Gert Sibande District are concentrated around Bethal, Secunda, Standerton and Carolina. Linked with these coal mines are some of the world's largest coal fired power stations, such as Majuba and Tutuka in Gert Sibande District. The area is however confronted by the tension between the agricultural activities in the sense that valuable agricultural land is being sterilised by mining activities (CSIR, 2007).

The Gert Sibande area has a strong manufacturing component, which is concentrated in the western part of the district, specifically the Secunda area (CSIR, 2007).

There is potential to expand small-scale eco-tourism activities in the vicinity of Chrissiesmeer, because of the unique grassland habitats and the bird life associated with the grassland and wetland areas. The establishment of stop-over facilities linked to the development of the bird watch tourism cluster adds value to the tourism potential of the Gert Sibande District (CSIR, 2007).

The forestry activities in the Gert Sibande area relate to pine, eucalyptus and wattle plantations, which are concentrated in the eastern parts of the region stretching from Carolina, Lothair, and Amsterdam down to Piet Retief in the south. Mondi has a manufacturing facility in Gert Sibande, namely the Piet Retief mill.

There exists tension between agriculture and forestry activities over the use of land (CSIR, 2007).

5.4 Cultural and Archaeological Environment

In the National Heritage Resources Act, no 25 of 1999 (NHRA), Section 2(vi), it is stated that ''cultural significance'' means aesthetic, architectural, historical, scientific, social, spiritual, linguistic or technological value or significance. This is determined in relation to a site or feature's uniqueness, condition of preservation and research potential.

The purpose of this Heritage Impact Assessment (HIA) is to review the current state of cultural heritage resources that occur in the vicinity of the alignment of a new railway line that is planned by Transnet. Preliminary desktop studies have revealed the following facts regarding the Davel Yard area:

5.4.1 Stone Age

The larger region has been inhabited by humans since Early Stone Age (ESA) times. Tools dating to this period are mostly, although not exclusively, found in the vicinity of watercourses.

The original dating and evolutionary scheme for the development of tools during this early period, was based on a study of the river terrace gravels of the Vaal River in the Vereeniging region, referred to as the Older, the Younger and the Youngest gravels (Söhnge, Visser & Van Riet-Lowe 1937; Breuil 1948). However, on subsequent investigation, the findings derived from this proved to be unacceptable as it was based on incorrect interpretations of the river gravels. It was only with the excavation of similar material from sealed, stratified sites, that it was realised that the material from the river gravels was not in is its primary context, having been uncovered and washed about over many millennia. Consequently, artefacts derived from such surface collections are now seen to have little significance.

The oldest of these tools are known as choppers, crudely produced from large pebbles found in the river. Later, Homo erectus and early Homo sapiens people made tools shaped on both sides, called bifaces. Biface technology is known as the Acheulean tradition, from St Acheul in France, where bifaces were first identified in the mid-19th century.

During Middle Stone Age (MSA) times (c. 150 000 – 30 000 BP), people became more mobile, occupying areas formerly avoided. According to Thakeray (1992) the MSA is a period that still remains somewhat murky, as much of the MSA lies beyond the limits of conventional radiocarbon dating. However, the concept of the MSA remains useful as a means of identifying a technological stage characterized by flakes and flake-blades with faceted platforms, produced from prepared cores, as distinct from the core tool-based ESA technology.

Open sites were still preferred near watercourses. These people were adept at exploiting the huge herds of animals that passed through the area, on their seasonal migration. As a result, tools belonging to this period also mostly occur in the open or in erosion dongas. Similar to the ESA material, artefacts from these surface collections are viewed not to be in a primary context and have little or no significance.

Late Stone Age (LSA) people had even more advanced technology than the MSA people and therefore succeeded in occupying even more diverse habitats. Also, for the first time we now get evidence of people's activities derived from material other than stone tools. Ostrich eggshell beads, ground bone arrowheads, small bored stones and wood fragments with incised markings are traditionally linked with the LSA.

LSA people preferred, though not exclusively, to occupy rock shelters and caves and it is this type of sealed context that make it possible for us to learn much more about them than is the case with earlier periods.

Only a few stratified sites are known to exist in the study area. One of these, called Hope Hill Shelter, was excavated by Wadley & Turner (1987). From the excavations it was determined that Late Stone Age people frequented the site sporadically, probable on a seasonal basis, in the time period approximately 4 400 years BP. Probably as a result of this absence of sites that were occupied on a long term basis, few sites containing rock art are known from the region.

5.4.2 Iron Age

Iron Age people started to settle in southern Africa c. AD 300, with one of the oldest known site at Silver Leaves south east of Tzaneen dating to AD 270. Having only had cereals (sorghum, millet) that need summer rainfall, Early Iron Age (EIA) people did not move outside this rainfall zone, and neither did they occupy the central interior highveld area. Because of their specific technology and economy, Iron Age people preferred to settle on the alluvial soils near rivers for agricultural purposes, but also for firewood and water.

The occupation of the larger geographical area (including the study area) did not start much before the 1500s. To understand all of this, we have to take a look at the broader picture. Towards the end of the first millennium AD, Early Iron Age communities underwent a drastic change, brought on by increasing trade on the East African coast. This led to the rise of powerful ruling elites, for example at Mapungubwe. The abandonment of Mapungubwe (c. AD 1270) and other contemporaneous settlements show that widespread drought conditions led to the decline and eventual disintegration of this state Huffman (2005).

By the 16th century things changed again, with the climate becoming warmer and wetter, creating condition that allowed Late Iron Age (LIA) farmers to occupy areas previously unsuitable, for example the Witwatersrand and the treeless, wind swept plains of the Free State and the Mpumalanga highveld.

This period of consistently high rainfall started in about AD 1780. At the same time, maize was introduced from Maputo and grown extensively. Given good rains, maize crops yield far more than sorghum and millets. This increase in food production probably led to increased populations in coastal area as well as the central highveld interior by the beginning of the 19th century.

This wet period came to a sudden end sometime between 1800 and 1820 by a major drought lasting 3 to 5 years. The drought must have caused an agricultural collapse on a large, subcontinent scale.

This was also a period of great military tension. Armed Qriqua and Korana raiders on horseback were active in the northern Cape and Orange Free State by about 1790. The Xhosa were raiding across the Orange River about 1805. Military pressure from Zululand spilled onto the highveld by at least 1821. Various marauding groups of displaced Sotho-Tswana moved across the plateau in the 1820s. Mzilikazi raided the plateau extensively between 1825 and 1837. The Boers trekked into this area in the 1830s.

Due to their specific settlement requirements, LIA people preferred to settle on the steep slope of a mountain, possibly for protection, or for cultural considerations such as grazing for their enormous cattle herds. Because of the lack of trees they built their settlements in stone.

A number of stone-walled archaeological sites, which are dated to the LIA (c. AD 1640 - AD 1830s), were identified in the study area, and some of them have been excavated (Taylor 1979, Pelser et al 2007). These sites are conventionally associated with Tswana-speaking people.

5.4.3 Ethno-history

Whereas it is impossible to correlate any living group of people to Early Iron Age communities, it is possible, by using ethnographic evidence, to identify some of the groups of people that entered the region in pre-colonial times (i.e. the LIA) and are currently settled in the larger region. The Tswana-speakers were located to the south and

west in the study area, with the Ndzundza Ndebele (Nguni-speakers) to the north. The eastern section of the study area was occupied by Swazi-speakers, also of Nguni origin.

5.4.4 Historic period

Things were set to change drastically during the early part of the 19th century. Not only was it a time of population movement resulting from events to the south and east, but it was also the arrival of the first white settlers in the area.

Currently, a large number of towns exist in the area, with Balfour, Secunda, Standerton and Piet Retief the larger ones. All of these date to the latter half of the 19th century and each has its own history as each developed for a particular reason. As they were small and largely served farming communities, they did not expand rapidly. Consequently, all of them retained many buildings (shops, houses, churches, schools) and other features (cemeteries) of heritage significance.

The various battles and skirmishes resulting from the conflict during the Anglo-Boer War (1899-1902) had a huge impact on heritage resources in the area, as many farms were burned down. Conversely, it also left a legacy of heritage sites scattered across the veld: fortifications and war cemeteries occur all over. Although most of the conflict centred on the railway line to Lourenço Marques (Maputo), located to the north, incidents also took place in other areas, e.g. Bakenlaagte (Cloete 2000).

However, the area remained up till today, a largely farming orientated community. Much of the heritage potential of the study area is therefore located within the many farmsteads in the area. Farmhouses and related structures (e.g. barns, sheds, etc.), as well as cemeteries dot the landscape. Equally important, are the homesteads, related structures and cemeteries of the farm labourers living on these farms.

Industrial and mining activities also took place in the region, on an ever increasing scale. Coal mining dates to the beginning of the 20th century, although there is written evidence that it was exploited by farmers prior to that. Forestry also became a big operation, going back as far as the early 1900s.

6 ISSUES IDENTIFIED DURING THE SCOPING PHASE

The proposed construction and upgrade of the Davel Rail Yard is anticipated to impact on a range of biophysical, social and economic aspects of the environment. One of the main purposes of the EIA process is to understand the significance of these potential impacts both positive and negative and to identify suitable mitigation measures.

A summary of issues raised by both the specialists and the I&APs during the project's Scoping Phase are indicated below. The Plan of Study for the EIA in Appendix B, Annexure J provides a detailed indication of how these issues were addressed during the Impact Assessment Phase. The results of these assessments are detailed in Chapter 8.

The detail contained below has been sourced from the specialist input reports which can be found in Appendix B, Annexures A through I.

6.1 Issues Raised by the Specialists

The issues and response report (IRR) containing all the issues raised by the public during the public participation meetings held can be found in Appendix C, Annexure G.

6.1.1 Ecological Issues Raised

Activities taking place within the 1:100 year floodline or the wetland/riparian area (whichever is the greatest), an application for a Water Use License must be made. In addition, activities close to wetlands are excluded from the General Authorization for S21 (c) and (i) water uses (government gazette No. 389) due to the complexity and potentially cumulative impact on a wetlands and rivers and the resources as a whole (DWA, 2010). Therefore all activities within 500m of wetlands or rivers should be subject to an application for authorization.

The Davel Yard line will traverse a number of important habitats, which are shown in Figure 4 as either:

- Highly significant – development criteria = "linear developments are restricted"; and
- Important or necessary (ecosystem functioning or corridors) - development criteria = "linear developments are restricted".

The remaining areas were categorised as follows:

- No Natural habitat remaining - development criteria = "linear developments are permitted"; and
- Least concern - development criteria = "linear developments are permitted".

The following issues and impacts were identified during the Scoping Phase together with potential impacts which were then investigated during the EIA phase:

- Destruction of natural habitat:
    - Loss of habitat and removal of vegetation – terrestrial;

  - Loss of habitat and removal of vegetation – wetland and waterbodies;
  - Loss of corridors; and
  - Loss of ecotones.
- Loss of endangered species:
  - Loss of rare and endangered species; and
  - Introduction of alien and invasive species
- Removal of topsoils and soil erosion:
  - An increase in soil erosion.
- Introduction of alien vegetation:
  - Introduction of alien or invasive plants.

The proposed yard extension falls within a catchment containing two small streams / rivers and the endorheic pan. All of these systems have been classified as part of the National Freshwater Ecosystem Priority Atlas (NFEPA) project (Nel *et al*., 2012).

Most of the wetlands systems, although forming part of the important Highveld Grassland Wetland Cluster, would be considered man-made or artificial and thus have a conservation rating score of Z1 or Z2, i.e. low conservation importance. However several wetland areas associated with the local streams were rated as A / B or C, i.e. Pristine to moderately modified or largely modified respectively (Nel *et al*., 2012). These were then considered carefully in the EIA phase, firstly to establish their exact form and function through delineation and then determine their PES.

Notably the Endorheic pan found circled by the proposed line is shown to be highly modified and with little or no function (Nel *et al*., 2012 – metadata). This is possibly due to all the surrounding developments and is evident in the aerial images. This was investigated further during the EIA site visit.

6.1.2 Geohydrological Issues Raised

The potential for groundwater contamination is associated with uncontrolled spills of fuels and lubricants during the construction phase, as well as any hazardous material transported during the operational phase. The extent and impact of potential groundwater contamination is largely dependent on the nature of the subsurface soil, geological and geohydrological conditions.

6.1.3 Social, Economic and Cultural / Heritage Issues Raised

Negative Socio-economic Impacts

- A loss of land and assets to the railway servitude or areas to be occupied by project-related surface infrastructure;
- A population influx (due to the presence of a construction and operational workforce, as well as an influx of job-seekers into the area), with a possible concomitant increase in social pathologies and increased pressure on existing infrastructure and services;
- Disruption of access routes and daily movement patterns by the construction and / or permanent servitude;
- Impacts on sense of place. Such impacts may arise as a result of the visual intrusion of project-related infrastructure, as well as noise and traffic impacts during construction;

- Dust caused by the construction works and from movement of heavy equipment. During the construction phase, the local community and construction workers would be inconvenienced by the dust generated by the construction works;
- Noise and vibration due to the construction works and from movement of heavy equipment. Movement of heavy machinery on existing local roads may be one of the core problems for the local community during the construction phase. Vibration may also damage structures located nearby;
- Socio-cultural differences and conflicts between migrant workers and the local community. Single men predominately occupy the construction camps which could create social conflicts, usually as a result of cultural differences, alcohol abuse or being away from their wives or girlfriends for extended periods of time. A possible reason for conflict would be the perception among locals that the outsiders are taking up jobs that could have gone to unemployed members of the local community. An influx of unemployed job seekers could also add to the potential for conflict;
- Diseases associated with the arrival of temporary labour in the area. Various social pathologies, such as drug / alcohol misuse, abuse of woman and children and incidences of sexually transmitted diseases (STDs) may increase with the influx of job-seekers into the area;
- An inflow of construction workers and job seekers may also be accompanied by an increase in crime. Even if specific instances of crime are not as a result of the newcomers, they may still be ascribed to them by local communities; and
- Informal settlements. Once construction is concluded and the camp is vacated, it may be illegally occupied by unlawful tenants.

Positive Socio-economic Impacts

- Local employment and job opportunities. The construction phase of the project will have a positive impact on the local labour market. It is anticipated that the operational phase will also create permanent employment opportunities for the local affected communities though some level of technical skills and qualifications may be needed;
- Local economy opportunities and economic empowerment. The construction phase of the project will have temporary positive impacts on the local economy; and
- Establishment / upgrading of services.

6.1.4 Cultural / Heritage Issues Raised

The cultural and heritage issues foreseen in this project include the following:

- Ignorance as to the importance and value of heritage sites and their protection through legislation. Land and property owners are, in most cases, ignorant about the value of heritage or their legal obligation to protect it. Current legislation is very clear as to the obligation of the land or property owner with regards to heritage management and preservation;
- Ignorance as to the nature and distribution of heritage resources. There is very little information available on heritage in the area. This can be overcome by a number of actions, e.g. -

- A system whereby members of the public can record the heritage sites in their communities or on their properties should be established. This can be achieved, for example by keeping a register at the local library; and
- The municipality and other authorities should make funds available for systematic surveys by which sites can be documented.

- Lack of information on heritage resources on the side of the authorities responsible for planning. This is the direct result of the above-mentioned problem. More information is needed; and
- Heritage is not static. New heritage sites are continuously being created, due to events that take place, or simplistically seen, because existing features and structures become older with the passage of time and all should be considered for their contribution to retelling the story of the past. The process of identifying and documenting heritage features would therefore, in theory, never stop.

The specialists have investigated the above mentioned impacts in the EIA - the results of the assessments, description of potential impacts as well as proposed mitigation measures are described in Chapter 8.

6.1.5 Safety and Security Aspects

An emergency response plan should be compiled and incorporated into the EMPs for both the construction and operational phases. Issues pertaining to regular inspections, monitoring mechanisms, maintenance and emergency response will be incorporated into this EMP.

Safety requirements linked to the existing development footprint of the proposed construction site will be investigated and reported in the legislative and institutional requirements of the EIA report. These aspects will further be incorporated into the design and layout of the proposed facility. Where necessary, monitoring and inspection mechanisms will be included in the construction and operational phases of the EMP.

6.2 Issues raised during the Public Participation Process

The following issues in Table 13 constitute an extract from the issues and response report (IRR) and the Minutes captured at the public and focus group meetings for the Davel Rail Yard section of the proposed Swaziland Railway Link project. The IRR containing all the issues raised by the public during the public participation meetings held can be found in Appendix C, Annexure G and hard copies of the comments are included in Appendix C Annexure J.

Table 13: Issues and Responses

ISSUE	RESPONSE
A major issue for the local community is that in the past promises have been made for the provision of jobs on such projects as this railway link, and then once construction commenced labourers from elsewhere were appointed and the local community did not benefit.	As far as reasonable labour and supplies should be sourced from local communities. The project should also aim to contribute to skills transfer.

What is the date for commencement of construction	There are two processes that need to be considered in terms of timeframes. Firstly the EIA Process which is currently underway. Transnet cannot commence with construction until the EIA Process is finalised and Environmental Authorisation has been issued by the Competent Authority. This process is anticipated to be finalised by March 2014. Therefore Transnet anticipates that should the project be approved that construction can only commence mid next year (2014), this date is also still dependent on the detailed designs to be given by the engineers.
If you are employed once construction commences will that employment be applicable to construction on all sections of the railway line (for instance will it extend into Swaziland)	An important socio economic benefit of the project relates to the provision of job opportunities to the local communities where the construction is taking place. If labourers for instance, from Davel, continue construction into Swaziland it is anticipated to create conflict within local communities in Swaziland who may feel that it is unfair that workers from outside their community has been provided with the work.

6.3 Institutional and Legal Aspects Raised During the Scoping Phase

6.3.1 Project Lifecycle

The project is effectively in the preliminary design phase, and no detailed design is available as such. Where applicable comment and suggestions made during the scoping phase will be incorporated into the design.

6.3.2 Alternatives to and Need for the Project

A detailed alternatives assessment will be conducted in the EIA phase, based on alternatives identified during the Scoping Phase. These alternatives include evaluation of the "No-Go" option; alternatives to site selection; and alternatives to construction methodologies and site layout. The need for the project will be evaluated and presented in the EIA report.

6.3.3 Availability of Specialist Reports and Information Relevant to the Application

All documentation relevant to this environmental application, particularly specialist reports and background information used to compile the draft EIR will be appended to the final reports and made available during the required comment periods.

6.4 Consultation with the Competent Authorities

Consultations with the authorities will occur on the following occasion:

- A site visit with DWA and MDEDET is proposed once the Final Scoping Report has been submitted;
- After the Draft EIA report has been made available for comment within the public domain, comments will be incorporated into the Issues and Response Report and Final EIA Report for submission to DEA;
- The Final EIA Report will once again be made available for comment within the public domain;
- A second site visit and meeting with DEA is proposed once the Final EIA report is in its commenting period;
- Any final comments will be incorporated into the Final EIA for submission to DEA; and
- Apart from the above mentioned occasions, further consultation with authorities will occur whenever necessary.

7 ASSESSMENT METHODOLOGY

The purpose of this chapter is to describe the assessment methodology utilised in determining the significance of the potential impacts of the proposed activities on the biophysical, social and economic environment. The methodology was developed in 1995 and has been continually refined to date through the application of it to over 400 EIA processes. The methodology is broadly consistent to that described in the DEA's Guideline Document on the EIA Regulations (1998).

7.1.1 Evaluation Methods in Environmental Assessments

7.1.1.1 Identification of environmental, social and economic attributes

Environmental, social and economic attributes are first identified for which impacts of the proposed activity will be assessed. This is done through initial investigations by the EAP and then through public participation.

7.1.1.2 Collection of data and description of status quo situation

Baseline information is then required to establish the *status quo* for the environmental and social attributes to be evaluated in the impact assessment. This is done through collection and collation of existing spatial information (GIS, aerial photographs, planning databases etc.) which is then verified through specialist assessments.

7.1.1.3 Identification of environmental, social and economic impacts

The impact of activities to be conducted during various phases of the proposed project on the attributes identified during scoping phase EIA is then evaluated by the EAP through input from the various specialists. The preferred methodology to evaluation is a simple Impact – Activity Checklist.

7.1.1.4 Impact – Activity Checklist

This section outlines the methodology used to assess the significance of the potential environmental impacts identified. For each impact, the EXTENT (spatial scale), INTENSITY (size or degree scale) and DURATION (time scale) are described (Table 14). These criteria are used to ascertain the SIGNIFICANCE of the impact, firstly in the case of no mitigation and then with the most effective mitigation measure(s) in place. The mitigation described in the EIR represent the full range of plausible and pragmatic measures *but does not necessarily imply that they should or will all be implemented*. The decision as to which mitigation measures to implement lies with Transnet and ultimately with the DEA. The tables on the following pages show the scale used to assess these variables, and defines each of the rating categories.

Table 14: Criteria for the evaluation of environmental impacts

CRITERIA	CATEGORY	DESCRIPTION
Extent or spatial influence of impact	**Regional**	Beyond a 10 km radius of the proposed construction site.
	Local	Within a 10 km radius of the centre of the proposed construction site.
	Site specific	On site or within 100 m of the proposed construction site.
Intensity of impact (at the indicated spatial scale)	**High**	Natural and / or social functions and / or processes are *severely* altered.
	Medium	Natural and / or social functions and / or processes are *notably* altered.
	Low	Natural and / or social functions and / or processes are *slightly* altered
	Very Low	Natural and / or social functions and / or processes are *negligibly* altered.
	Zero	Natural and / or social functions and / or processes remain *unaltered.*
Duration of impact	**Construction period**	Up to 2 years.
	Medium Term	Up to 5 years after construction.
	Long Term	More than 5 years after construction.

The SIGNIFICANCE of an impact is derived by taking into account the temporal and spatial scales and intensity. The means of arriving at the different significance ratings is explained in the table below.

Table 15: Definition of significance ratings

SIGNIFICANCE RATINGS	LEVEL OF CRITERIA REQUIRED
High	• High intensity with a regional extent and long term duration; • High intensity with either a regional extent and medium term duration or a local extent and long term duration; and • Medium intensity with a regional extent and long term duration.
Medium	• High intensity with a local extent and medium term duration; • High intensity with a regional extent and construction period or a site specific extent and long term duration; • High intensity with either a local extent and construction period duration or a site specific extent and medium term duration; • Medium intensity with any combination of extent and duration except site specific and construction period or regional and long term; and • Low intensity with a regional extent and long term duration.
Low	• High intensity with a site specific extent and construction period duration; • Medium intensity with a site specific extent and construction period duration; • Low intensity with any combination of extent and duration except site specific and construction period or regional and long term; and • Very low intensity with a regional extent and long term duration.
Very low	• Low intensity with a site specific extent and construction period duration; and • Very low intensity with any combination of extent and duration except regional and long term.
Neutral	• Zero intensity with any combination of extent and duration.

Once the significance of an impact has been determined, the PROBABILITY of this impact occurring as well as the CONFIDENCE in the assessment of the impact would be determined using the rating systems outlined in Table 16 and Table 17 respectively. It is important to note that the significance of an impact should always be considered in connection with the probability of that impact occurring. Lastly, the REVERSIBILITY of the impact is estimated using the rating system outlined in Table 18.

Table 16: Definition of probability ratings

PROBABILITY RATINGS	CRITERIA
Definite	Estimated greater than 95 % chance of the impact occurring.
Probable	Estimated 5 to 95 % chance of the impact occurring.
Unlikely	Estimated less than 5 % chance of the impact occurring.

Table 17: Definition of confidence ratings

CONFIDENCE RATINGS	CRITERIA
Certain	Wealth of information on and sound understanding of the environmental factors potentially influencing the impact.
Sure	Reasonable amount of useful information on and relatively sound understanding of the environmental factors potentially influencing the impact.
Unsure	Limited useful information on and understanding of the environmental factors potentially influencing this impact.

Table 18: Definition of reversibility ratings

REVERSIBILITY RATINGS	CRITERIA
Irreversible	The activity will lead to an impact that is permanent.
Reversible	The impact is reversible, within a period of 10 years.

7.1.2 Subjectivity in Assigning Significance

Despite attempts at providing a completely objective and impartial assessment of the environmental implications of development activities, EIA processes can never escape the subjectivity inherent in attempting to define significance. The determination of the significance of an impact depends on both the context (spatial scale and temporal duration) and intensity of that impact. Since the rationalisation of context and intensity will ultimately be prejudiced by the observer, there can be no wholly objective measure by which to judge the components of significance, let alone how they are integrated into a single comparable measure.

This notwithstanding, in order to facilitate informed decision-making, EIAs must endeavour to come to terms with the significance of the potential environmental impacts associated with particular development activities. Recognising this, we have attempted to address potential subjectivity in the current EIA process as follows:

- Being explicit about the difficulty of being completely objective in the determination of significance, as outlined above;
- Developing an explicit methodology for assigning significance to impacts and outlining this methodology in detail in the PoSfEIA and in this EIR. Having an explicit methodology not only forces the assessor to come to terms with the various facets contributing towards the determination of significance, thereby avoiding arbitrary assignment, but also provides the reader of the EIR with a clear summary of how the assessor derived the assigned significance;
- Wherever possible, differentiating between the likely significance of potential environmental impacts as experienced by the various affected parties; and
- Utilising a team approach and internal review of the assessment to facilitate a more rigorous and defendable system.

Although these measures may not totally eliminate subjectivity, they provide an explicit context within which to review the assessment of impacts.

7.1.3 Consideration of cumulative impacts

Section 2 of the NEMA requires the consideration of cumulative impacts as part of any environmental assessment process. EIAs have traditionally, however, failed to come to terms with such impacts, largely as a result of the following considerations:

- Cumulative effects may be local, regional or global in scale and dealing with such impacts requires co-ordinated institutional arrangements; and
- EIA's are typically carried out on specific developments, whereas cumulative impacts result from broader biophysical, social and economic considerations, which typically cannot be addressed at the project level.

8 ASSESSMENT OF POTENTIAL IMPACTS AND PROPOSED MITIGATION MEASURES

8.1 Introduction

This chapter describes the potential impacts on the biophysical and social environments, which may occur due to the issues identified in Chapter 6.

The potential impacts identified during the Scoping Phase of this project as assessed in detail in this report. The significance of the impact determined in the following sections of this chapter is detailed as well. The methodology used to assess the potential impacts is detailed in Chapter 7 of this report. The terms pre-mitigation and post-mitigation refer to the impact a certain aspect might have before mitigation measures have been implemented, as well as the impact of such aspect after mitigation measures have been implemented. Note that this does not imply that mitigation should or would be undertaken, but merely indicates the extent to which mitigation could change the significance of the impact where it is to be implemented.

8.2 Impacts on the Biophysical Environment

8.2.1 Ecological assessment

Dr Brian Colloty from Scherman Colloty and Associates conducted the ecological and aquatic specialist assessments for the project. The specialist report can be found in Appendix B, Annexure A.

The following general methods were used in assessing the study area, which included the 35 m wide footprint of the proposed rail line area and 500 m zone either side of the alignment with regards to wetlands:

Flora:

- Provide a description of the general floristic species diversity and community composition;
- Evaluating the occurrence of potential Red Data taxa;
- Demarcating physiognomic units based on floristic relevès; and
- Provide an indication on the ecological condition (successional stage) of the predetermined physiognomic units.

Fauna:

- A detailed faunal assessment based on field observation;
- An avifaunal assessment with particular reference towards the occurrence species sensitive to the placement of transmission lines; and
- An evaluation of the occurrence of any of the listed conservation needy species.

Wetlands and rivers:

A large proportion of the available habitat related to sensitive or important taxa are associated with the wetland / riverine / moist habitats. The EIA phase thus focused on critical assessment of the wetland / riverine systems in the following way:

- Delineation of any important wetland and river boundaries using the requisite techniques based upon the latest Wetland Classification systems (SANBI, 2009);
- Indicate suitable buffer zones as prescribed by the relevant provincial policies / conservation plans;
- Assess the status of the observed faunal and floral populations observed; and
- Assess the potential impacts on the functioning of these systems.

8.2.1.1 Terrestrial habitats

The present day land use around the alignment is characterised by rural urban development, KwaDela Township, subsistence agriculture (cattle), large scale commercial crop production and a large modified endorheic pan (depression). Notably the existing rail lines already encroach on this wetland feature.

Plate 1: Typical landscape within the western portion of the study area.

Plate 2: The typical environment of the central portion of the project near Lothair, containing forestry and endorheic pans.

As explained in Chapter 2, Mucina and Rutherford (2006) describe two regional vegetation types for the Davel Yard. Little of the natural vegetation remains within the study area, due to the existing impacts (housing, grazing and farming), together with the present road and rail infrastructure. Thus not only has the environment been impacted upon (loss of species diversity) but a large degree of habitat fragmentation has also occurred.

The following species were observed during the survey:

Table 19: Species observed on the Davel Yard proposed area

Species	Common Name	Conservation Status	CARA status (where applicable)
Plants			
Halopcarpha scaposa	Bietou	-	-
Solanum spp		-	Category 1
Themeda triandra	Rooigras	-	-
Aristida junciformis	Ngongoni three awn	-	-
Oenothera tetraptera	Evening primrose	-	-
Gomphocarpus fructicosus	Milk weed	-	-
Selago spp	-	-	-
Plantago lanceolata	Ribwort	-	-

Species	Common Name	Conservation Status	CARA status (where applicable)
Senecio spp	-	-	-
Hyparrhenia hirta	Common Thatching Grass	-	-
Cymbopogon plurinodes	Narrow-leaved turpentine grass	-	-
Digitaria eriantha	Finger grass	-	-
Acacia mearnsii	Black wattle	-	Category 2
Eucalyptus spp	-	-	Category 2
Jacaranda mimosifolia	Jacaranda	-	Category 3
Birds			
Vanellus armatus	*Blacksmith lapwing*	-	
Bostrychia hagedash	*Hadeda ibis*	-	
Motacilla capensis	*Cape Wagtail*	-	
Passer domesticus	*House sparrow*	-	
Bubulcus ibis	*Western cattle egret*	-	
Corvus capensis	*Cape Crow*	-	
Ardea melanocephala	*Black-headed heron*	-	
Fulica cristata	*Red-knobbed coots*	-	

8.2.1.1.1 Terrestrial environment impact assessment – Loss of habitat and removal of vegetation

Nature of the impact

Due to the nature of the project, vegetation will be cleared and replaced with rail infrastructure, service roads and storm water management systems.

Significance of impacts with mitigation

The construction phase would have the greatest impact on the surrounding vegetation. This will definitely result in the disturbance of the vegetation and soils within the site especially when considering the linear aspects of the project such as the rail lines and ancillary works mentioned above. Due to the site scale of disturbance in the construction period on the surrounding vegetation when compared to its current state, i.e. the magnitude would be low, the overall significance of would be rated as Very Low with and Low without mitigation.

The operational phase of the project would have limited impact on the surrounding vegetation once the plants are allowed to re-establish themselves in any remaining areas; thus the overall intensity would remain be Very Low as the species assemblages would have altered from natural. It is also anticipated that the grazing pressure on the vegetation would also continue but would be equitable to the present state and thus similar to the “No-Go” option.

The table below indicates the impact description as well as mitigation measures proposed.

Table 20: Impact description for the loss of habitat and removal of vegetation in the terrestrial habitat

IMPACT DESCRIPTION: Loss of habitat and removal of vegetation - terrestrial				
Predicted for project phase:	Pre-construction	Construction	Operation	Decommissioning
Dimension	**Rating**	**Motivation**		
PRE - MITIGATION				
Duration	Short - term	Equal to the duration of the construction phase.	Consequence: Negligible	Significance: Low - negative
Extent	Site-specific	Will result in the disturbance of the vegetation and soils within the sites.		
Intensity	Low - negative	Due to the site scale of disturbance in the construction period on the surrounding vegetation when compared to its current state, i.e. the intensity would be low.		
Probability	Certain	The activity will definitely lead to on site loss of habitat and vegetation.		
MITIGATION: • 'Clearing of vegetation should be kept to a minimum, keeping the width and length of the earth works to a minimum and the floodplain / wetlands habitats identified should be retained within the development footprint in its current state. • Construction activities should not exceed the proposed construction boundaries by more than 15m to avoid the secondary impact of construction and increasing the areas that would require clearing and rehabilitation • A search and rescue operation for both plants and fauna (particularly reptiles) must be initiated prior to the commencement of any construction once the required permits are in place. Applications must be submitted to the Department of Agricultural, Fisheries and Forestry (DAFF) and the Provincial Department of the Mpumalanga Department of Economic Development, Environment and Tourism (DEDET) where applicable. • Re-vegetation as part of a rehabilitation plan is always advocated, however due the nature of the vegetation, this may not be practical. It is suggested that the shallow topsoil layer be stockpiled separately from the subsoil layers, should the excavation exceed 0.5 m. When the construction has been completed, then the topsoil layers, which contain seed and vegetative material, should be reinstated last thus allowing plants to rapidly re-colonise the bare soil areas. • Alien plant regrowth should also be monitored, and any such species should be removed during the construction phase.				
POST-MITIGATION				
Duration	Short-term	As for pre-mitigation.	Consequence: Negligible	Significance: Very low
Extent	Site-specific	As for pre-mitigation.		
Intensity	Very low	Mitigation will reduce the negative impact.		
Probability	Very likely	The activity will definitely lead to on site loss of habitat and vegetation but will be reduced through appropriate mitigation measures.		

The mitigation measure in red text was found to be highly unfeasible to Transnet. As the new Golela to Nsezi line will be constructed adjacent to the existing line, 15m either side of the centre line will not allow the contractors sufficient space to carry out construction activities. Therefore the EAP proposes the following as included in the EMP that **the width of the construction footprint must be agreed upon by the ECO and the Engineer and as far as possible must be kept to a minimum. The maximum width of the construction footprint servitude will not exceed 75m. Should additional space be needed for the temporary storage of material, the ECO must advise on an appropriate area away from any sensitive areas**.

8.2.1.2 Aquatic habitats

As described in Chapter 2, the proposed yard extension falls within a catchment containing two small streams / rivers and the endorheic pan forming part of the Viskuile (B11A) and Renosterloopspruit (C11F) catchments of the Olifants and Vaal river systems respectively. All of these systems have been classified as part of the NFEPA project (Nel *et al.*, 2012).

Most of the wetlands systems, although forming part of the important Highveld Grassland Mesic Grassland Wetland Cluster, would be considered man-made or artificial and thus have a conservation rating score of Z1 or Z2, i.e. low conservation importance (Figure 18). However several wetland areas associated with the local streams were rated with a condition score of A / B or C, i.e. Pristine to moderately modified or largely modified respectively (Nel *et al*., 2012).

Notably the Endorheic pan found encircled by the proposed line, is shown to be highly modified and with little or no function (Nel *et al*., 2012 – metadata). This is possibly due to all the surrounding developments and is evident in the aerial images.

The Present Ecological State of these systems was rated as follows:

Table 21: PES for the Davel Yard aquatic environment

Wetland	Present Ecological State	Ecological Importance & Sensitivity
Endorheic pan	D	Moderate
Seep	B / C	Moderate

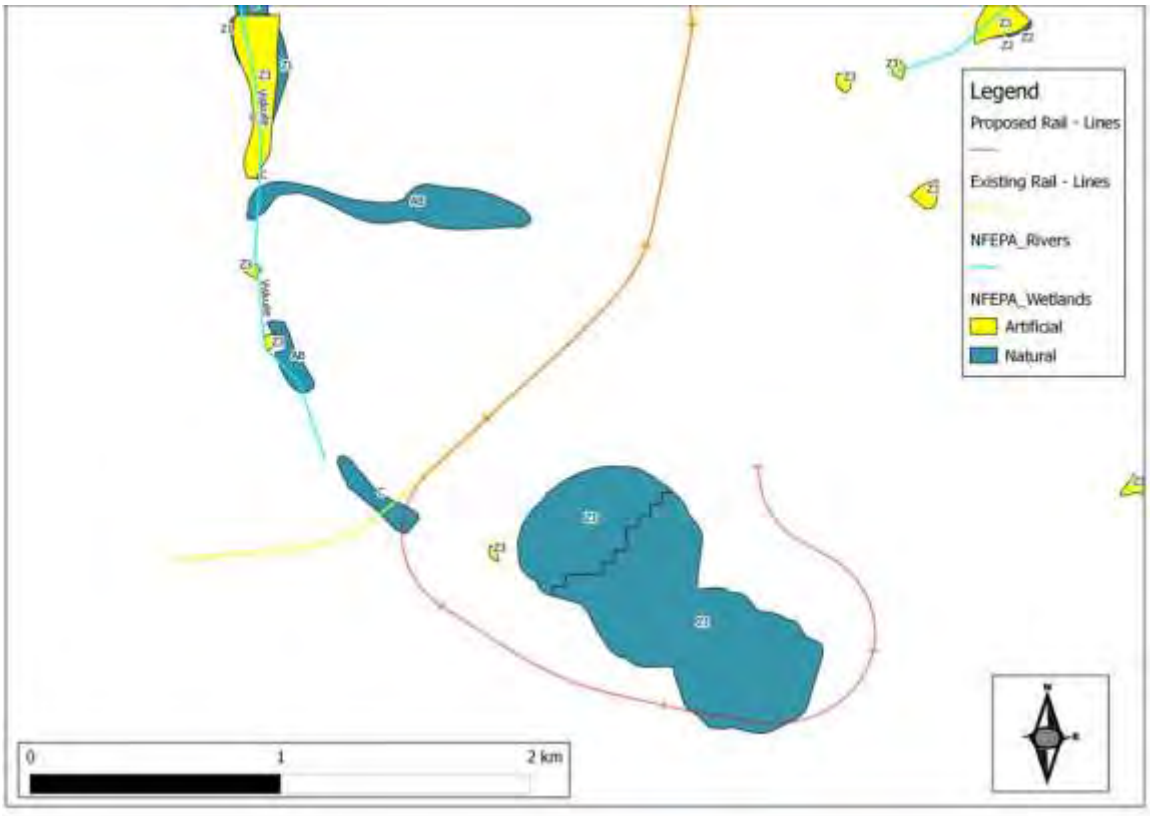


Figure 18: A map illustrating the major rivers and wetland areas within the study region

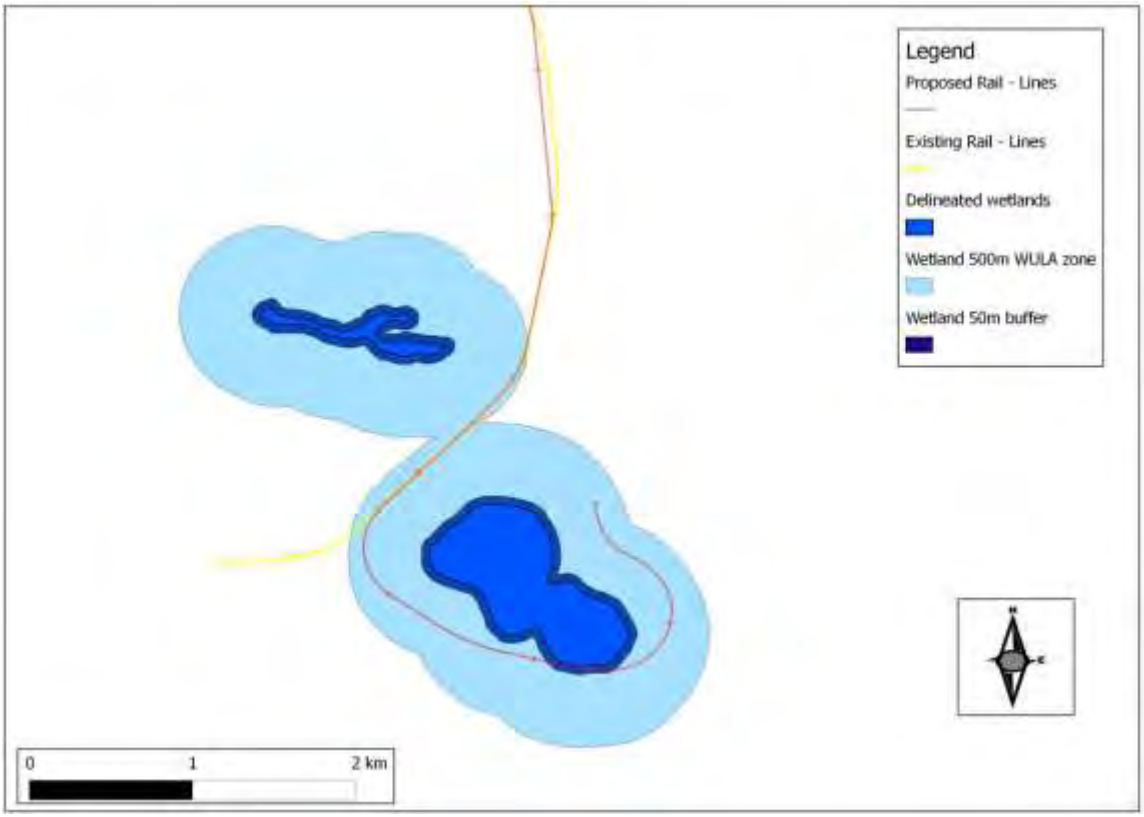


Figure 19: Delineated wetland systems with the prescribed 50m ecological buffer and the 500m Water Use License Application zone

8.2.1.2.1 Aquatic environment impact assessment – loss of habitat and removal of vegetation

Nature of the impact

Due to the nature of the project vegetation will be cleared and replaced with rail infrastructure, service roads and stormwater management systems. The increase in rail footprint would have an impact on the observed pan with regard physical loss of catchment, wetland area and changes to the local hydrology. This would then reduce the physical and as well as the functional attributes of the wetland system. This could also happen to the other wetland and riverine areas to the West of the proposed development area, especially due to the placement of the proposed yard infrastructure. However several impacts already occur within and adjacent to these systems and the proposed layout would seem to have little further impact considering the size of the footprints or the current state or lack of connectivity within the site.

Significance of impacts with mitigation

The construction phase would have the greatest impact on the surrounding wetland areas. This will definitely result in the disturbance of the vegetation and soils within the site. Due to the site scale of disturbance in the construction period on the surrounding vegetation when compared to its current state, i.e. the magnitude would be low, the overall significance of would be rated as Low without mitigation and Very Low with mitigation.

The operational phase of the project would have limited impact on the surrounding wetland areas once the plants are allowed to re-establish themselves in any remaining areas; thus the overall intensity would remain be Low as the species assemblages would have altered from natural. It is also anticipated that the grazing pressure on the vegetation would also continue but would be equitable to the present state and thus similar to the “No-Go” option.

The table below indicates the impact description as well as mitigation measures proposed.

Table 22: Impact description for the loss of habitat and removal of vegetation in the aquatic habitat

IMPACT DESCRIPTION: Loss of habitat and removal of vegetation - wetland and waterbodies				
Predicted for project phase:	Pre-construction	Construction	Operation	Decommissioning
Dimension	**Rating**	**Motivation**		
PRE-MITIGATION				
Duration	Short-term	Equal to the duration of the construction phase.	Consequence: Slightly detrimental	Significance: Low - negative
Extent	Site-specific	The increase in rail footprint would have an impact on the observed pans and valley head seeps with regard physical loss of catchment, wetland area and changes to the local hydrology.		
Intensity	Moderate - negative	Several impacts already occur within and adjacent to these systems and the proposed layouts would seem to have little further impact considering the size of the footprints or the current state or lack of connectivity within the sites.		
Probability	Certain	The activity will definitely lead to on site loss of habitat and vegetation in the aquatic environment.		
MITIGATION: • All designs should include means to protect or maintain the current hydrological regime, thus maintaining and not impeding or diverting any surface water flows. • Stormwater management systems should include energy dissipation structures to minimise the potential impact of erosion and sedimentation. • Clearing of vegetation should be kept to a minimum, keeping the width and length of the earth works to a minimum and the floodplain / wetlands habitats identified should be retained within the development footprint in its current state. • Construction activities should not exceed the proposed construction boundaries by more than 15m to avoid the secondary impact of construction and increasing the areas that would require clearing and rehabilitation • A search and rescue operation for both plants and fauna (particularly reptiles) must be initiated prior to the commencement of any construction once the required permits are in place. Applications must be submitted to the Department of Agricultural, Fisheries and Forestry (DAFF) and the Provincial Department of the Mpumalanga Department of Economic Development, Environment and Tourism (DEDET), where applicable. • Re-vegetation as part of a rehabilitation plan is always advocated, however due the nature of the vegetation, this may not be practical. It is suggested that the shallow topsoil layer be stockpiled separately from the subsoil layers, should the excavation exceed 0.5 m. When the construction has been completed, then the topsoil layers, which contain seed and vegetative material, should be reinstated last thus allowing plants to rapidly re-colonise the bare soil areas. • Alien plant regrowth should also be monitored, and any such species should be removed during the construction phase.				
POST-MITIGATION				
Duration	Short-term	As for pre-mitigation.	Consequence: Negligible	Significance: Very low
Extent	Site-specific	As for pre-mitigation.		
Intensity	Low - negative	Appropriate mitigation will reduce the potential negative impacts.		
Probability	Very likely	Appropriate mitigation will reduce the risk of this impact.		

The mitigation measure in red text was found to be highly unfeasible to Transnet. As the new Golela to Nsezi line will be constructed adjacent to the existing line, 15m either side of the centre line will not allow the contractors sufficient space to carry out construction activities. The EMP therefore proposes that **the width of the construction footprint must be agreed upon by the ECO and the Engineer and as far as possible must be kept to a minimum. The maximum width of the construction footprint servitude will not exceed 75m. Should additional space be needed for the temporary storage of material, the ECO must advise on an adequate area away from any sensitive areas**.

8.2.1.2.2 Aquatic environment impact assessment – Increase in sedimentation and erosion

Nature of the impact

This impact would be also categorised as a cumulative impact, as it would impact on the region with regard potential changes to downstream habitat quality. The increase in any surface water flow velocities within the site would then increase the risk of soil erosion and later downstream sedimentation. Should sediments eventually reach the downstream systems, this could have impacts on sediments loads, but also smother benthic habitats (plants and invertebrates).

Significance of impact with mitigation

The intensity of this impact would however be Low due to the site scale of the operations in the construction phase as well as during the operational phase. Should surface water run-off be managed, in way of mitigation, using a storm water management plan, then overall significance would be Very Low for the construction and operations phase.

The table below indicates the impact description as well as mitigation measures proposed.

Table 23: Impact description of the increase in soil erosion

<table>
<tr><th colspan="5">IMPACT DESCRIPTION: An increase in soil erosion</th></tr>
<tr><th>Predicted for project phase:</th><td>Pre-construction</td><td>Construction</td><td>Operation</td><td>Decommissioning</td></tr>
<tr><th>Dimension</th><th>Rating</th><th colspan="3">Motivation</th></tr>
<tr><td colspan="5">PRE-MITIGATION</td></tr>
<tr><td>Duration</td><td>Short-term</td><td>During construction denuded and bare areas should be monitored and managed to reduce the surface water velocity and downstream deposit of sediment.</td><td rowspan="3">Consequence: Negligible</td><td rowspan="4">Significance: Very low</td></tr>
<tr><td>Extent</td><td>Site-specific</td><td>Erosion could occur on denuded soil although it could have a downstream impact by way of sediment depositing.</td></tr>
<tr><td>Intensity</td><td>Low - negative</td><td>Due to the site scale of the operations in the construction phase as well as during the operational phase.</td></tr>
<tr><td>Probability</td><td>Fairly likely</td><td colspan="2">Due to the type of activity the potential exist for erosion on denuded soil.</td></tr>
<tr><td colspan="5">MITIGATION:
• During construction, erosion should be monitored while areas of vegetation are being cleared; and
• Hard engineered surfaces that increase surface water run-off should be limited and a storm water management plan should be created for the development for the operations phase.</td></tr>
<tr><td colspan="5">POST-MITIGATION</td></tr>
<tr><td>Duration</td><td>Short-term</td><td>As for pre-mitigation.</td><td rowspan="3">Consequence: Negligible</td><td rowspan="4">Significance: Very low</td></tr>
<tr><td>Extent</td><td>Site-specific</td><td>As for pre-mitigation.</td></tr>
<tr><td>Intensity</td><td>Very low</td><td>Mitigation measures will decrease the intensity of erosion.</td></tr>
<tr><td>Probability</td><td>Fairly likely</td><td colspan="2">Mitigation will decrease probability of erosion on cleared areas.</td></tr>
</table>

8.2.1.2.3 Aquatic environment impact assessment – Changes to the hydrological regime within the wetland environment

Nature of the impact

Due to the nature of the proposed project this would be an operational phase impact, limited to when the rail and watercourse crossing features and any erosion protection structures have been constructed. These structures could interfere with natural run-off patterns, either diverting flows or increasing the velocity of surface water flows. This has the potential to increase or decrease surface water flows into wetland areas.

Plate 4: Excess ballast falls into the culverts and so creates berms, which then impedes flow. Plate 4 indicates the ballast spoil impeding water flow. It is also important that during construction and operations that excess ballast is not allowed to enter any water course areas, culverts etc., which if so doing alter these systems by forming impoundments as shown in Plate 4.

Significance of impact with mitigation

Although permanent changes to the local hydrological regime are probable, the intensity of the impact in the operational phase would be Low but on a site wide scale in the long-term, thus the overall significance of this impact would be Low with mitigation.

The table below indicates the impact description as well as mitigation measures proposed.

Table 24: Impact description for the hydrological impacts on wetlands

IMPACT DESCRIPTION: Hydrological impacts on wetlands				
Predicted for project phase:	Pre-construction	Construction	Operation	Decommissioning
Dimension	**Rating**	**Motivation**		
PRE-MITIGATION				

Duration	Long-term	Structures could interfere with natural run-off patterns, either diverting flows or increasing the velocity of surface water flows and has the potential to increase or decrease surface water flows into wetland areas.	Consequence: Moderately detrimental	Significance: Low - negative
Extent	Site-specific	Impact will generally be confined to specific areas.		
Intensity	Moderate - negative	Permanent changes to the local hydrological regime are probable, the intensity of the impact in the operational phase would be moderate but on a site wide scale in the long-term.		
Probability	Fairly likely	Due to the type of activity the potential exist for erosion on denuded soil.		
MITIGATION: • Surface water management features such as the crossing of drainage lines, should be placed in manner that flows remain unaltered in terms of direction, velocity and volume, thus the natural base flows, i.e. hydrological regime within these systems is maintained; and • It is also important that during construction and operations that excess ballast is not allowed to enter any water course areas, culverts etc.				
POST-MITIGATION				
Duration	Long-term	Mitigation can reduce the risk of lasting negative effects.	Consequence: Slightly detrimental	Significance: Low - negative
Extent	Site-specific	As for pre-mitigation.		
Intensity	Low - negative	Mitigation measures should be effective in reducing severity of impacts.		
Probability	Fairly likely	Mitigation measures would reduce probability of impacts occurring to the extent predicted.		

8.2.1.3 Biodiversity conservation

The Mpumalanga Biodiversity Conservation Plan maps biodiversity into six categories, depending on level of importance, as indicated in the text table below (Lötter and Ferrar, 2006).

Table 25: Mpumalanga Biodiversity Conservation Plan categories and descriptions

Colour code	Category and Description
	Protected Areas: Formally Protected Areas (PA) managed for biodiversity conservation and sustainable use e.g. commercial nature based tourism, education, and limited production and harvesting of wild resources, especially game animals. All PAs contribute to meeting biodiversity targets. AREA: 4.4 % (+10.4 % KNP).
	Irreplaceable Areas: Areas of highest biodiversity value supporting unique biodiversity features e.g. endangered species, rare habitats, which have already been severely transformed and which require protection. Developments must be controlled to ensure conservation objectives. AREA: 2.4 %
	Highly Significant Areas: Very few options remain to meet biodiversity targets in these areas. Natural vegetation cover should be maintained or restored. Developments must be compatible with conservation objectives, e.g. well managed livestock grazing, small scale, biodiversity friendly. AREA: 12.3 %
	Important & Necessary Areas: These areas meet biodiversity targets while minimising land use conflict. Larger areas will be required elsewhere for targets to be met, if biodiversity is lost in this category. There are options for development. Developments must be compatible with conservation objectives. AREA: 9.5 %
	Least Concern: Natural areas not currently required for meeting biodiversity targets, but which contribute to functioning ecosystems and ecological connectivity. A greater variety of development choices exists in these areas. AREA: 25.2 %
	No natural habitat remaining: Transformed areas e.g. urban, industrial and cultivated areas. AREA:

	35.8 %
	Ecological Corridors: Ecological corridors allow for long term biological movement in response to environmental change, and are located along rivers and altitudinal gradients, preferably along intact natural habitat while linking important biodiversity. Management guidelines include the maintenance of natural vegetation, minimization of natural habitat loss, and restoration of degraded habitats. Developments must be compatible with conservation objectives.

The Davel Yard will traverse a number of important habitats as shown in Figure 8 of Chapter 2:

- Highly significant – development criteria = “linear developments are restricted”; and
- Important or necessary (ecosystem functioning or corridors) - development criteria = “linear developments are restricted”.

The remaining areas were categorised as follows:

- No Natural habitat remaining - development criteria = “linear developments are permitted”; and
- Least concern - development criteria = “linear developments are permitted”.

8.2.1.3.1 Land use guidelines

A set of land use guidelines are recommended for each category delineated on the Mpumalanga Biodiversity Conservation Plan Map (Refer to Table 26)

The Railway is a Linear Engineering Structure, which is permitted within Important & Necessary Areas, Ecological Corridors and areas of Least Concern, but with restrictions to reduce the impact on biodiversity, whereas it is not permitted within Protected Areas, Irreplaceable areas and Highly Significant areas. However, it should be noted that the greater part of the proposed route follows the existing alignment.

Table 26: Recommended land use guidelines for the categories in the Mpumalanga Biodiversity Conservation Plan (Y = Yes, N = No, R = Restricted)

LAND USE	PROTECTED AREAS	IRREPLACE-ABLE	HIGHLY SIGNIFICANT	IMPORTANT & NECESSARY	ECOLOGICAL CORRIDORS	LEAST CONCERN
Conservation Management	Y	Y	Y	Y	Y	Y
Extensive Game Farming	Y	Y	Y	Y	Y	Y
Extensive Livestock Production	R	Y	Y	Y	Y	Y
Rural Recreational Development	N	N	R	R	R	Y
Rural Communal Settlement	N	N	R	R	R	R
Dryland Crop Cultivation	N	N	N	N	R	Y
Intensive Animal Farming	N	N	N	N	R	Y
Irrigated Crop Cultivation	N	N	N	N	R	Y
Timber Production	N	N	N	N	R	Y
Urban & Business development	N	N	N	N	N	R
Major Development Projects	N	N	N	N	N	Y
Linear Engineering Structures	**N**	**N**	**N**	**R**	**R**	**R**
Water Projects & Transfers	N	N	R	R	R	R
Underground Mining	N	N	R	R	R	N
Surface Mining, Dumping & Dredging	N	N	N	N	R	R

8.2.1.3.2 Biodiversity impact assessment – loss of corridors and habitat fragmentation

Nature of the impact

Due to the nature of the project vegetation will be cleared and replaced with rail lines and supporting infrastructure and this will result in additional habitat fragmentation both within the terrestrial and aquatic environments, i.e. the elevated embankments on which the rail lines would disrupt movement corridors. The construction phase would have the greatest impact in terms of habitat destruction, but the actual impact of fragmentation would occur in the operational phase.

Plate 3: An example of an elevated culvert that has raised the level of the riverbed resulting in a form of habitat fragmentation.

Significance of impact with mitigation

With the above mitigation measures in place, the definite impact on the fragmentation would remain within the Local area, resulting in a long-term impact of Medium and Low intensities (without and with mitigation respectively) for the operational phase, resulting in a Low (without mitigation) and Very Low (with mitigation) significance. This is assuming that the proposed infrastructure will allow for culverts in suitable areas to maintain links within the aquatic and terrestrial environment.

The table below describes the impact of the potential loss of corridors and habitat fragmentation and the proposed mitigation measures.

Table 27: Impact description of the loss of corridors and habitat fragmentation

IMPACT DESCRIPTION: Loss of corridors and habitat fragmentation				
Predicted for project phase:	Pre-construction	Construction	Operation	Decommissioning
Dimension	**Rating**	**Motivation**		
PRE-MITIGATION				
Duration	Long-term	The construction phase would have the greatest impact in terms of habitat destruction, but the actual impact of fragmentation would occur in the operational phase.	Consequence: Moderately detrimental	Significance: High - negative
Extent	Local	Vegetation will be cleared and replaced with rail lines and supporting infrastructure and this will result in additional habitat fragmentation both within the terrestrial and aquatic environments.		
Intensity	Moderate - negative	The construction of the railway line will to a degree restrict movement of fauna.		
Probability	Certain	Due to the nature of the activity it will have a definite impact on the corridors of movement resulting in fragmentation.		
MITIGATION: • Where extensive or elevated (>2m in height) embankments are required it is advised that additional culverts are installed to provide access for fauna in areas with high fauna populations such as nature reserves and game farms. • Wetland and 1:100 year floodline areas must be excluded from development as far as possible, i.e. designs should include means to span these areas thus maintain open ecological networks. • Where culverts are installed across drainage lines and watercourses, the proposed designs should ensure that natural ground levels are maintained, i.e. the culvert base does pose as an obstacle for the movement of aquatic organisms (Plate 3). • Construction activities should not exceed the proposed construction boundaries by more than 15m to avoid the secondary impact of construction and increasing the areas that would require clearing and rehabilitation • Re-vegetation as part of a rehabilitation plan is always advocated, however due the nature of the vegetation, this may not be practical. It is suggested that the shallow topsoil layer be stockpiled separately from the subsoil layers, should the excavation exceed 0.5 m. When the construction has been completed, then the topsoil layers, which contain seed and vegetative material, should be reinstated last thus allowing plants to rapidly re-colonise the bare soil areas. • Alien plant regrowth should also be monitored, and any such species should be removed during the construction phase.				
POST-MITIGATION				
Duration	Long-term	As for pre-mitigation.	Consequence: Moderately detrimental	Significance: Moderate - negative
Extent	Local	With the implementation of the proposed mitigating measures the impact on fragmentation would remain in the local sphere.		
Intensity	Low - negative	The proposed mitigation will reduce impacts to some extent.		
Probability	Very likely	Mitigation will reduce the risk of these impacts to some extent.		

The mitigation measure in red text was found to be highly unfeasible to Transnet. As the new Golela to Nsezi line will be constructed adjacent to the existing line, 15m either side of the centre line will not allow the contractors sufficient space to carry out construction activities. The EMP therefore proposes that **the width of the construction footprint must be agreed upon by the ECO and the Engineer and as far as possible must be kept to a minimum. The maximum width of the construction footprint servitude will not exceed 75m. Should additional space be needed for the temporary storage of material, the ECO must advise on an adequate area away from any sensitive areas**.

8.2.1.3.3 Biodiversity impact assessment: Loss of species of special concern

Nature of impact

Any loss of systems could possibly result in the loss of species of special concern within the habitats as a result of their destruction during the construction phase. Changes in the hydrological region in the operational phase, could

limit the presence of these species, should surface water flows be diverted. This would then limit the potential formation of the required habitats (fauna and flora).

However, no flora and fauna species of special concern were evident during the study within the wetland or water course areas, as well as the terrestrial habitats, possibly due to the intensity of farming, housing and rail infrastructure already found in the study area. The lack of any rainfall also seemed to precluded the early growth or appearance of species known to occur in the area so as precautionary step, it is important that all wetland areas are retained and allowed to function, as a number of protected species listed by the Mpumalanga Nature Conservation Act (Act 10 of 1998) do occur within the region.

Significance of impact with mitigation

The impact would be rated as a regional impact due to the species under consideration and the lack of potential habitat still remaining. The impact would persist into the long-term however the unlikely probability of finding such species together with the proposed mitigations both the intensity and significance of the impact would be Low. The impact would be rated as Low without mitigation due to confidence in this assessment based in the reasons listed above.

The table below describes the impact of the potential loss of rare and endangered species and the proposed mitigation measures.

Table 28: Impact description for the potential loss of rare and endangered species

<table>
<tr><th colspan="5">IMPACT DESCRIPTION: Loss of rare and endangered species</th></tr>
<tr><td>Predicted for project phase:</td><td>Pre-construction</td><td>Construction</td><td>Operation</td><td>Decommissioning</td></tr>
<tr><td>Dimension</td><td>Rating</td><td colspan="3">Motivation</td></tr>
<tr><td colspan="5">PRE-MITIGATION</td></tr>
<tr><td>Duration</td><td>Long-term</td><td>Any loss of systems could possibly result in the loss of species of special concern within the habitats as a result of their destruction during the construction phase but could persist into the long term.</td><td rowspan="3">Consequence: Moderately detrimental</td><td rowspan="4">Significance: Low - negative</td></tr>
<tr><td>Extent</td><td>Regional</td><td>Due to the species under consideration and the lack of potential habitat still remaining.</td></tr>
<tr><td>Intensity</td><td>Low - negative</td><td>In view of the unlikely probability of finding such species together with the proposed mitigations, the intensity of the impact would be low.</td></tr>
<tr><td>Probability</td><td>Unlikely</td><td colspan="2">No flora and fauna species of special concern were evident during the study within the wetland or water course areas, as well as the terrestrial habitats, possibly due to the intensity of farming, housing and rail infrastructure already found in the study area.</td></tr>
<tr><td colspan="5">MITIGATION:
• All designs should include means to protect or maintain the current hydrological regime, thus maintaining and not impeding or diverting any surface water flows.
• Stormwater management systems should include energy dissipation structures to minimise the potential impact of erosion and sedimentation.
• Clearing of vegetation should be kept to a minimum, keeping the width and length of the earth works to a minimum and the floodplain / wetlands habitats identified should be retained within the development footprint in its current state.
• Construction activities should not exceed the proposed construction boundaries by more than 15m to avoid the secondary impact of construction and increasing the areas that would require clearing and rehabilitation
• A search and rescue operation for both plants and fauna (particularly reptiles) must be initiated prior to the commencement of any construction once the required permits are in place. Applications must be submitted to the Department of Agricultural, Fisheries and Forestry (DAFF) and the Provincial Department of the Mpumalanga Department of Economic Development, Environment and Tourism</td></tr>
</table>

(DEDET).

- Re-vegetation as part of a rehabilitation plan is always advocated, however due the nature of the vegetation, this may not be practical. It is suggested that the shallow topsoil layer be stockpiled separately from the subsoil layers, should the excavation exceed 0.5 m. When the construction has been completed, then the topsoil layers, which contain seed and vegetative material, should be reinstated last thus allowing plants to rapidly re-colonise the bare soil areas.
- Alien plant regrowth should also be monitored, and any such species should be removed during the construction phase.

POST-MITIGATION				
Duration	Long-term	As per pre-mitigation.	Consequence: Negligible	Significance: Very low
Extent	Regional	As per pre-mitigation.		
Intensity	Very low	As per pre-mitigation.		
Probability	Unlikely	As per pre-mitigation.		

The mitigation measure in red text was found to be highly unfeasible to Transnet. As the new Golela to Nsezi line will be constructed adjacent to the existing line, 15m either side of the centre line will not allow the contractors sufficient space to carry out construction activities. The EMP therefore proposes that **the width of the construction footprint must be agreed upon by the ECO and the Engineer and as far as possible must be kept to a minimum. The maximum width of the construction footprint servitude will not exceed 75m. Should additional space be needed for the temporary storage of material, the ECO must advise on an adequate area away from any sensitive areas**.

8.2.1.3.4 Biodiversity impact assessment – The potential spread of alien vegetation

Nature of the impact

Only a few small areas did contain alien plants, and these are mostly limited to disturbed areas near the homes in KwaDela and exotic *Acacia mearnsii* and *Eucalyptus* stands for example.

Significance of impact with mitigation

With the above mitigation measures in place, the impact on the vegetation would remain within the site, with natural re-vegetation happening within a short time period, resulting in a Very Low impact significance with mitigation (Low, without). This is also based on the fact that during the operational phase on-going clearing and maintenance practices will be employed by Transnet.

The table below describes the potential impact of the introduction of alien vegetation and the proposed mitigation measures.

Table 29: Impact description for the introduction of alien and invasive species

IMPACT DESCRIPTION: Introduction of alien and invasive species				
Predicted for project phase:	Pre-construction	Construction	Operation	Decommissioning
Dimension	**Rating**	**Motivation**		
PRE-MITIGATION				
Duration	Medium-term	Will be limited to construction phase	Consequence: Slightly detrimental	Significance: Low - negative
Extent	Site-specific	Potential for spread of alien species in newly cleared areas		
Intensity	Low - negative	A large area of the project is already disturbed and planted with alien species.		
Probability	Fairly likely	The disturbance of vegetation can easily lead to the establishment of new		

		colonies of alien and invasive species		
MITIGATION: • Clearing of vegetation should be kept to a minimum, keeping the width and length of the earth works to a minimum; • Re-vegetation as part of a rehabilitation plan is always advocated, however to the low annual rainfall (normal conditions), this may not be practical. It is suggested that the shallow topsoil layer be stockpiled separately from the subsoil layers, should the excavation exceed 0.5 m. When the construction has been completed, then the topsoil layers, which contain seed and vegetative material, should be reinstated last thus allowing plants to rapidly re-colonise the bare soil areas; and • Alien plant regrowth should also be monitored, and any such species should be removed during the construction phase.				
POST-MITIGATION				
Duration	Medium-term	As for pre-mitigation	Consequence: Negligible	Significance: Very low
Extent	Site-specific	As for pre-mitigation		
Intensity	Very low	Mitigation measures will reduce the potential spread of alien species and natural re-vegetation can take place		
Probability	Fairly likely	Mitigation measures will reduce likelihood of spread of alien species and clearing of the sites during operational phase will further reduce the possible negative impacts.		

8.2.1.4 Conclusions and recommendations of the ecological assessment undertaken

The results, based on the available information and the site investigations, show that the proposed Davel Rail Yard could impact on a number of sensitive and / or important terrestrial and aquatic habitats. However several of the metadata sources (Ferrar & Lötter, 2007) for the spatial data shown in this report also indicate that large areas of habitat at a broad scale are degraded or transformed. This is also supported by the observed land use character shown in the aerial images (Google Earth). This was confirmed during the site visit.

It would therefore seem based on the site visit and the type of habitats observed that the proposed extension of rail lines and yard would have a limited impact on both the terrestrial aquatic environment if the mitigations and recommendations are upheld together with the following aspects that must be included as well as submission of the requisite Water Use License Applications (WULA) to the Department of Water Affairs.

Compilation and implementation of a Construction Environmental Management Programme (CEMP), that provides specifications with regards to:

- Rehabilitation with indigenous plants species. (i.e. a Rehabilitation Plan);
- Plant removal within the construction footprint only;
- Alien clearing and management within the development footprint / construction area;
- Detailed storm-water management and erosion control plan;
- Waste management:
  - (i) To prevent accidental leakage of pollutants e.g. oil, fuel, cement;
  - (ii) To identify procedures for solid waste disposal (e.g. bins, no littering or burning policy and the maintenance of ablution facilities, including the disposal of liquid and hazardous waste at a licensed waste disposal site;
  - (iii) To ensure that no re-fuelling of construction vehicles or maintenance activities occur proximate to the non-perennial stream (drainage area) to the west of the sites; and

(iv) To designate an area for the construction camp (which includes ablution facilities, storage of hazardous wastes, maintenance stations etc.) at least 100 m away from the non-perennial stream (drainage area) to the west of the sites.

- Other generic mitigation measures associated with construction; and
- Employment of an Environmental Control Officer to oversee the implementation of the CEMP and the Record of Decision (Environmental Authorisation).

8.2.2 Hydrology assessment

Aurecon conducted the hydrological assessment for the project. The specialist report can be found in Appendix B, Annexure C. A short description of the impacts assessed follows.

Davel is situated on a watershed between two Quaternary Catchments namely B11A and C11F. The rail yard is situated in B11A and the alignment extension that loops around a pan close to KwaDela is in C11F. Davel has a mean annual precipitation (MAP) 740 mm and in South African terms a relatively low inter-annual coefficient of variation for rainfall of 25 %. The annual rainfall for Davel from 1930 to 1999 is presented in Figure 20, with the MAP for the Swazi Rail Link study in Figure 4. Schulze (1997) used the Markham technique to delineate southern Africa into regions of rainfall seasonality. The Highveld area in which Davel is situated was designated an early summer rainfall area i.e. November / December maximum (see Figure 21). A mid-summer dry spell occurs in 9 out of 10 years, with a low rainfall spell for days to weeks with high temperatures.

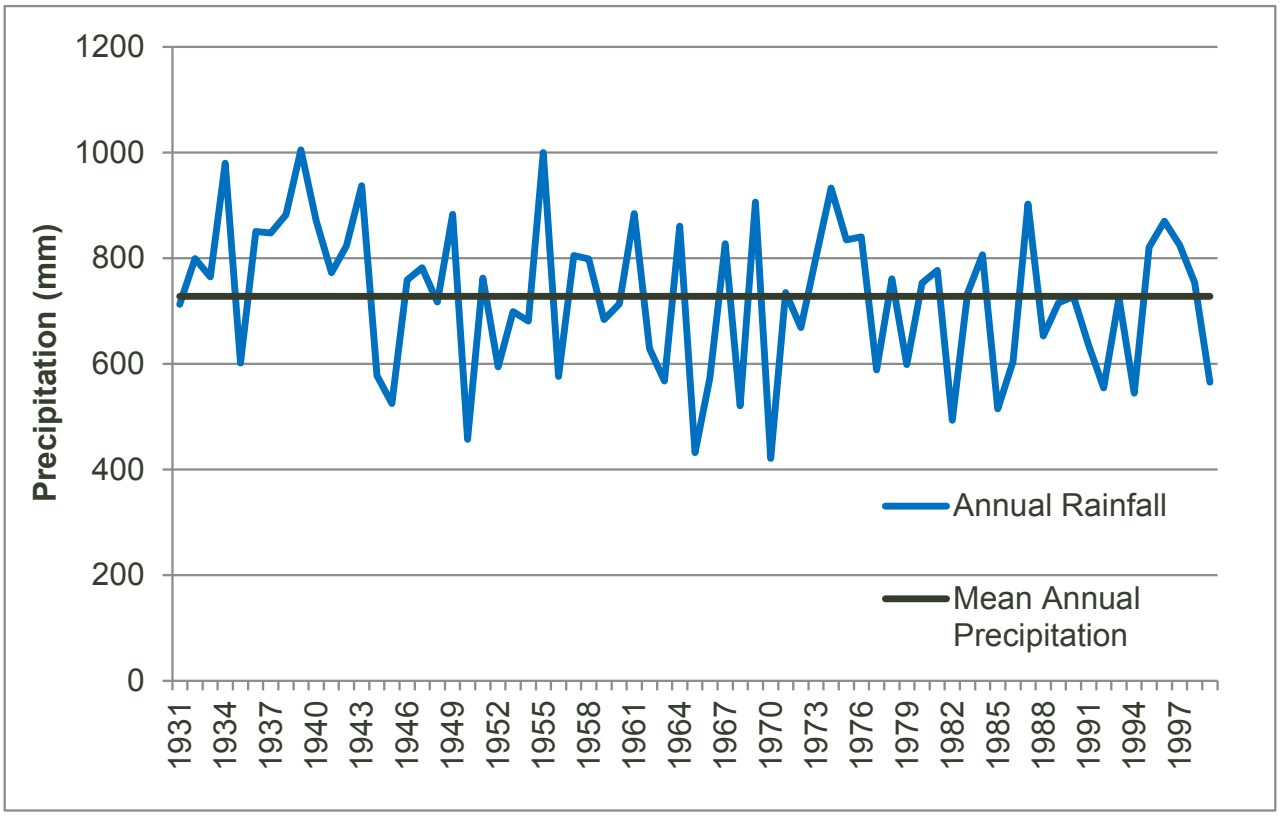


Figure 20: Annual precipitation for Davel (rainfall station 0479297 W)

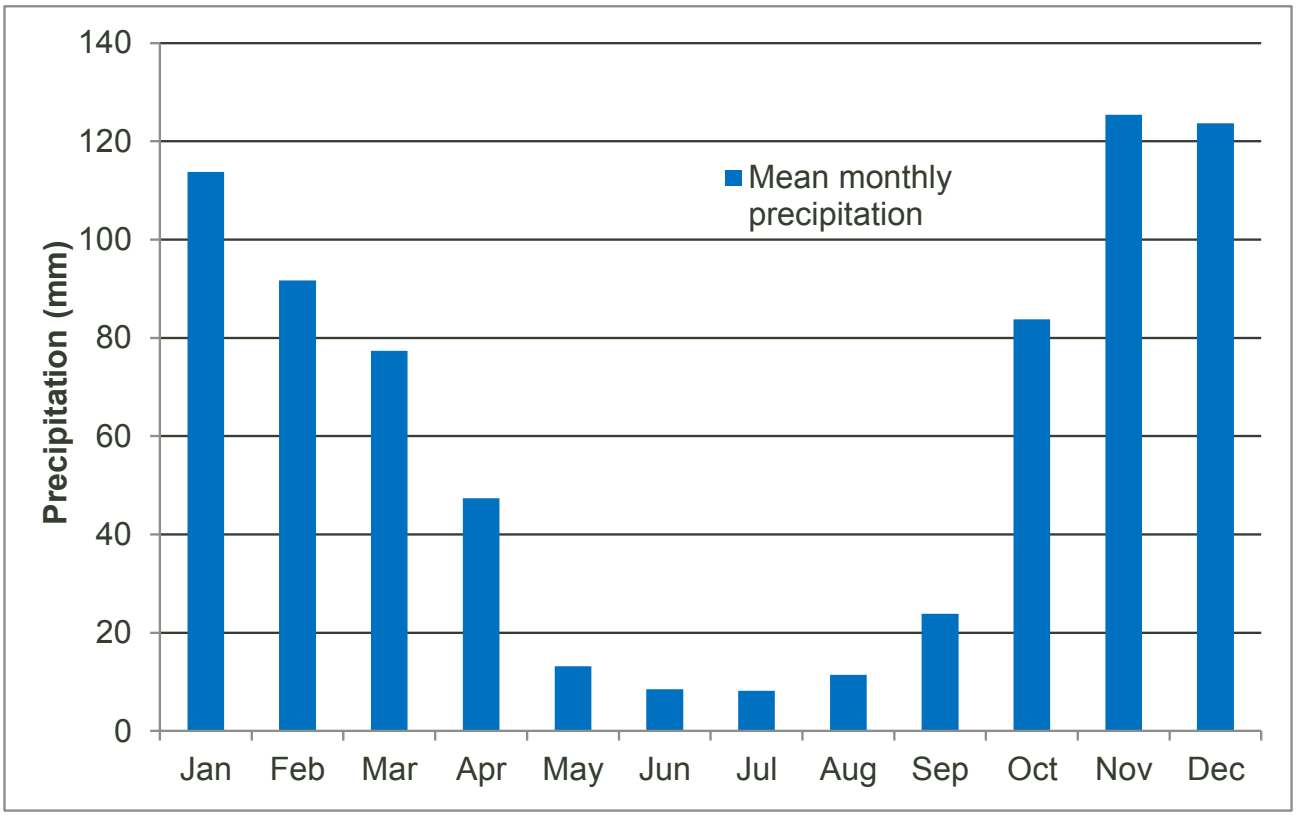


Figure 21: Mean monthly precipitation for Davel (rainfall station 0479297 W)

Impacts on surface waters will occur during rail construction. Pollution from mobilised suspended solids is the major concern particularly for the new alignment that is in close vicinity of the pan at the KwaDela settlement (Figure 22 and Figure 23). Sediment mobilisation can be prevented in the most part in the construction phase by the use of silt traps. These silt traps would need to be cleaned regularly. If best practice is followed in culvert design then erosion and sediment mobilisation in the long term will have a limited impact. Good practice would include erosion protection.

Potential sources of surface water pollution at the rail yard include:

- Wastewater from kitchen and ablution facilities;
- Wash bays and workshops;
- Fuelling facilities; and
- Coal dust and rainfall seepage from the wagons.

Figure 22: Pan near to KwaDela settlement

Figure 23: Existing rail and pan near to KwaDela

The runoff for catchment B11A is and for C11F mm Figure 24) This area of Mpumalanga (Ermelo / Bethal) is a high yielding maize environment (Figure 28) with the soils being generally a sandy clay loam or a sandy clay texture, with soil thickness ranging from 400-1200 mm (see Figure 26). The geology for the entire alignment is shown in Figure 27.

It is recommended that monitoring be undertaken of any effluent that is discharged from the Davel Yard into a surface water resource such as a stream or pan. If the volume of the discharge is less than 2000 cubic metres on any given day, then the effluent must comply with the general effluent standards according to Sections 21 (f) and (h) of the Revision of General Authorisations in terms of Section 39 of the National Water Act (as revised on 6 September 2013) (Government Notice No. 665). The general effluent standards are specified in Table 2.1 of the General Authorisation regulations (Government Notice No. 665). The effluent should be metered and records be kept of total weekly discharges, and the effluent quality should be monitored at a monthly frequency. The constituents to be monitored for depends on effluent volume that is discharged (refer Table 2.2 of the General Authorisation regulations). For a small discharge (up to 100 cubic metres) only three parameters are monitored, and more parameters for larger volumes of effluent.

If the volume of effluent discharged exceeds 2000 cubic metres per day, then a water use licence must be issued by the Department of Water Affairs and the effluent standards and monitoring conditions will be specified in the licence conditions.

No storm water may be discharged from the site if it contains waste, or waste emanating from industrial activities on the premises. It is important that there be proper separation of clean storm water runoff from contaminated storm water.

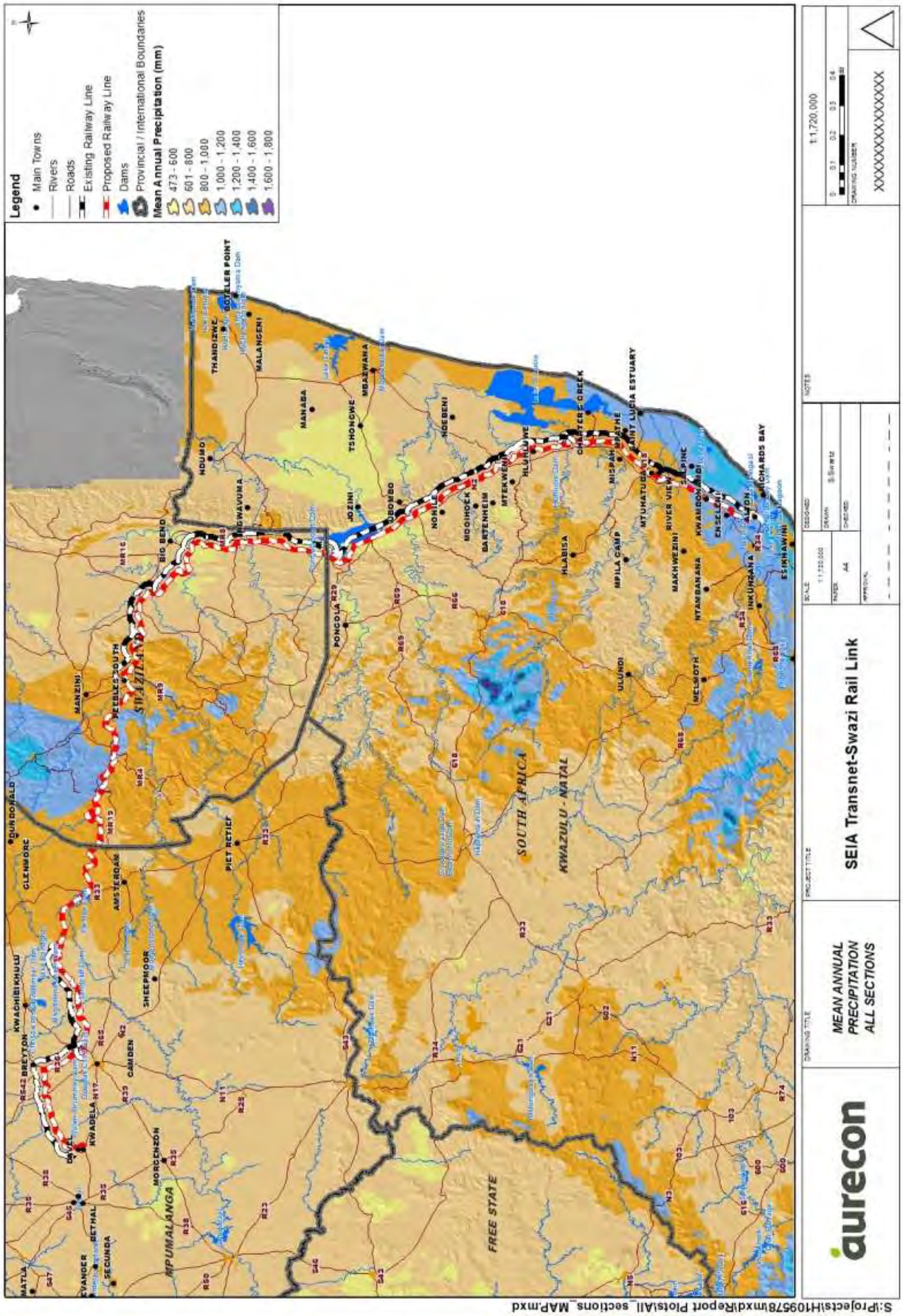


Figure 24: Mean Annual Precipitation (mm) for all sections of the Transnet Swazi Rail Link

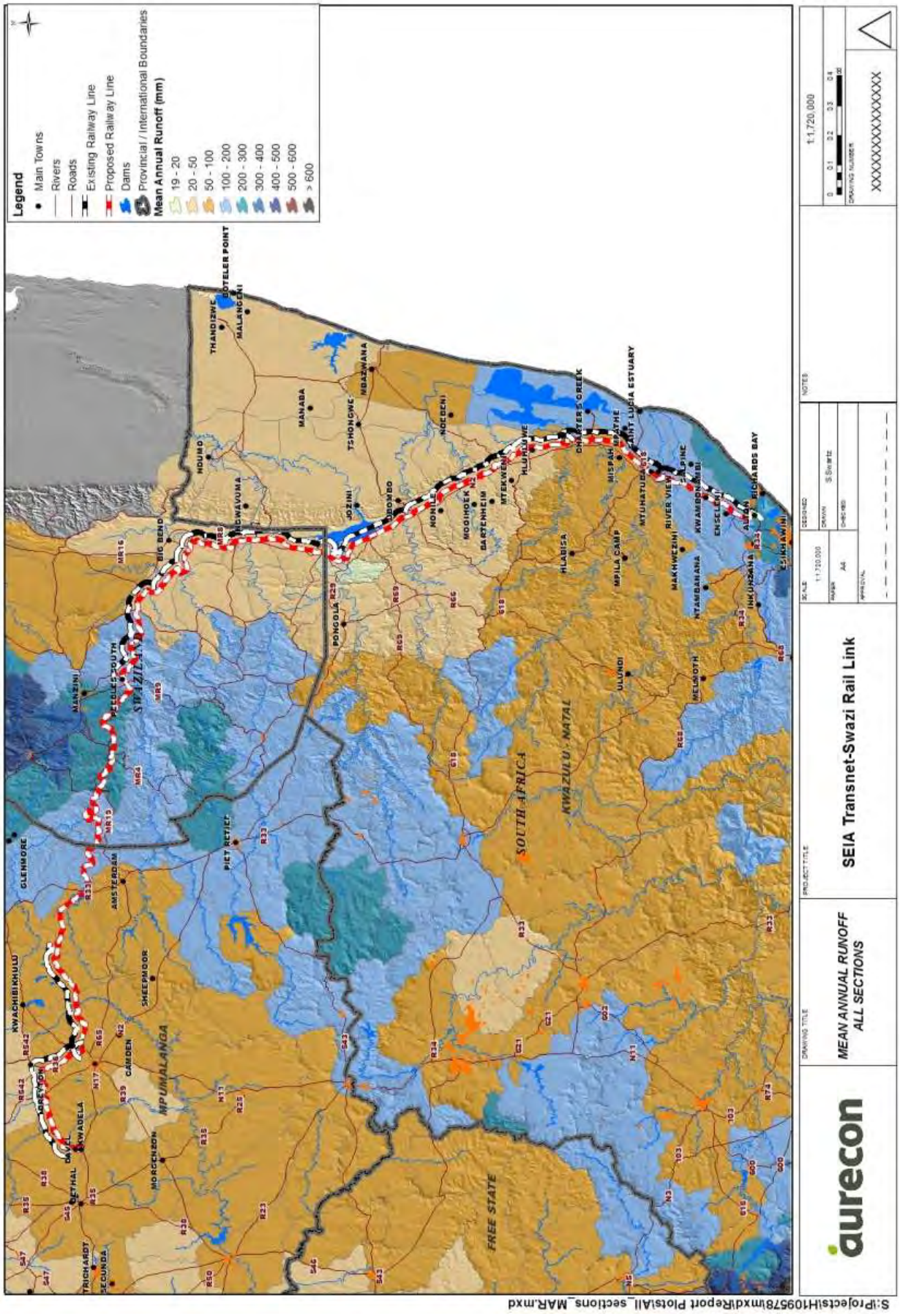


Figure 25: Runoff (mm) for all sections of the Transnet Swazi Rail Link

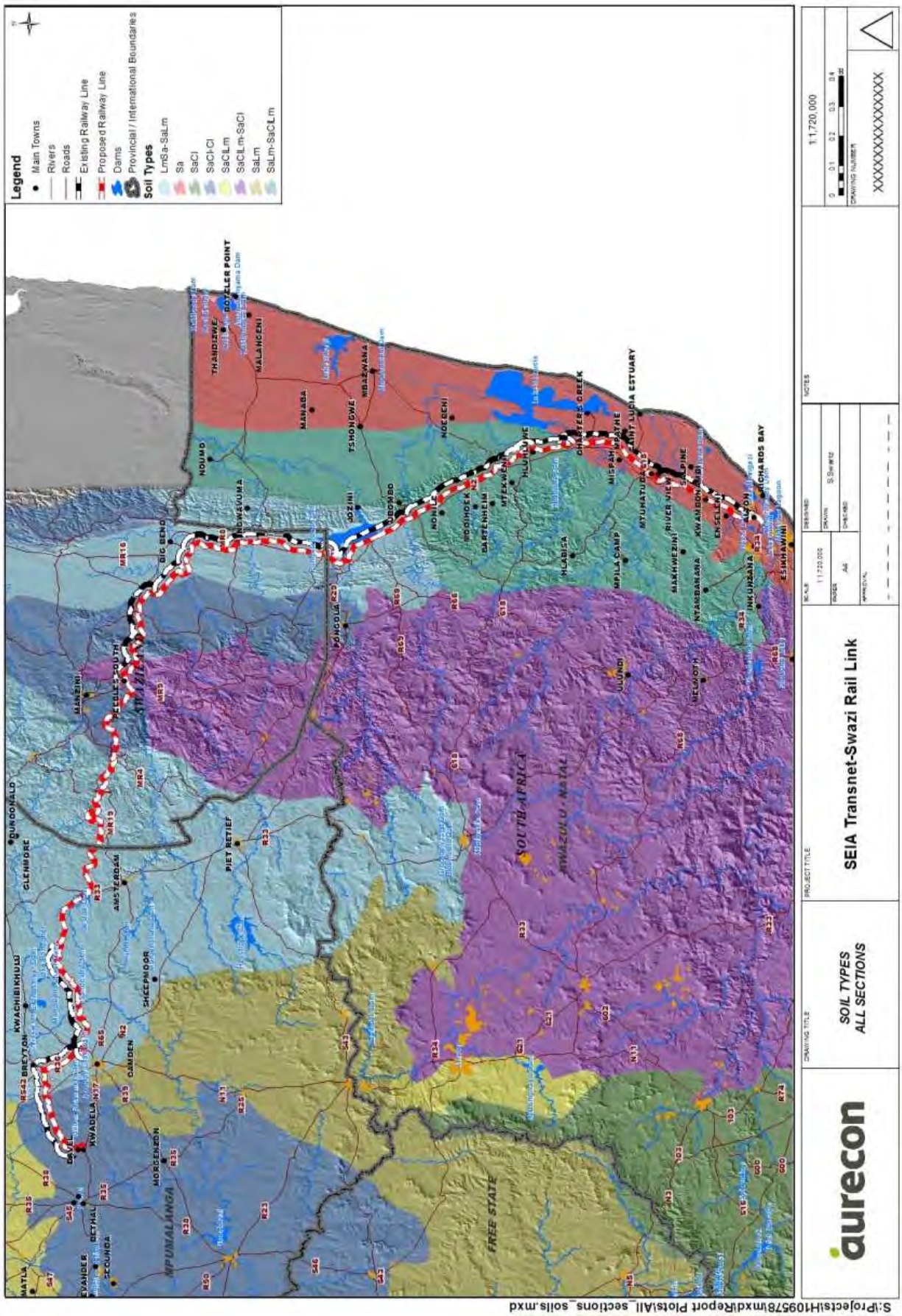


Figure 26: Soil types for all sections of the Transnet Swazi Rail Link

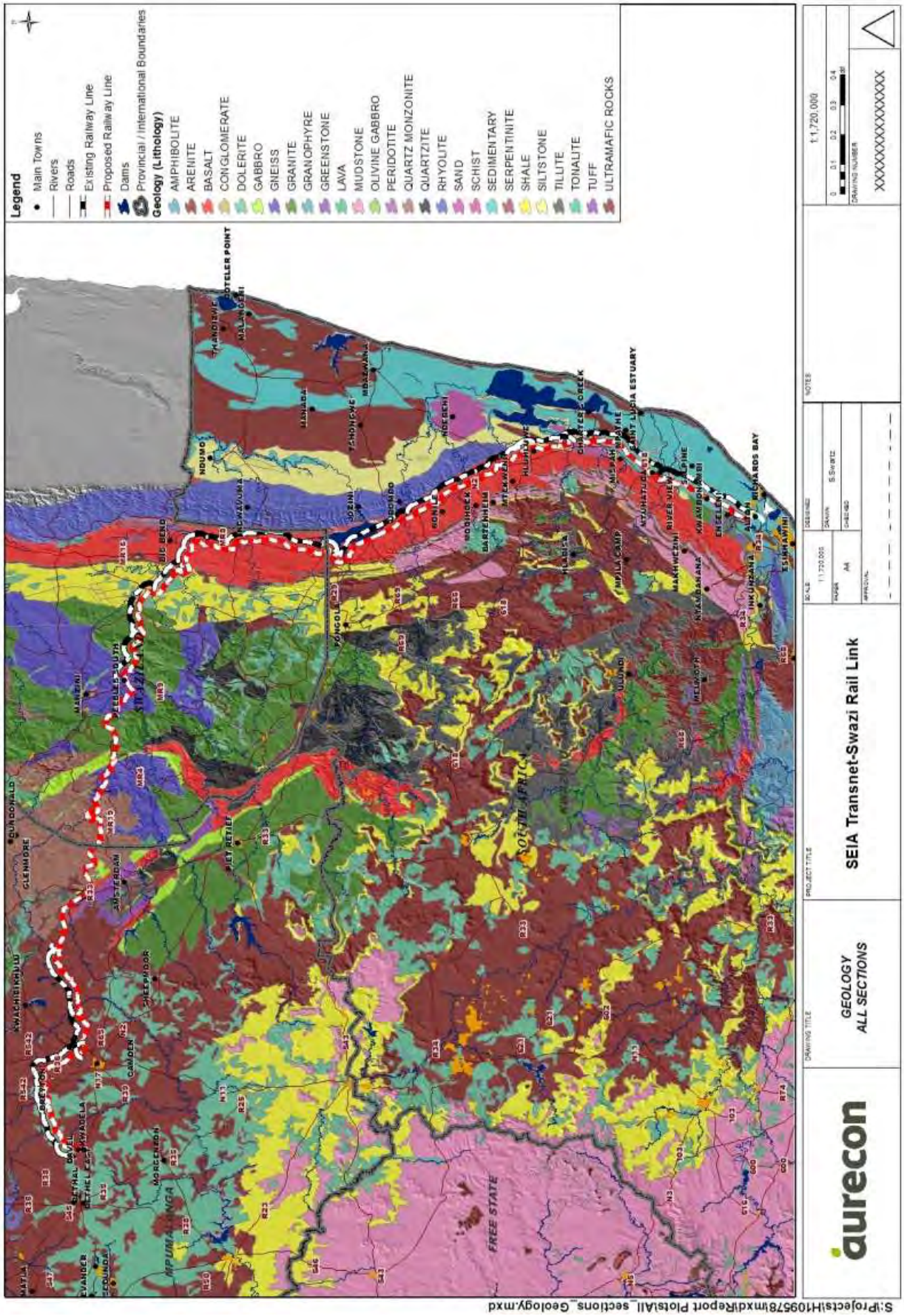


Figure 27: Geology for all sections of the Transnet Swazi Rail Link

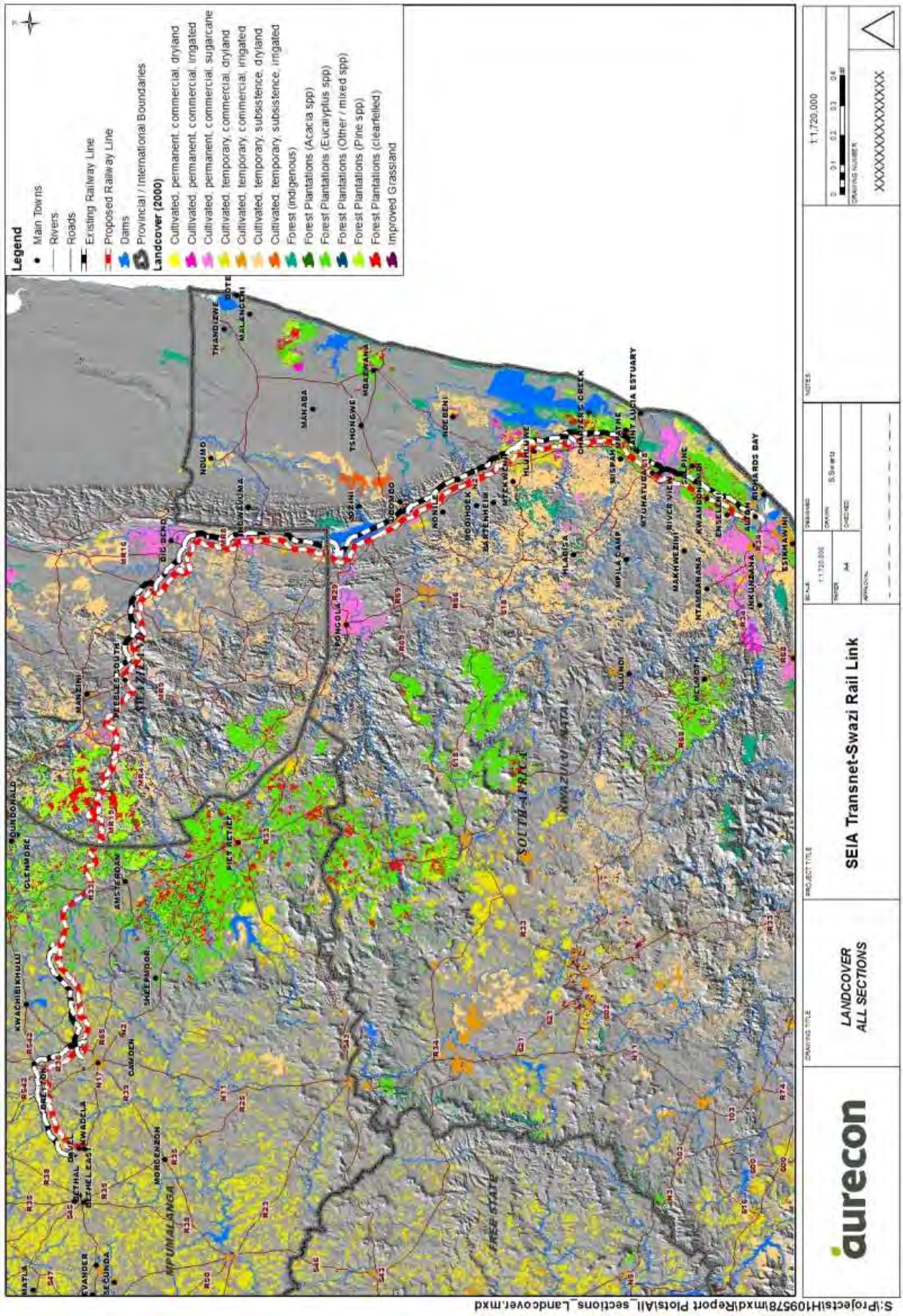


Figure 28: Land cover for all sections of the Transnet Swazi Rail Link

8.2.2.1 Water quality impact assessment

In terms of water quality impacts of the railway line, there are three concerns. The impact descriptions can be found at the end of Chapter 8.2.2:

1. The first is the accumulation of coal dust along the railway line and the impacts this may have on water quality in local streams and rivers. The water quality impacts may include an increase in the amount of dissolved salts in wash-off from the affected area, and a possible change in the pH of the water. However, it is estimated that these impacts would probably be minor and would only be manifested during the rainy season and rainfall events that generate runoff. There might be first flush effect at the onset of the rainfall season but there would probably be sufficient dilution during that time to minimise any water quality impacts. Coal dust in small quantities is relatively innocuous when mixed in water. Impurities in the coal such as sulphides may become mobilised when mixed with water and chemical reactions may create sulphates that are readily soluble in water. Particularly high volumes of sulphates need to enter the rivers to raise sulphate concentrations to levels where it can be harmful to humans, livestock and aquatic life. Golder Associates undertook an environmental impact assessment of transporting coal by rail to a power station in South Africa (Golder Associates, 2004). As part of the study they investigated the water quality impacts of the Richards Bay Coal Transport Line that transports coal from the Highveld coalfields to the coal export harbour at Richards Bay, South Africa. This line has been in operation since 1976. On this line coal is transported using both sealed wagons and bottom dumping wagons. They found no obvious signs of coal dust pollution, land owners confirmed that there did not appear to be any detrimental impacts as a result of coal dust, and an examination of soil and vegetation samples near the railway line did not show signs of coal dust pollution. They also investigated the impacts of coal falling from wagons and found minor evidence of coal falling on the area adjacent to the ballast. It was concluded that this coal fell from side-dumping wagons that did not seal well resulting in small pieces of coal falling through the small openings between the flaps. A comparison of water quality in farm dams upstream and downstream of the railway line found no difference in water quality and it was concluded that the railway line had a negligible effect on water quality (Golder Associates, 2004).
2. The second concern is seepage of rain water from uncovered wagons during the rainfall season. The limited contact time between the rainwater and the coal could lead to a minor increase in dissolved salts in the seepage water. However, there would probably be sufficient rainfall runoff and dilution in the surrounding area during such events to minimise any water quality impacts. It is also a linear impact, that is, the impact is distributed linearly along the length of the railway line.
3. The third concern is smothering of in-stream aquatic habitats with coal dust. In this case aquatic habitat refers to the substrate where aquatic biota occurs and it includes the mosaic of bedrock, cobbles, vegetation, sand, gravel and mud that make up a stream habitat. Large volumes of coal dust have the potential of smothering aquatic habitats, impacting negatively on the biota. However, no evidence of habitat smothering was found along the Richards Bay Coal Transport Line.

8.2.2.2 Hydrological impact assessment and mitigation

The table below describes the impacts associated with the hydrological assessments conducted by the specialist as well as mitigation measures proposed.

Table 30: Impact description for the potential disturbance, introduction of sediments or erosion of banks or channels

IMPACT DESCRIPTION: Disturbance, introduction of sediments or erosion of banks or channels				
Predicted for project phase:	Pre-construction	Construction	Operation	Decommissioning
Dimension	**Rating**	**Motivation**		
PRE-MITIGATION				
Duration	Medium-term	Mobilised suspended solids released as a result of the construction activities will settle once construction is finalised. Erosion to banks is possible during construction and will naturally stabilise with time.	Consequence: Slightly detrimental	Significance: Low - negative
Extent	Local	Impact will be restricted to the immediate surroundings of the railway yard.		
Intensity	Low - negative	Impact on water quality where there water abstractions close to the watercourse crossing as well at those crossings that are upstream of nature reserves or dams.		
Probability	Fairly likely	Due to the construction activity the probability of this impact is fairly likely.		
MITIGATION: • Sediment mobilisation can be prevented in the most part in the construction phase by the use of silt traps; • Regular cleaning of the silt traps; • Best practice culvert and bridge design practices to be followed to provide good drainage and prevent erosion and sediment mobilisation; • Upstream and downstream erosion protection; • In order to mitigate an increase in flow velocity, a structure to dissipate the energy maybe required; and • Attention needs to be given to the prevention of bank erosion and sediment input into the stream both during construction and as a result of storm water during the operational phase.				
POST-MITIGATION				
Duration	Short-term	The implementation of the proposed mitigation measures will result in the decrease of suspended solids and erosion of stream banks.	Consequence: Negligible	Significance: Very low
Extent	Site-specific	Will be contained through the implementation of the proposed mitigation measures.		
Intensity	Very low	Effective implementation of the mitigation measures will reduce the release of suspended solids and the possible erosion of water course banks.		
Probability	Fairly likely	Due to the construction activity the probability of this impact is fairly likely, however, the potential impact will be reduced by the mitigation measures.		

Table 31: Impact description for the impact of potential waste water from Davel Yard

IMPACT DESCRIPTION: Impact of waste water from Davel Yard				
Predicted for project phase:	Pre-construction	Construction	Operation	Decommissioning
Dimension	**Rating**	**Motivation**		
PRE-MITIGATION				
Duration	Long-term	Waste water will be generated during the construction and operational activities.	Consequence: Moderately detrimental	Significance: Low - negative
Extent	Local	Impact will be within the immediate vicinity of the railway yard.		
Intensity	Low - negative	Effluent will have an impact on the water resources.		
Probability	Fairly likely	Generation of waste water from ablution facilities, wash bays, workshops and fuelling stations can pollute the water resources.		

MITIGATION: • In order to mitigate an increase in flow velocity, a structure to dissipate the energy maybe required; • Best practice culvert and bridge design practices to be followed to provide good drainage and prevent erosion and sediment mobilisation; and • Natural weirs and small lakes must be preserved as far as possible.				
POST-MITIGATION				
Duration	Long-term	As per pre-mitigation.	Consequence: Negligible	Significance: Very low
Extent	Local	As per pre-mitigation.		
Intensity	Very low	Appropriate mitigation will reduce the release and accidental discharge of effluent.		
Probability	Unlikely	Appropriate mitigation will reduce the release and accidental discharge of effluent.		

Table 32: Impact description for coal dust and rainfall seepage water from the coal wagons

IMPACT DESCRIPTION: Coal dust and rainfall seepage water from the coal wagons.				
Predicted for project phase:	Pre-construction	Construction	Operation	Decommissioning
Dimension	**Rating**	**Motivation**		
PRE-MITIGATION				
Duration	Long-term	Suspended solids in the water might cause reduction in water quality during construction.	Consequence: Moderately detrimental	Significance: Low - negative
Extent	Local	Water abstraction points downstream of construction will be affected.		
Intensity	Low - negative	Concentration of suspended solids may impact on water quality for man and beast.		
Probability	Fairly likely	Due to the construction activity the probability of this impact is fairly likely.		
MITIGATION: • Best practice culvert and bridge design practices to be followed to provide good drainage and prevent erosion and sediment mobilisation; and • Upstream and downstream erosion protection.				
POST-MITIGATION				
Duration	Long-term	As for pre-mitigation.	Consequence: Negligible	Significance: Very low
Extent	Local	As for pre-mitigation.		
Intensity	Very low	Concentration of suspended solids will be reduced as a result of the mitigation measures.		
Probability	Unlikely	Due to the construction activity the probability of this impact is fairly likely, however, the potential impact will be reduced by the mitigation measures.		

8.2.3 Air quality assessment

The objectives of the Air Quality Impact Assessment (AIA) are to:

- Assess qualitatively the potential air quality impacts of emissions during the construction phase of the Davel Yard and associated infrastructure;
- Assess quantitatively the potential air quality impacts of pollutants from the combustion of diesel fuel from locomotives; and
- Propose mitigation measure for each phase to prevent or reduce any adverse air quality impacts on the receiving environment.

The complete air quality impact assessment report can be found in Appendix B, Annexure F.

8.2.3.1 Emissions characterisation

Emission estimates are typically the biggest uncertainty in an AIA. Since the overall objective of any AIA is to protect human and environmental health, it is important to understand that conservative estimates will be made at every step of emissions estimation. Two operational scenarios are considered. First the construction phase of the proposed project, thereafter the operational phase.

8.2.3.1.1 Construction phase of the project

The construction phase will be relatively short. It will also result in mainly nuisance impacts in the form of dust. Large uncertainties are associated with emission estimates for these type of activities, resulting mostly in fugitive emissions. These factors therefore do not justify a full modelling assessment for the construction phase of this project. However, the nuisance and other possible impacts should still be managed. Best practise and possible mitigation strategies are therefore recommended for the construction activities.

It will include emissions from on-site heavy-duty off-road vehicles, other light-duty vehicles and dust emissions as a result of the construction activities. The most important emissions will be NOx from the vehicles and dust from the earthworks. It will also result in mainly nuisance impacts in the form of dust.

8.2.3.1.2 Operational phase of the project

Combustion of diesel results in the following emissions:

- Volatile organic compounds ($V\ OCs$) and other hydrocarbons (HC);
- Carbon monoxide (CO);
- Nitrogen oxides (NOx);
- Particulate matter with an aerodynamic diameter smaller than 10 μg (PM_{10});
- Particulate matter with an aerodynamic diameter smaller than 2.5 μg ($PM_{2.5}$); and
- Sulphur dioxide (SO_2).

The pollutants of most concern and for which there exist ambient standards in South Africa include CO, nitrogen dioxide (NO_2), PM_{10} and benzene (C_6H_6) (one of the HCs). Although SO_2 is a pollutant of concern, the emission factors strongly depend of the fuel characteristics, which is not known, and furthermore, the contribution is likely not significant. Emissions for diesel locomotives have been quantified by the USEPA (1989). Emissions factors for different duty cycle diesel locomotives are shown in Table 33. The different duty cycles correspond to the age of the technology (as shown in brackets). Separate emissions standards are given for line-haul and switch mode of operation.

Table 33: USEPA Locomotive emission standards (g / bhp.hr)

Duty Cycle	HC	CO	NOx	$PM10$
Tier 0 (1973-1992)				
Line-haul	1.00	5.0	8.0	0.22
Switch	2.10	8.0	11.8	0.26
Tier 1 (1993-2004)				

Line-haul	0.55	2.2	7.4	0.22
Switch	1.20	2.5	11.0	0.26
Tier 2 (2005 – 2011)				
Line-haul	0.30	1.5	5.5	0.10
Switch	0.60	2.4	8.1	0.13
Tier 3 (2012-2014)				
Line-haul	0.30	1.5	5.5	0.10
Switch	0.60	2.4	5.0	0.10
Tier 4 (2015 or later)				
Line-haul	0.14	1.5	1.3	0.03
Switch	0.14	2.4	1.3	0.03

To calculate the total annual emissions from the diesel locomotives, the information on the number of locomotives, the annual fuel consumption rates of diesel for each train types and line types, and the mode of the locomotives operation (line-haul or switch modes) is required. The speed of operation (throttle notch), as well as the idle characteristics also have an impact on emissions. The USEPA uses average characteristics as presented in Table 33.

A detailed analysis of the proposed design capacity was done in the pre-feasibility stage. The track design allow for a train length of 2,562 m, or 200 wagons for coal and 160 wagons for general freight. Class 43 (or equivalent) type diesel electric locomotives have been assumed for the entire train service. Traction is provided by up to 6 Class 43 equivalent diesel locomotives positioned at the front, the centre and the rear of the train in Distributed Power (DP) mode.

Three terminals will be used for operations. These include Davel, Nsezi and Phuzamoya. Nsezi in Richards Bay will be the base of operations. Activities at Nsezi will include traction changes, load consolidation / distributions and fuelling. Davel will be the secondary terminal. Activities at Davel include traction changes, load consolidation/distributions and secondary fuelling. A junction terminal will be located in Phuzamoya in Swaziland. Activities at Phuzamoya will include junction and secondary fuelling.

Table 34: Throttle notch weighting factors for diesel locomotives (UNESPA, 2008)

Throttle notch	Line-haul	Switch
Idle	38.0	59.8
Dynamic brake	12.5	0.0
Notch 1	6.5	12.4
Notch 2	6.5	12.3
Notch 3	5.2	5.8
Notch 4	4.4	3.6
Notch 5	3.8	3.6
Notch 6	3.9	1.5
Notch 7	3.0	0.2
Notch 8	16.2	0.8

Trains start off in 50 wagon lengths at 20 ton axle loads during 2017. By 2020 almost all possible combinations with current wagon types are performed and 25 % of coal trains run at 26 ton axle loads. By 2030 approximately 50 % of all wagons are high capacity wagons running at 20 ton axle loads whilst some coal runs at 26 tons. At 2040 the majority of bulk trains run in 200 wagon lengths at 26 ton axle loads. All general freight trains then run at maximum lengths.

Coal from other areas will probably be transported in light-loaded jumbo wagons and 100 wagon blocks initially. The train axle loading and length will evolve to the maximum permissible axle loading and length over time.

A worst case scenario at full capacity is assumed for the purpose of an AIA. The maximum particle design capacity estimated scenario is shown in Table 35. Slight differences in train frequencies exist between the Davel to Phuzamoya and the Phuzamoya to Nsezi sections. For this AIA, the maximum of the two are used. A conservative estimate of 150 Ml of diesel per annum is assumed. This includes haul-line and switch mode operations.

Table 35: Maximum annual estimated fuel consumption during the operational phase

Train composition	Trains / direction / day	Litre diesel / train	Litre diesel / day	Mega litre diesel / annum
100 w / 20 tal	1	15,010	15,010	150
160 w / 20 tal	7	24,141	144,846	
200 w / 26 tal	8	35,089	280,712	

8.2.3.2 Proposed emissions included in the assessment

The locomotive fleet is likely older and the maintenance might not be to the same standard as those used in for testing. It is also not certain what the exact specification of the locomotives used on this rail line will be. For the purpose of the AIA, conservative estimates of operations, as well as emission factors should account for these uncertainties. The AIA therefore models two scenarios: scenario A assumes old, badly maintained tier 0 locomotives and scenario B assumes new locomotives with the best available emission control technology, or tier 4. This approach provides the absolute worst possible impact as well as the benefits obtainable from using best available technology. The final set of emission factors used for modelling the two scenarios are shown in Table 35. It is further assumed that 15 % of fuel is spent on switch mode operations an 85 % for line haul. Combining the emission factors in Table 36 with the fuel estimates in Table 35 leads to total estimated annual emissions for the peak of operations (Table 37). Annual contributions of 13,307 T / annum NOx, 336 T / annum PM_{10}, 673 T / annum hydro carbons and 4,394 T / annum CO makes up a significant portion of the national budget for the worst case scenario.

Table 36: Locomotive emission estimates used in this analysis (g / l)

Duty Cycle	NO_x	PM_{10}	HC	CO
Scenario A (worst case)				
Line-haul	83.5	2.1	4.1	27.5
Switch	95.6	2.4	5.5	32.1
Scenario B (mitigated)				
Line-haul	0.14	1.5	1.3	0.03
Switch	0.14	2.4	1.3	0.03

Table 37: Total estimated annual emissions for the peak operations of the Swazi Rail Link (T / annum)

Scenario	NO_x	PM_{10}	HC	CO
A: Worst-case	13,307	336	673	4,394
B: Mitigated	1,070	24	116	1,318

8.2.3.3 Meteorological overview

The diurnal distribution of winds (figure 3.2) shows the typical backing from an Easterly component at midnight to a Westerly component by midday and then veering back to an Easterly. Wind speeds are higher during the day.

The most dominant summer pattern shows relatively strong South Easterly winds in January. Wind speeds reach a minimum in autumn. They then back towards the West, increasing slightly until another maximum is reached during peak spring in October. Spring winds have a strong Northerly component.

8.2.3.4 Baseline air quality assessment

Davel is situated in the Highveld Priority Area. As such, although not in the immediate vicinity, it is surrounded by large industrial sources. Several monitoring studies have been conducted in the area. The most recent of these were conducted in Davel / KwaDela during the 2013 months with the worst dispersion potential (Figure 29 and Figure 30 as presented by Piketh et al. (2013)). These measurements are representative of the air quality around low income households.

It therefore provides a perfect baseline for the current AIA. Typical diurnal patterns driven by domestic cooking and heating are visible in the diurnal distribution (Figure 30). Isolated high peaks in CO and SO_2 suggest an impact for industry and biomass burning in the area. CO values are relatively low and below the national guidelines. Particulate matter (PM) (PM_{10} and $PM_{2.5}$), NOx and SO_2 are especially high during times of domestic burning.

It is evident that the ambient concentrations of pollutants in low income areas are poor. Even isolated villages are expected to have high PM values. Any contribution to ambient PM and NOx would therefore be significant.

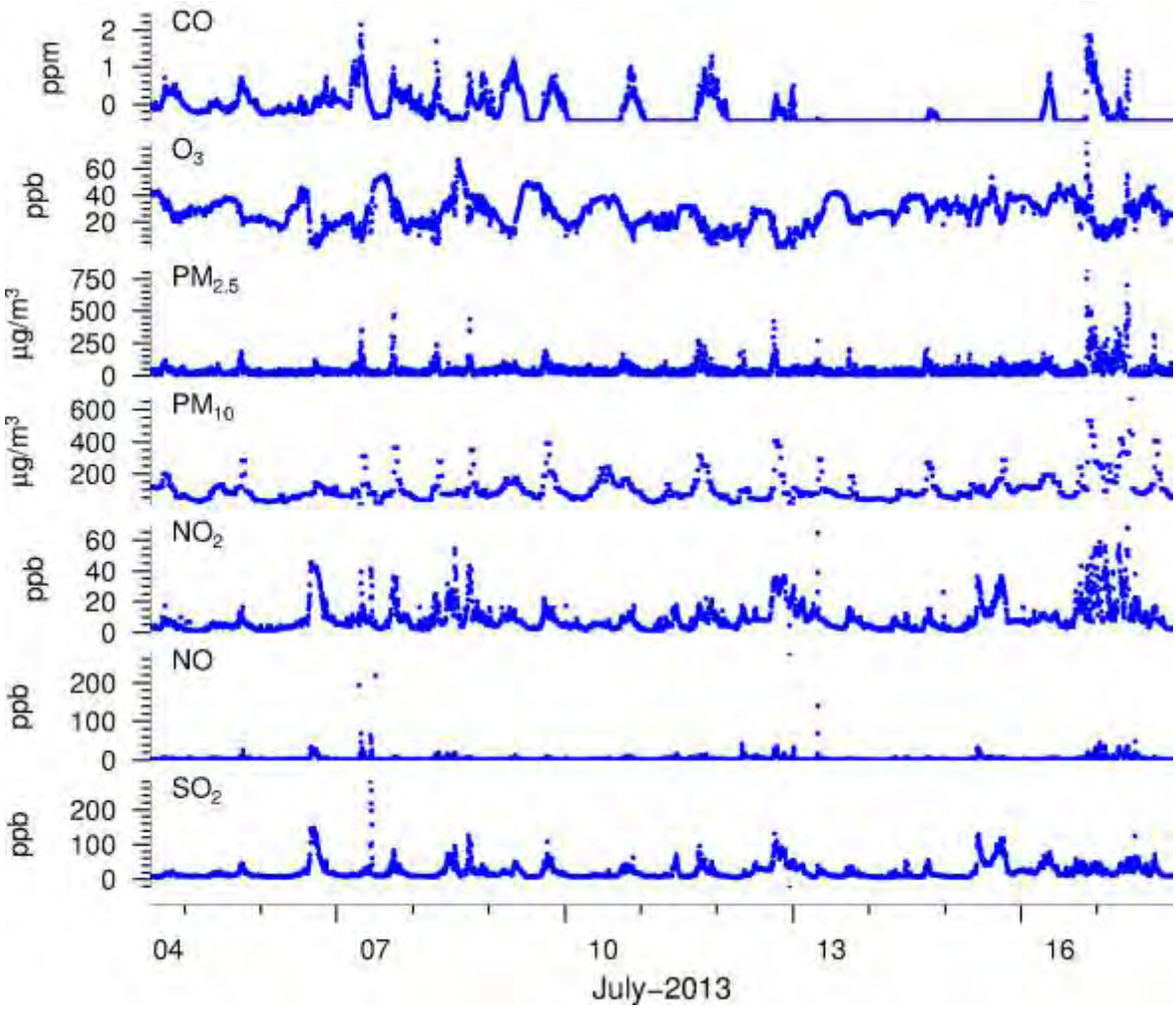


Figure 29: Ambient measurements of pollutants in KwaDela, Mpumalanga (Piketh et al, 2013)

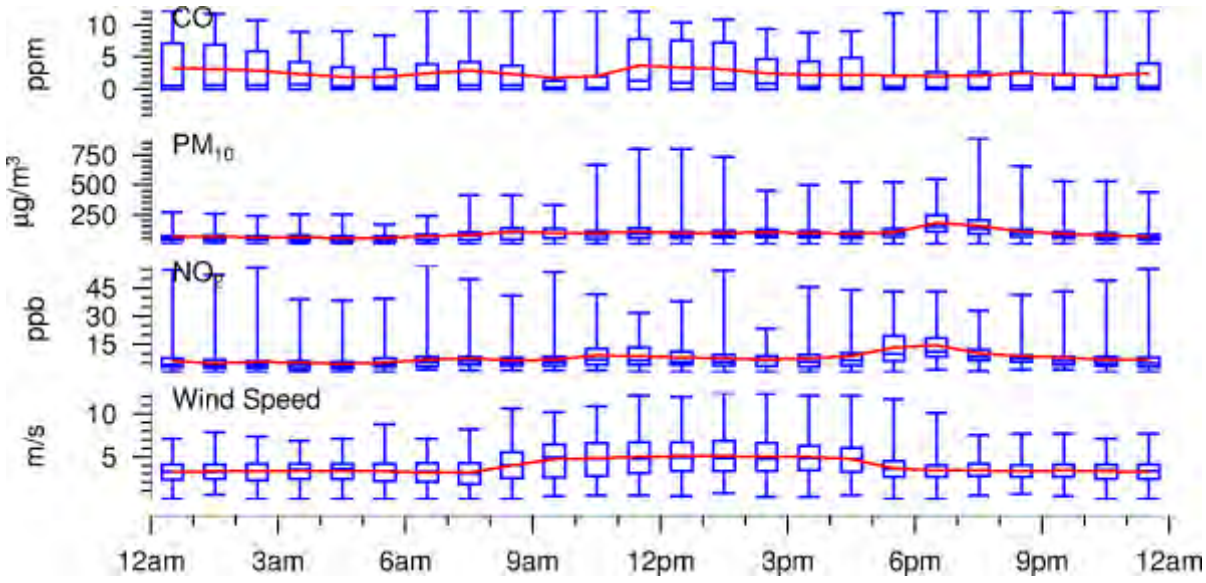


Figure 30: Ambient measurements of the diurnal distribution of pollutants in KwaDela, Mpumalanga (Piketh et al., 2013). The box-and-whiskers show the minimum, 25 %, median, 75 % and maximum values. The red lines show the average for that hour

The following tables indicate the impact description together with the proposed mitigation measures for the impacts relative to air quality for the Davel Rail Yard.

Table 38: Impact description for the release of dust from earthworks

IMPACT DESCRIPTION: Dust releases from earthworks				
Predicted for project phase:	Pre-construction	Construction	Operation	Decommissioning
Dimension	**Rating**	**Motivation**		
PRE-MITIGATION				
Duration	Short-term	Particulate matter will be produced during the construction phase.	Consequence: Negligible	Significance: Very low
Extent	Site-specific	Be restricted to the immediate vicinity of the site.		
Intensity	Very low			
Probability	Certain			
MITIGATION: Standard mitigation measures are recommended for the construction phase. These include: • Use of enclosures, screens and sheeting to contain dust; • Use of paved / surfaced and cleaned haul routes; • Use of water suppression and wheel washing; • Choice of location and facilities for site storage where required; • Location of dust generating activities; • Transport route selection and location; • No burning on site and close to settlements; • Conduct any slash burning (glossary term) in compliance with open burning permit requirements; • Minimize the amount of disturbance and areas cleared of vegetation; • Revegetate disturbed areas as soon as possible after disturbance; • Use dust abatement techniques on unpaved, unvegetated surfaces; • Enact fugitive dust and vehicle emission controls; • Establish and enforce speed limits to reduce airborne fugitive dust; • When feasible, shut down idling construction equipment; • Keep soil moist while loading into dump trucks to minimize fugitive dust; • Keep soil loads below the freeboard of the truck to minimize fugitive dust; • Minimize drop heights when loaders dump soil into trucks; • Tighten gate seals on dump trucks; • Cover dump trucks before traveling on public roads; and • When possible, schedule construction activities during periods of low winds to reduce fugitive dust.				
POST-MITIGATION				
Duration	Short-term	As per pre-mitigation.	Consequence: Negligible	Significance: Very low
Extent	Site-specific	As per pre-mitigation.		
Intensity	Very low	Mitigation measures will reduce the intensity.		
Probability	Very likely			

Table 39: Impact description of vehicle exhaust during construction

IMPACT DESCRIPTION: Construction vehicle exhaust				
Predicted for project phase:	Pre-construction	Construction	Operation	Decommissioning
Dimension	**Rating**	**Motivation**		
PRE-MITIGATION				
Duration	Short-term	Emissions of mainly NO_2 from on-site heavy-duty off-road vehicles and other light-duty vehicles will occur during the construction phase	Consequence: Negligible	Significance: Very low
Extent	Site-specific	Emissions will be restricted to the immediate vicinity of the construction activities		
Intensity	Very low	The emissions will have a nuisance value		
Probability	Very likely	Due to the activities associated with construction exhaust emissions will be generated		
MITIGATION: Standard mitigation measures are recommended for the construction phase. These include: • Transport route selection and location • Enact fugitive dust and vehicle emission controls • Establish and enforce speed limits to reduce airborne fugitive dust • When feasible, shut down idling construction equipment • Tighten gate seals on dump trucks				
POST-MITIGATION				
Duration	Short-term	As per pre-mitigation	Consequence: Negligible	Significance: Very low
Extent	Local	As per pre-mitigation		
Intensity	Very low	Mitigation will reduce the intensity of the impact		
Probability	Fairly likely	Due to the activities associated with construction exhaust emissions will be generated		

Table 40: Impact description for the contribution of the proposed project to the ambient CO

IMPACT DESCRIPTION: Contribution to ambient CO				
Predicted for project phase:	Pre-construction	Construction	Operation	Decommissioning
Dimension	**Rating**	**Motivation**		
PRE-MITIGATION				
Duration	Medium-term	Combustion of diesel will result in release of carbon monoxide	Consequence: Moderately detrimental	Significance: Moderate - negative
Extent	Local	Impact will be localised		
Intensity	Moderate - negative	Calculated release is well below ambient standard		
Probability	Very likely	Combustion of diesel will result in release of carbon monoxide		
MITIGATION: • Huge reduction in emissions from diesel locomotives can be achieved by upgrading the engines • Maintenance of the locomotives				
POST-MITIGATION				
Duration	Medium-term	As per pre-mitigation	Consequence: Negligible	Significance: Very low
Extent	Local	As per pre-mitigation		
Intensity	Very low	Implementation of the mitigation measures will reduce the release of carbon monoxide		
Probability	Very unlikely	Implementation of mitigation measures will greatly reduce the probability of the impact		

Table 41: Impact description for the contribution to ambient PM_{10}

IMPACT DESCRIPTION: Contribution to ambient PM_{10}				
Predicted for project phase:	Pre-construction	Construction	Operation	Decommissioning
Dimension	**Rating**	**Motivation**		
PRE-MITIGATION				
Duration	Medium-term	Combustion of diesel will result in release of particulate matter	Consequence: Moderately detrimental	Significance: Moderate - negative
Extent	Local	Impact will be localised		
Intensity	High - negative	Ambient concentration of PM in low income areas are poor and even isolated villages will have a high PM. Release of particulate matter will contribute to this will have a significant impact at local level		
Probability	Very likely	Combustion of diesel will result in release of particulate matter		
MITIGATION: • Huge reduction in emissions from diesel locomotives can be achieved by upgrading the engines; and • Maintenance of the locomotives.				
POST-MITIGATION				
Duration	Short-term	Mitigation will reduce the duration of the impact	Consequence: Negligible	Significance: Very low
Extent	Local	As per pre-mitigation		
Intensity	Very low	Release of particulate matter will be reduced to almost zero through the implementation of appropriate mitigation measures		
Probability	Unlikely	Release of particulate matter will be reduced		

Table 42: Impact description for the contribution to ambient NO_2

IMPACT DESCRIPTION: Contribution to ambient NO_2				
Predicted for project phase:	Pre-construction	Construction	Operation	Decommissioning
Dimension	**Rating**	**Motivation**		
PRE-MITIGATION				
Duration	Long-term	**Combustion of diesel will result in release of nitrogen oxides**	Consequence: Highly detrimental	Significance: High - negative
Extent	Regional	Distribution of the plume could result in a regional impact		
Intensity	High - negative	Nitrogen oxide pollution have an impact on human health		
Probability	Very likely	Combustion of diesel results in the release of nitrogen oxides		
MITIGATION: • Huge reduction in emissions from diesel locomotives can be achieved by upgrading the engines; and • Maintenance of the locomotives.				
POST-MITIGATION				
Duration	Short-term	Combustion of diesel will result in release of nitrogen oxides	Consequence: Negligible	Significance: Very low
Extent	Local	Distribution of the plume could result in a regional impact		
Intensity	Very low	Implementation of appropriate mitigation measures will reduce the level of nitrogen oxides		
Probability	Unlikely	Combustion of diesel results in the release of nitrogen oxides albeit at a much reduced level		

Table 43: Impact description for the contribution to ambient C_6H_6

IMPACT DESCRIPTION: Contribution to ambient C_6H_6				
Predicted for project phase:	Pre-construction	Construction	Operation	Decommissioning
Dimension	**Rating**	**Motivation**		
PRE-MITIGATION				
Duration	Medium-term	Combustion of diesel will result in release of hydro carbons	Consequence: Moderately detrimental	Significance: Moderate - negative
Extent	Local	Impact will be localised		
Intensity	Moderate - negative	Hydro carbon pollution could have an impact on human health		
Probability	Very likely	Combustion of diesel will result in release of hydro carbons		
MITIGATION: • Huge reduction in emissions from diesel locomotives can be achieved by upgrading the engines; and • Maintenance of the locomotives.				
POST-MITIGATION				
Duration	Short-term	Combustion of diesel will result in release of hydro carbons	Consequence: Negligible	Significance: Very low
Extent	Local	Impact will be localised		
Intensity	Very low	The release of hydro carbons will be reduced to below the ambient standard		
Probability	Unlikely	Combustion of diesel will result in release of hydro carbons		

8.2.4 Geohydrological assessment

A geohydrological assessment was conducted at the Davel Yard specifically due to the fact that a refuelling station will also be constructed as part of the Davel Yard facilities. This refuelling station was identified as having the greatest impact on the geohydrological environment in the event of a fuel spill. A detailed baseline groundwater study was therefore conducted on this area. The investigation consisted of the following:

- Desk study and hydrosensus;
- Borehole siting by means of a ground geophysical survey;
- Appointment of a drilling contractor and supervising the drilling of 3 monitoring boreholes;
- Hydraulic testing and chemical analysis of the newly drilled boreholes; and
- Report on the findings, perform an impact assessment and develop a monitoring program.

The specialist assessment report for the geohydrological studies conducted can be found in Appendix B, Annexure B. The summary of the impact assessment findings are discussed below.

The local drainage will be in a north-easterly direction (0.01 or 1%) towards an unnamed nonperennial stream which flow into an unnamed Spruit, which flows in a southerly direction. The unnamed Spruit flows into the Vaal River.

According to the published 1:250 000 geological map (2628 East Rand) the site is underlain by the Vryheid Formation of the Ecca Group (Karoo Supergroup). Based on the published geological map, no linear structures are present on the site. Due to the site's close proximity to the Viskuile River, a relatively shallow water table can be expected. This was confirmed by the water level measured in the three newly drilled monitoring boreholes with the static water level being <12 meters below ground level. It can be assumed that the regional groundwater flow direction will emulate to local topography. Groundwater flow will thus be in a north easterly direction towards an unnamed Spruit. Three distinct superimposed groundwater systems are present within the occurring geology. They can be classified as the upper weathered Ecca aquifer, the fractured aquifers within the unweathered Ecca sediments and the aquifer below the Ecca sediments.

A hydrocensus was carried out in the area adjacent to the site to identify legitimate groundwater users, the groundwater potential and quality. The hydrocensus extended to a distance of ~1 km from the site, except where a river or a surface water body exists. A total of 2 boreholes were identified and although other boreholes are present in the area, none are in use and the majority is destroyed or rock-filled. Although some people make use of groundwater, the majority of people in the area make use of municipal water. The location of these boreholes is indicated in Figure 31. A complete summary of the hydrocensus results are presented in Appendix B of the Geohydrological Report. Table 44 summarises the most important details of the boreholes identified during hydrocensus.

Table 44: Details of boreholes identified during hydrocensus

BH nr.	Coordinates	Static water level (mbgl)	Estimated Yield (litres / hour)	User application
DV-BH4	S26.44402 E29.67076	22.72	3,000	Domestic
DV-BH5	S26.44190 E29.66843	12.54	1,000	Irrigation

Figure 31: Map indicating the borehole locations at the Davel Yard

A geophysical survey was performed to investigate possible geological lineaments or weathering to determine the location of possible water bearing structures which could act as preferred groundwater pathways. The ground geophysical survey was used to select suitable targets for the placement of the up- and downstream monitoring boreholes. One up- and two downstream monitoring boreholes were drilled on the 25th of September 2013.

Falling head tests ("slug tests") were carried out on the newly drilled boreholes. Data acquired from the "slug tests" was used to calculate the hydraulic conductivity (K) used in the calculation of the flow velocity of groundwater on-site. Applying the values (using the worst case scenario - highest obtained K value) calculated for the site and using a porosity of 5 % (0.05), the groundwater flow velocity on-site was calculated. Based on Darcy's flow equation potential pollutants originating from the fuel farm and seeping into the groundwater would migrate at an estimated rate of ~2.86 x 10-8 m / d towards an unnamed Spruit.

Pumped groundwater samples were collected for chemical analysis from the 3 new recently drilled boreholes on the 18th of October 2013. The groundwater samples were submitted to an accredited laboratory for a major cation / anion analysis, as well as selected trace metals. All of the samples reported water quality fit for human consumption. Floating samples were also taken (bailed) from each newly drilled borehole and submitted to UIS Organic Laboratory in Centurion for a Gasoline Range Organics (GRO) and Diesel Range Organics (DRO) screening. No detectable traces of GRO & DRO's were detected in any of these samples.

Based on the field work, interpretation of available and newly acquired data, the upgrade of the Davel Rail Yard and construction of the fuel farm, will have a "very low" impact on the investigated geohydrological environment, given that sound environmental infrastructure and management procedures are put in place. During the rating and ranking procedure of impacts, all identified impacts could be countered by appropriate mitigation. The impact description and accompanying mitigation measures can be found in the following table:

Table 45: Impact description for the possible contamination of groundwater by incorrect disposal of hazardous and non-hazardous materials or waste

IMPACT DESCRIPTION: Incorrect disposal of hazardous and non-hazardous materials or waste could contaminate groundwater.				
Predicted for project phase:	Pre-construction	Construction	Operation	Decommissioning
Dimension	**Rating**	**Motivation**		
PRE-MITIGATION				
Duration	Long-term	Hydrocarbon contamination of aquifers poses long term threats.	Consequence: Extremely detrimental	Significance: Moderate - negative
Extent	Regional	Plumes migrate off-site.		
Intensity	Very high - negative	Poses serious health risks.		
Probability	Fairly likely	Contamination is fairly likely due to human error.		
MITIGATION: • Fuel storage tanks should be installed according to the relevant SABS standards, for example SABS 089, 1535, 0131, 0108 and 0400. These standards make provision for observation wells, leak detectors, overfill protectors, etc.; • The construction of the workshops, cleaning bays and fuel dispensing areas should be in such a way that no accidental spillages leave the site and surface and storm water run-off be diverted through an oil / water separator before leaving the site; • Emergency spill kits should always be present at strategic locations with capable people with the necessary training available to use it in the case of accidental spillages; • A groundwater monitoring program as outlined in the EMP should be implemented to monitor the impact of the rail yard and fuel farm on the geohydrological environment; and • Should it become evident from the monitoring program that pollution of the groundwater environment occurs; corrective and remedial actions should be implemented.				
POST-MITIGATION				
Duration	Short-term	Aquifers will not be contaminated.	Consequence: Negligible	Significance: Very low
Extent	Site-specific	Spillages will be contained.		
Intensity	Very low	No contamination of aquifers.		
Probability	Unlikely	Mitigation will reduce the potential of contamination.		

Table 46: Impact description for the potential contamination of groundwater by spillages resulting from a leakage caused by a fracture / crack or rupture in the fuel storage tanks

IMPACT DESCRIPTION: Potential hydrocarbon spillages resulting from a leakage caused by a fracture/crack or rupture in the fuel storage tanks may lead to contamination of groundwater.				
Predicted for project phase:	Pre-construction	Construction	Operation	Decommissioning
Dimension	**Rating**	**Motivation**		
PRE-MITIGATION				
Duration	Long-term	Hydrocarbon contamination of aquifers poses long term threats.	Consequence: Extremely detrimental	Significance: Moderate - negative
Extent	Regional	Plumes migrate off-site.		
Intensity	Very high - negative	Poses serious health risks.		
Probability	Fairly likely	Contamination is fairly likely due to human error.		
MITIGATION: • Fuel storage tanks should be installed according to the relevant SABS standards, for example SABS 089, 1535, 0131, 0108 and 0400. These standards make provision for observation wells, leak detectors, overfill protectors, etc.; • The construction of the workshops, cleaning bays and fuel dispensing areas should be in such a way that no accidental spillages leave the site and surface and storm water run-off be diverted through an oil / water separator before leaving the site; • Emergency spill kits should always be present at strategic locations with capable people with the necessary training available to use it in the case of accidental spillages; • A groundwater monitoring program as outlined in the EMP should be implemented to monitor the impact of the rail yard and fuel farm on the geohydrological environment; and • Should it become evident from the monitoring program that pollution of the groundwater environment occurs; corrective and remedial				

actions should be implemented.				
POST-MITIGATION				
Duration	Short-term	Aquifers will not be contaminated.	Consequence: Negligible	Significance: Very low
Extent	Site-specific	Spillages will be contained.		
Intensity	Very low	No contamination of aquifers.		
Probability	Unlikely	Mitigation will reduce the potential of contamination.		

Table 47: Impact description for the potential contamination of groundwater due to hydrocarbon spillages from equipment, machinery and vehicle storage

IMPACT DESCRIPTION: Potential hydrocarbon spillages from equipment, machinery and vehicle storage may lead to contamination of groundwater.				
Predicted for project phase:	Pre-construction	Construction	Operation	Decommissioning
Dimension	**Rating**	**Motivation**		
PRE-MITIGATION				
Duration	Long-term	Hydrocarbon contamination of aquifers poses long term threats.	Consequence: Extremely detrimental	Significance: Moderate - negative
Extent	Regional	Plumes migrate off-site.		
Intensity	Very high - negative	Poses serious health risks.		
Probability	Fairly likely	Contamination is fairly likely due to human error.		
MITIGATION: • Fuel storage tanks should be installed according to the relevant SABS standards, for example SABS 089, 1535, 0131, 0108 and 0400. These standards make provision for observation wells, leak detectors, overfill protectors, etc.; • The construction of the workshops, cleaning bays and fuel dispensing areas should be in such a way that no accidental spillages leave the site and surface and storm water run-off be diverted through an oil/water separator before leaving the site; • Emergency spill kits should always be present at strategic locations with capable people with the necessary training available to use it in the case of accidental spillages; • A groundwater monitoring program as outlined in the EMP should be implemented to monitor the impact of the rail yard and fuel farm on the geohydrological environment; and • Should it become evident from the monitoring program that pollution of the groundwater environment occurs; corrective and remedial actions should be implemented.				
POST-MITIGATION				
Duration	Short-term	Aquifers will not be contaminated.	Consequence: Negligible	Significance: Very low
Extent	Site-specific	Spillages will be contained.		
Intensity	Very low	No contamination of aquifers.		
Probability	Unlikely	Mitigation will reduce the potential of contamination.		

8.3 Impacts on the Physical Environment

8.3.1 Noise and vibration assessment

Enviro Acoustic Research conducted the noise and vibration specialist assessments for the project. Their specialist report can be found in Appendix B, Annexure G.

The word "noise" is generally used to convey a negative response or attitude to the sound received by a listener. There are four common characteristics of sound, any or all of which determine listener response and the subsequent definition of the sound as "noise". These characteristics are:

- Intensity;
- Loudness;
- Annoyance; and

- Offensiveness.

Of the four common characteristics of sound, intensity is the only one which is not subjective and can be quantified. Loudness is a subjective measure of the effect sound has on the human ear. As a quantity it is therefore complicated, but has been defined by experimentation on subjects known to have normal hearing.

The annoyance and offensive characteristics of noise are also subjective. Whether or not a noise causes annoyance mostly depends upon its reception by an individual, the environment in which it is heard, the type of activity and mood of the person and how acclimatised or familiar that person is to the sound.

Initial daytime (06:00 – 22:00) and night-time (22:00 – 06:00) operations will be assessed in this section. Most critical investigational times would be the night-time hours when a quiet environment is desired (at night for sleeping, weekends etc.).

At future dates (taken as 15 years in this document) the capacity of train trips, carriages and locomotives will increase. Assessment for future daytime (06:00 – 22:00) and night-time (22:00 – 06:00) operations will also be addressed.

Calculations in this section are based on a worst-case scenario and will not be relevant for all times of the development operations. It is based on peak hours (over a 1 hour equivalent period).

- The Equator principle with a 55 and 45 dBA day / night time rating level for receptors.

8.3.1.1 Vibrations

South African Standards available are limited to the SABS ISO 4866:1990 and SABS ISO 2631-1 1991. These documents are based on human and building infrastructure that is exposed to vibrations. It is a trend in African countries to refer to International Standards and guidelines in terms of vibration criteria.

Infrastructure vibrations predominately occur below 300 Hz, with many International guidelines highlighting the need to consider the measurement frequency weighting when assessing vibrations. These include the international W_m / KB and British W_b / W_d standards, vibration decibel (VdB) measurements as well as the correlation between $\mathbf{L_{Aeq}}$ and $\mathbf{L_{Ceq}}$ for assessment of lower frequencies [1] (refer to Section 2.5 of the Noise and Vibration specialist report for SANS methodology).

A ground-borne vibration is a system interlinking the noise source, vibration medium and receiver with one another. Several different mechanisms constitute this system including the distances, infrastructure specifications and railway *modus operandi*.

This report will only investigate airborne noise disturbances motivated by the following reasons:

- Vibration decibel's international criterion for annoyance includes the amount of trains per day and is generally based on railways used for commuting purposes (Figure 32). International countries where railways are used for commuting purposes is a far busier and more complex system than what is required from this proposed industrial route;

[1] RIVAS. Review of existing standards, regulations and guidelines, as well as laboratory and field studies concerning human exposure to vibration. 2011.

- International documents based on commuter trains do focus a fair amount on built-up dense urban environments whereby potential vibration annoyance may increase. This proposed railway route assessment is in a fairly rural area when considering the surrounding land use;
- International guidelines also take into account high speed commuter trains, with commuter trains that can reach a velocity of a maximum of 200 km/h[2]. This proposed industrial route will have trains operating at 40 km/h near sensitive areas. The levels of ground-borne vibration and noise vary approximately 20 times the logarithm of speed. This means that doubling train speed will increase the vibration levels approximately 6 decibels and halving train speed will reduce the levels by 6 decibels. Due to the directly proportional relationship between vibration and noise, the lower the rolling stock speeds the less likely there will be for a vibration annoyance[3];
- Ground-borne noise mainly applies at receiver locations above rail operations in tunnels where ground-borne noise levels from rail transport are likely to be greater than airborne noise levels (and at speed). This is particularly relevant internationally for commuter underground subway systems. Air-borne noise generally is far more annoying to a receptor than ground-borne vibrations;
- Only limited research into the impacts of ground-borne noise is available, and information and modelling on practices applied overseas is scarce[4]. There is currently no accepted model available to allow the extent of vibration and ground-born noise from railway vehicles. Such efforts as the CATdBTren[5] and ENVIB[6] projects whereby empirical calculations are proposed for the prediction of the complex ground-borne vibration;
- A ground-borne vibration is proportional of the distance from noise source to the receiver. Refer to Figure 32 for such an example (based on an underground subway system, example only). In this instance, not all receptors in the study area are adjacent to the proposed railway line;
- Many proposed mitigation measures for consideration in this document due to air-borne noise will similarly influence ground vibrations[7]. Refer to Table 48 indicating the likely corrections that can be achieved to reduce both air and ground-borne vibrations simultaneously, and was considered for the air-borne acoustical mitigation section of this document[8]. Continuous welded rails and wheel maintenance is important for both air and ground-borne vibration reductions. Wheel flat spots can be generated when trains slide over the tracks. The wheel flat spots will similarly influence the increase in audible acoustics as well as ground-borne vibrations due to the clunking effect of the lack of symmetry of wheel radii. The maintenance of the wheel will thus benefit both air and ground-borne acoustics; and
- There are many factors involved in the sophisticated estimation of vibration and ground-borne vibration, including[9]:
    1. The medium - The surrounding geological strata, bedrock depth, soil type, bedrock contours, soil layering, depth of the water table etc.;

[2] http://en.wikipedia.org/wiki/High-speed_rail

[3] High-Speed Ground Transportation Noise and Vibration Impact Assessment.1998.

[4] M.J Griffin. The Handbook of Human Vibration. 1996

[5] The Sixteenth International Congress of Sound and Vibration. Krakow. 2009.

[6] Mehdi Bahrekazemi. Train-Induce Ground Vibration and its Prediction.2004

[7] High-Speed Ground Transportation Noise and Vibration Impact Assessment.1998.

[8] High-Speed Ground Transportation Noise and Vibration Impact Assessment.1998.

[9] David A. Towers, P.E. Rail Transit Noise and Vibration; Sinan Al Suhairy. Prediction of Ground Vibration from Railways.2000

2. The source - Condition of the track, design of the track, speed of the locomotive and carriage, track support, suspension, track alignment, weight of cargo, condition of the rail track and wheel, wheel axles etc.; and
3. The receiver – Receptor's foundation design, building construction, interior acoustical absorption and location of building etc.

It must be noted that due to the high level of uncertainties of the geology in relation to the railway line, an individual's unique infrastructure and foundation specifications, it cannot be guaranteed that ground-borne vibrations will meet international criteria at all dwellings. An unlikely situation may arise whereby a receptors dwelling may be located in an ideal setting whereby vibrations may be easily transmitted to the surrounding environment.

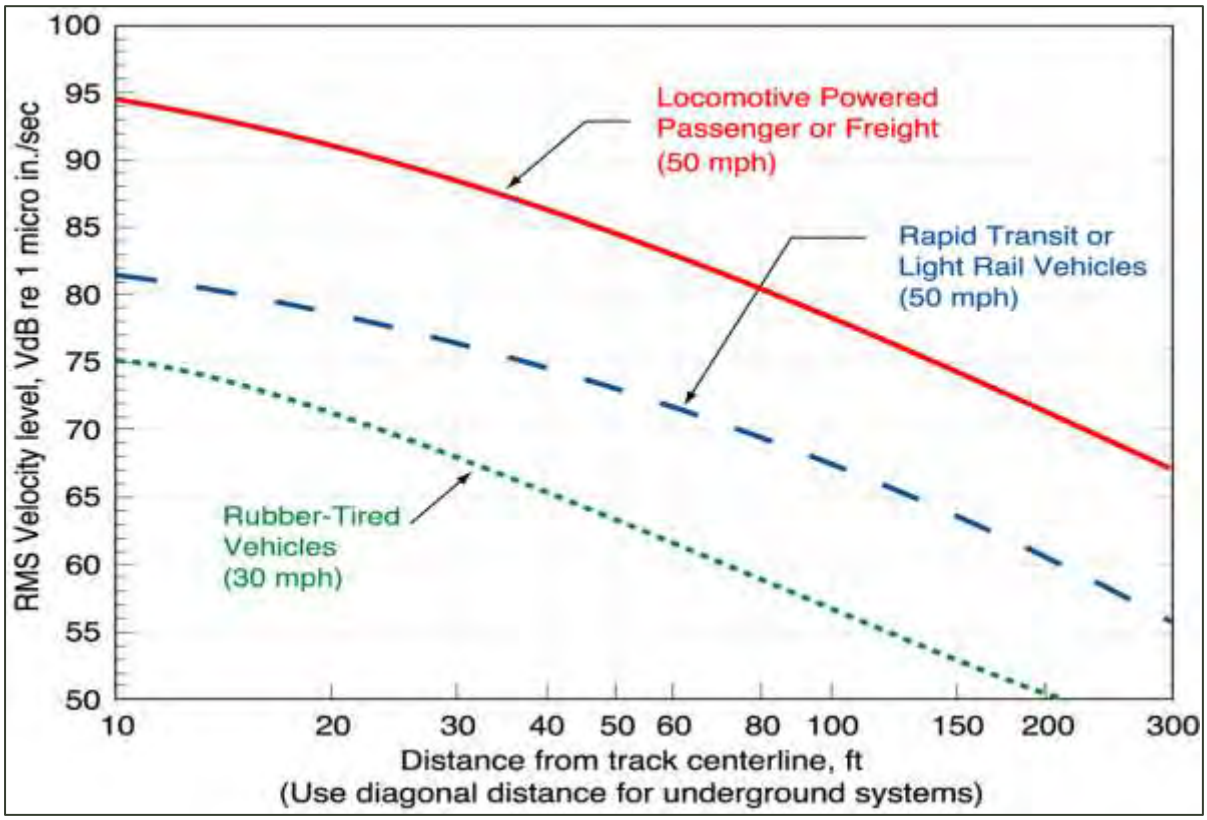


Figure 32: Trains speed vs VdB (underground subway system)

Table 48: Adjustment factors, railway noise and vibration

Factors Affecting Vibration Source				
Source Factor	**Adjustment to Propagation Curve**			**Comment**
Speed		Reference Speed		Vibration level is approximately proportional to 20*log(speed/speed$_{ref}$). Sometimes the variation with speed has been observed to be as low as 10 to 15 log(speed/speed$_{ref}$).
	Vehicle Speed	50 mph	30 mph	
	60 mph	+1.6 dB	+6.0 dB	
	50 mph	0.0 dB	+4.4 dB	
	40 mph	-1.9 dB	+2.5 dB	
	30 mph	-4.4 dB	0.0 dB	
	20 mph	-8.0 dB	-3.5 dB	
Vehicle Parameters (not additive, apply greatest value only)				
Vehicle with stiff primary suspension	+8 dB			Transit vehicles with stiff primary suspensions have been shown to create high vibration levels. Include this adjustment when the primary suspension has a vertical resonance frequency greater than 15 Hz.
Resilient Wheels	0 dB			Resilient wheels do not generally affect ground-borne vibration except at frequencies greater than about 80 Hz.
Worn Wheels or Wheels with Flats	+10 dB			Wheel flats or wheels that are unevenly worn can cause high vibration levels. This can be prevented with wheel truing and slip-slide detectors to prevent the wheels from sliding on the track.
Track Conditions (not additive, apply greatest value only)				
Worn or Corrugated Track	+10 dB			If both the wheels and the track are worn, only one adjustment should be used. Corrugated track is a common problem. Mill scale on new rail can cause higher vibration levels until the rail has been in use fo some time.
Special Trackwork	+10 dB			Wheel impacts at special trackwork will significantly increase vibration levels. The increase will be less at greater distances from the track.
Jointed Track or Uneven Road Surfaces	+5 dB			Jointed track can cause higher vibration levels than welded track. Rough roads or expansion joints are sources of increased vibration for rubber-tire transit.
Track Treatments (not additive, apply greatest value only)				
Floating Slab Trackbed	-15 dB			The reduction achieved with a floating slab trackbed is strongly dependent on the frequency characteristics of the vibration.
Ballast Mats	-10 dB			Actual reduction is strongly dependent on frequency of vibration.
High-Resilience Fasteners	-5 dB			Slab track with track fasteners that are very compliant in the vertical direction can reduce vibration at frequencies greater than 40 Hz.
Factors Affecting Vibration Path				
Path Factor	**Adjustment to Propagation Curve**			**Comment**
Resiliently Supported Ties	-10 dB			Resiliently supported tie systems have been found to provide very effective control of low-frequency vibration.
Track Configuration (not additive, apply greatest value only)				
Type of Transit Structure	Relative to at-grade tie & ballast: Elevated structure -10 dB Open cut 0 dB			The general rule is the heavier the structure, the lower the vibration levels. Putting the track in cut may reduce the vibration levels slightly. Rock-based subways generate higher-frequency vibration.
	Relative to bored subway tunnel in soil: Station -5 dB Cut and cover -3 dB Rock-based - 15 dB			
Ground-borne Propagation Effects				
Geologic conditions that promote efficient vibration propagation	Efficient propagation in soil +10 dB			Refer to the text for guidance on identifying areas where efficient propagation is possible.
	Propagation in rock layer	**Dist.**	**Adjust.**	The positive adjustment accounts for the lower attenuation of vibration in rock compared to soil. It is generally more difficult to excite vibrations in rock than in soil at the source.
		50 ft	+2 dB	
		100 ft	+4 dB	
		150 ft	+6 dB	
		200 ft	+9 dB	
Coupling to building foundation	Wood Frame Houses -5 dB 1-2 Story Masonry -7 dB 3-4 Story Masonry -10 dB Large Masonry on Piles -10 dB Large Masonry on Spread Footings -13 dB Foundation in Rock 0 dB			The general rule is the heavier the building construction, the greater the coupling loss.
Factors Affecting Vibration Receiver				
Receiver Factor	**Adjustment to Propagation Curve**			**Comment**
Floor-to-floor attenuation	1 to 5 floors above grade: -2 dB/floor 5 to 10 floors above grade: -1 dB/floor			This factor accounts for dispersion and attenuation of the vibration energy as it propagates through a building.
Amplification due to resonances of floors, walls, and ceilings	+6 dB			The actual amplification will vary greatly depending on the type of construction. The amplification is lower near the wall/floor and wall/ceiling intersections.
Conversion to Ground-borne Noise				
Noise Level in dBA	Peak frequency of ground vibration: Low frequency (<30 Hz): -50 dB Typical (peak 30 to 60 Hz): -35 dB High frequency (>60 Hz): -20 dB			Use these adjustments to estimate the A-weighted sound level given the average vibration velocity level of the room surfaces. See text for guidelines for selecting low, typical or high frequency characteristics. Use the high-frequency adjustment for subway tunnels in rock or if the dominant frequencies of the vibration spectrum are known to be 60 Hz or greater.

8.3.1.1.1 Vibrations – International Regulations and Guidelines

International guidelines available for vibrations include the ISO 2631-1:1997, ISO8041:2005, Austrian ÖNORMS S 9012: 2010, German DIN4150-2:1999, American ANSI S3.29-1983 etc. These standards are measurement-based methodologies recommending units and weighting corrections that can be used in a measured scenario. The descriptor used for structural vibration damage is the Peak Particle Velocity unit (PPV. in / sec), while potential vibration annoyance is expressed in vibration decibels (VdB), a root mean square calculation.

Europe, Australia and other countries make use of railway lines for multiple purposes and not just industrial use, with commuting rail infrastructure far more advanced than what is available in South Africa. The magnitude of trains due to rail commuting in mentioned countries far exceeds the trip volume as proposed for this acoustical assessment. A staggering example is the 1.3 billion commuter journeys made by rails annually in the United Kingdom, with 575,000 trains alone from towns / cities traversing into London[10]. In comparison a paltry 8 trains is envisaged operations on this assessed rail route (initial volume).

As such the VdB criterion is a correction based on the amount of train passages near a receptor as well as the magnitude of trains per day / night period. The magnitude of trains that pass-by is defined as either infrequent or frequent events. Infrequent events can be classed as “fewer than 70 vibrations a day”. This criterion is defined in Figure 33. Furthermore a correction based on the type noise receiver is implemented. The limits for the three land uses applicable for vibrational assessments are:

1. Buildings where a low ambient vibration is essential – Refer to Figure 34;
2. Residential dwellings where a peaceful environment is sought for rest; and
3. Institutional land use.

Land Use Category	Ground-Borne Vibration Impact Levels (VdB re 1 micro inch/sec)		Ground-Borne Noise Impact Levels (dB re 20 micro Pascals)	
	Frequent[1] Events	Infrequent[2] Events	Frequent[1] Events	Infrequent[2] Events
Category 1: Buildings where low ambient vibration is essential for interior operations.	65 VdB[3]	65 VdB[3]	-4	-4
Category 2: Residences and buildings where people normally sleep.	72 VdB	80 VdB	35 dBA	43 dBA
Category 3: Institutional land uses with primarily daytime use.	75 VdB	83 VdB	40 dBA	48 dBA

Notes:

1. "Frequent Events" is defined as more than 70 vibration events per day. Most rapid transit projects fall into this category.
2. "Infrequent Events" is defined as fewer than 70 vibration events per day. This category includes most commuter rail systems.
3. This criterion limit is based on levels that are acceptable for most moderately sensitive equipment such as optical microscopes. Vibration sensitive manufacturing or research will require detailed evaluation to define the acceptable vibration levels. Ensuring lower vibration levels in a building often requires special design of the HVAC systems and stiffened floors.
4. Vibration-sensitive equipment is not sensitive to ground-borne noise.

Figure 33: Ground-bourne vibration criteria

[10] Networkrail.co.uk.

Type of Building or Room	Ground-Borne Vibration Impact Levels (VdB re 1 micro-inch/sec)		Ground-Borne Noise Impact Levels (dB re 20 micro-Pascals)	
	Frequent[1] Events	Infrequent[2] Events	Frequent[1] Events	Infrequent[2] Events
Concert Halls	65 VdB	65 VdB	25 dBA	25 dBA
TV Studios	65 VdB	65 VdB	25 dBA	25 dBA
Recording Studios	65 VdB	65 VdB	25 dBA	25 dBA
Auditoriums	72 VdB	80 VdB	30 dBA	38 dBA
Theaters	72 VdB	80 VdB	35 dBA	43 dBA

Notes:
1. "Frequent Events" is defined as more than 70 vibration events per day. Most transit projects fall into this category.
2. "Infrequent Events" is defined as fewer than 70 vibration events per day. This category includes most commuter rail systems.
3. If the building will rarely be occupied when the trains are operating, there is no need to consider impact. As an example consider locating a commuter rail line next to a concert hall. If no commuter trains will operate after 7 pm, it should be rare that the trains interfere with the use of the hall.

Figure 34: Ground-bourne vibration criteria for special buildings

8.3.1.1.2 Secondary vibrations – wind and air-borne infrastructure vibration

Buildings can be classified into two categories with regards to wind-induced vibration; vibration sensitive (flexible) and vibration insensitive (rigid). The height of the building is directly proportional to the vibration sensitivity of the building. As such, skyscrapers make use of large mass-tuned dampers to act as a ballast or counter-weight in relation to opposing wind shear.

Secondary vibrations can occur due to the propagation of acoustics in an air-borne manner, with the result manifesting as a secondary action, such as an audible rattle from a window pane.

8.3.1.2 Investigated worst case scenarios – initial day and night-time:

8.3.1.2.1 Road traffic

It is likely that the road traffic volumes around the proposed Davel Yard will increase during the operational phase but this increase is unlikely to impact on the total noise levels. It will not be considered in scenario.

8.3.1.2.2 Railway traffic

Based on available information the initial operations were assessed taking into account the following:

- The railway line was split into sections for various corrections. The daytime rail yard and mainline operations of 4 x Class 43 electric locomotives and 140 x 4-axle tread braked wagons per train with 10 trains passing through the station per day at 15 km / h. 15 km / h is below the calculation speed of the CRN model and as per the model method specifications 20 km / h was assessed for speeds below 20 km / h. Train speeds outside rail yard are calculated at 40 km / h near potential environmentally sensitive sections, and 80 km / h at maximum speed where allowable;
- The night-time rail yard and mainline operations of 4 x Class 43 electric locomotives and 140 x 4-axle tread braked wagons per train with 6 trains passing through the station per night at 15 km / h;
- Shunting activities at railway sidings in the rail yard will consider a +12 dBA correction as per SANS 10103:2008 methodology due to the highly impulsive nature of shunting activities. The recommendation in this guideline indicates a +12 dBA correction for *C*i in the calculation of the Rating level in $L_{Req,T} = L_{Aeq,T} + Ci + Ct$;
- Ballast correction (acoustics attenuation due to ballast effect) was not considered on the single rail (main line);

- Intervening ground conditions of a medium ground nature, i.e. (50 % hard ground conditions); and
- Assessment does not consider façade corrections or the row of houses acting as a screen when obstructing a direct line of sight to the railway line. Assessed calculations better illustrate potential noise levels at houses directly adjacent or with a direct line of sight to railway lines.

8.3.1.2.3 Rail infrastructure

A worst-case scenario was assessed whereby the most significant noisy equipment functions simultaneously at full load. Substation operations was calculated the entire day period, while other infrastructure operations was calculated at 10 % of the day night period.

8.3.1.2.4 Existing ambient contributors and acoustical factors

- Receptors are regarded at a height of 2 meters in relation to the surrounding environment;
- Daytime soundscape contributors considered;
- Intervening ground conditions of a medium ground nature, i.e. some flora etc. (50 % hard ground conditions);
- No existing railway lines and infrastructure activities were considered; and
- Activities functioning during wind-still conditions, in good sound propagation conditions (20 ^{o}C and 80 % humidity).

Table 49: Impact description of the initial day and night scenario

IMPACT DESCRIPTION: Initial day and night scenario				
Predicted for project phase:	Pre-construction	Construction	Operation	Decommissioning
Dimension	**Rating**	**Motivation**		
PRE-MITIGATION				
Duration	Long-term	Will continue after construction is complete.	Consequence: Extremely detrimental	Significance: Very high - negative
Extent	Regional	Will affect surrounding communities.		
Intensity	Very high - negative	Equivalent noise levels will exceed the Equator Principal during day and night-time hours.		
Probability	Certain	The nature of the project will result in noise and vibration becoming a nuisance.		
MITIGATION: • Programmes to manage rail and wheel roughness; • Lowering of speed limits near sensitive areas; • Screening of line of sight from sensitive receptors; • Relocate receptors; • Continuous public participation; • Establishment of a help line and noise complaint logging; • Environmental acoustical programme; and • Identifying of special receptors such as religious, health and educational facilities.				
POST-MITIGATION				
Duration	Long-term	Will continue after construction is complete.	Consequence: Highly detrimental	Significance: High - negative
Extent	Regional	Will affect surrounding communities.		

Intensity	Moderate - negative	Equivalent noise levels will exceed the Equator Principle during day and night-time hours.	
Probability	Certain	The implementation of the proposed mitigation measures will reduce the potential negative impact and the potential positive economic impacts of the project might create a positive attitude towards the project.	

Figure 35: Projected initial scenario – Modelled worst-case daytime noise levels (no 12 dBA highly impulsive correction – shunting)

Figure 36: Projected initial scenario – Modelled worst-case night-time noise levels (no 12 dBA highly impulsive correction – shunting)

8.3.1.3 Investigated worst case scenarios – future day and night time

8.3.1.3.1 Road traffic

It is likely that the road traffic volumes around the proposed Davel Yard will increase during future dates. As the railway line operations would dominate the ambient soundscape and the potential increase in noise levels due to additional road traffic was not considered.

8.3.1.3.2 Railway traffic

Based on available information the initial operations will be assessed taking into account the following:

- Train lines were split into sections for various corrections The daytime rail yard and mainline operations of 6 x Class 43 electric locomotives and 200 x 4-axle tread braked wagons per train with 22 trains passing through the station per day at 15 km / h. 15 km / h is below the calculation speed of the CRN model and as per the model method specifications 20 km / h was assessed for speeds below 20 km / h[11]. Train speeds outside rail yard are calculated at 40 km/h near potential environmentally sensitive sections, and 80 km / h at maximum speed where allowable;
- The night-time rail yard and mainline operations of 6 x Class 43 electric locomotives and 200 x 4-axle tread braked wagons per train with 10 trains passing through the station per night at 15 km / h;

[11]United Kingdom Department of Transport, Calculation of Railway Noise, 1995 (CRN), pg. 13.

- Shunting activities at railway sidings in the rail yard will consider a +12 dBA correction as per SANS 10103:2008 methodology[12]. The recommendation in this guideline indicates a +12 dBA correction for *C*i in the calculation of the Rating level in *L*Req,T = *L*Aeq,T + *C*i + *C*t;
- Ballast correction (acoustics attenuation screening of ballast effect) was not considered on single rail (main line); and
- Assessment does not consider façade corrections or the row of houses acting as a screen when obstructing a direct line of sight to the railway line. Assessed calculations better illustrate potential noise levels at houses directly adjacent or with a direct line of sight to railway lines.

8.3.1.3.3 Railway infrastructure

A worst-case scenario was assessed whereby the most significant noisy equipment functions simultaneously at full load. Substation operations was calculated the entire day period, while other infrastructure operations was calculated at 10 % of the day night period.

8.3.1.3.4 Existing ambient contributors and acoustical factors

- Receptors are regarded at a height of 2 meters in relation to the surrounding environment;
- Daytime soundscape contributors considered;
- Intervening ground conditions of a medium ground nature, i.e. some flora etc. (50 % hard ground conditions);
- No existing railway lines and infrastructure activities were considered; and
- Activities functioning during wind-still conditions, in good sound propagation conditions (20 ^{o}C and 80 % humidity).

The table below describes the impact and sets out a summary of mitigation measures.

Table 50: Impact description of the future day and night scenario

<table>
<tr><th colspan="5">IMPACT DESCRIPTION: Future day and night scenario</th></tr>
<tr><td>Predicted for project phase:</td><td>Pre-construction</td><td>Construction</td><td>Operation</td><td>Decommissioning</td></tr>
<tr><td>Dimension</td><td>Rating</td><td colspan="3">Motivation</td></tr>
<tr><td colspan="5">PRE-MITIGATION</td></tr>
<tr><td>Duration</td><td>Long-term</td><td>Will continue after construction is complete.</td><td rowspan="3">Consequence:
Extremely detrimental</td><td rowspan="4">Significance:
Very high - negative</td></tr>
<tr><td>Extent</td><td>Regional</td><td>Will affect surrounding communities.</td></tr>
<tr><td>Intensity</td><td>Very high - negative</td><td>Equivalent noise levels will exceed the Equator Principle during day and night-time hours.</td></tr>
<tr><td>Probability</td><td>Certain</td><td colspan="2">The nature of the project will result in noise and vibration becoming a nuisance.</td></tr>
<tr><td colspan="5">MITIGATION:
• Programmes to manage rail and wheel roughness;
• Lowering of speed limits near sensitive areas;
• Screening of line of sight from sensitive receptors;
• Relocate sensitive receptors;</td></tr>
</table>

[12]SANS 10103:2008. 'The measurement and rating of environmental noise with respect to annoyance and to speech communication'.

- Continuous public participation;
- Establishment of a help line and noise complaint logging;
- Environmental acoustical programme; and
- Identifying of special receptors such as religious, health and educational facilities.

POST-MITIGATION				
Duration	Long-term	Will continue after construction is complete.	Consequence: Highly detrimental	Significance: High - negative
Extent	Regional	Will affect surrounding communities.		
Intensity	Moderate - negative	Equivalent noise levels will exceed the Equator Principle during day and night-time hours.		
Probability	Certain	The implementation of the proposed mitigation measures will reduce the potential negative impact and the potential positive economic impacts of the project might create a positive attitude towards the project.		

The figures below indicate the difference in day and night time noise levels.

Figure 37: Projected future scenario – Modelled worst-case daytime noise levels (no 12 dBA highly impulsive correction – shunting)

Figure 38: Projected future scenario – Modelled worst-case night-time noise levels (no 12 dBA highly impulsive correction – shunting)

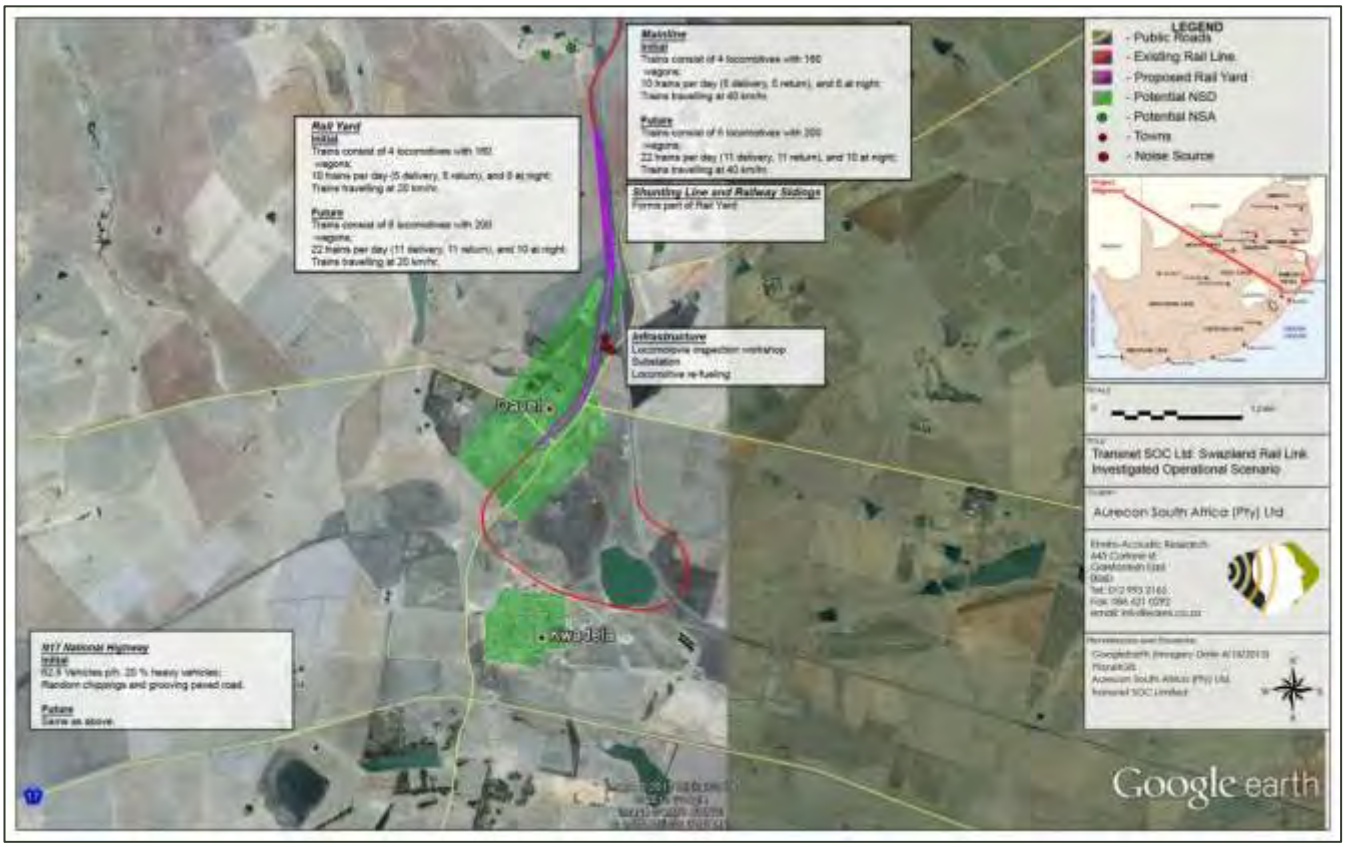


Figure 39: Future scenario as modelled for the day/night time period - worst case

Assessments indicate a potential sound environment where rating levels would exceed the initial and future *night-time* zone sound levels during peak traffic periods at houses directly adjacent to the train line in the Davel and KwaDela communities. This is mostly due to the 12 dBA impulse correction implemented (shunting activities at Davel Yard) for calculated values as recommended in SANS10103:2008.

It must be noted that commercial railway line activities are exempted from certain requirements of Government Notice R154 of 1992 (Noise Control Regulations) – Regulation 2(c) - "*Provided that the provisions of this paragraph* (in reference to noise emanating from a development) *shall not apply in respect of a disturbing noise or noise nuisance caused by rail vehicles or aircraft which are not used as recreational vehicles"*. Furthermore the locomotive horns are exempted from the Government Notice R154 of 1992 (Noise Control Regulations) – Clause 7(1) – *"the emission of sound is for the purposes of warning people of a dangerous situation".*

With a risk of a noise impact developing during the night-time hours of high significance, mitigation options are recommended to be evaluated by the developer. The mitigation of noise from existing roads and railway lines are difficult and potentially expensive to implement. Mitigation discussed below is optional and not mandatory for the developer due to the clauses mentioned above. Mitigation options would be most relevant to the houses directly adjacent to the railway line in the Davel and KwaDela communities.

Mitigation Options: Mitigation of Noise Source – Railway Line

Possibly the best mitigation options when considering acoustics is the design and specifications of railway lines and operations. These include:

1. *Minimise train operations during the night-times (22:00 – 06:00, SANS 10103:2008)* - The potential important times for a noise annoyance to occur would be during the night-time hours when a quiet environment is desired (at night for sleeping etc.). It is highly likely that maximum noise levels due to single noise events outdoor at houses (directly adjacent to the train) could exceed 80 dBA. This would be also relevant during religious worship, at educational and health care facilities and at business that cater for hospitality (e.g. pray times at the Mosque or Sunday church services and at game lodges).The developer should consider identifying such sensitive areas as mentioned above and discussing the findings of this report with them.

Mitigation Options: Management Mitigation

Public relations are important throughout the entire planning, construction and development of the project. The developer could consider the following:

1. *Public participation* – A developer representative could discuss the calculated noise levels in this document with receptors. The developer representative should indicate other positive aspects of the project (job and infrastructure enhancement in the area);
2. *Help line and noise complaint logging* - The developer could consider a line of communication (e.g. a help line where complaints could be lodged). All potential sensitive receptors should be made aware of these contact numbers. Sporadic and legitimate noise complaints could develop. For example, sudden and sharp increases in sound levels could result from poorly maintained tracks. Noise complaints can be logged and supplied to railway maintenance staff to further investigate (rail roughness);
3. *Environmental Acoustical Measurement Programme* – The developer could implement a noise measurements programme and reporting conducted on an annual basis and preferably linked to a noise propagation model to

illustrate the extent of the noise impact from the railway. This may enable the developer to identify and potential problems relating to noise from the development at that stage of the project operations; and

4. It must also be noted that it is unfair to expect the noises from the development to be inaudible under all circumstances (even mitigated noise) as this is an unrealistic expectation that is not required or expected from any other agricultural, commercial, industrial or transportation related noise source. Care must be taken to ensure that the sound produced by the proposed development is at a reasonable level in relation to the existing ambient sound levels.

8.3.2 Cultural and heritage resources assessment

Dr Johnny van Schalkwyk conducted the cultural and heritage assessment for the project. His specialist report can be found in Appendix B, Annexure H.

The NHRA stipulates the assessment criteria and grading of archaeological sites. The following categories are distinguished in Section 7 of the Act:

- **Grade I**: Heritage resources with qualities so exceptional that they are of special national significance;
- **Grade II**: Heritage resources which, although forming part of the national estate, can be considered to have special qualities which make them significant within the context of a province or a region; and
- **Grade III**: Other heritage resources worthy of conservation on a local authority level.

The occurrence of sites with a Grade I significance will demand that the development activities be drastically altered in order to retain these sites in their original state. For Grade II and Grade III sites, the applicable of mitigation measures would allow the development activities to continue.

Sites regarded as having low significance is viewed as recorded in full after identification and would require no further mitigation. Impact from the development would be judged to be low. Sites with a medium to high significance would require mitigation. Mitigation, in most cases the excavation of a site, is in essence destructive and therefore the impact can be viewed as high and as permanent.

8.3.2.1 Statement of significance

Based on current information regarding sites in the surrounding area, all sites expected to occur in the study region are judged to have **Grade III significance** and therefore would not prevent the proposed development for continuing after the implementation of the proposed mitigation measures and its acceptance by SAHRA.

Table 51 indicates the summary of the heritage resources which were identified during the assessment:

Table 51: Summary of identified heritage resources

Identified heritage resources	
Category, according to NHRA	*Identification/Description*
Formal protections (NHRA)	
National heritage site (Section 27)	None
Provincial heritage site (Section 27)	None
Provisional protection (Section 29)	None
Place listed in heritage register (Section 30)	None
General protections (NHRA)	
Structures older than 60 years (Section 34)	Yes
Archaeological site or material (Section 35)	None
paleontological site or material (Section 35)	None
Graves or burial grounds (Section 36)	Yes
Public monuments or memorials (Section 37)	None
Other	
Any other heritage resources (describe)	None

8.3.2.2 Impact assessment

Impact analysis of cultural heritage resources under threat of the proposed development, are based on the present understanding of the development.

Based on current knowledge and understanding of the area, one can evaluate the heritage sites in the area as follows:

- Old silos adjacent to the railway line and station:
    - Dependant on the number of similar structures in the region (according to function, age and architectural features), the feature is viewed to have high significance on a regional level;
    - Although this building has been abandoned for some time, it is still in a good state of repair. It is unclear if it would be impacted on by the proposed. If that is to be the case, it should be documented (architectural drawings, descriptions and full photographic documentation) unless such information can be access from Transnet Heritage Foundation. After acceptance of this documentation by SARHA, application for a permit for its destruction can be applied for; and
    - If there is no impact on this structure, no further action would be required.
- One formal cemetery has been identified in close proximity to the Davel Rail Yard:
    - The official cemetery is well fenced and would not be impacted on by the proposed development.

The table below describes the impact predicted by the heritage impact assessment, as well as the proposed mitigation measures.

Table 52: Impact description of the possible disturbance of cultural and heritage resources

IMPACT DESCRIPTION: Disturbance of cultural and heritage resources				
Predicted for project phase:	Pre-construction	Construction	Operation	Decommissioning

Dimension	Rating	Motivation		
PRE-MITIGATION				
Duration	Long-term	Should the silos be demolished it will have a permanent impact	Consequence: Moderately detrimental	Significance: Low - negative
Extent	Local	Impact would be localised		
Intensity	Moderate - negative	Demolishing of the silos would have a negative impact on the visual aspect of the town.		
Probability	Fairly likely	Unclear if the buildings will be affected, it is however likely to happen although it is quite likely		
MITIGATION: If the buildings are to be demolished it should be documented: • architectural drawings; • descriptions and full photographic documentation. After acceptance of these documents by SAHRA, application for a permit for its destruction can be applied for.				
POST-MITIGATION				
Duration	Long-term	As for pre-mitigation, if it is required to demolish the buildings	Consequence: Moderately detrimental	Significance: Low - negative
Extent	Local	As per pre-mitigation		
Intensity	Low - negative	As per pre-mitigation		
Probability	Fairly likely	As per pre-mitigation		

8.4 Impacts on the Social and Socio-economic Environment

8.4.1 Social impact assessment

The Social Impact Assessment (SIA) formed an important component of the EIA and was aimed at assessing and estimating, in advance, the social consequences that are likely to follow the implementation of the proposed project. The complete SIA assessment report can be found in Appendix B, Annexure E.

The SIA sought to provide a framework for prioritising, gathering, analysing, and incorporating social information and participation into the design and delivery of the project. Furthermore, the SIA ensured that the proposed project is informed and took into account the key relevant social issues.

The methodology took into account the distinction between social change processes and social impacts. A change process refers to a change that takes place within the receiving environment as a result of a direct or indirect intervention. An impact follows as a result of the change process. Impacts are those changes that are physically felt and emotionally experienced, positively and negatively. However, a change process can only result in an impact once it is experienced as such by individual persons, by groups of people and households, a community or society as a whole, social organisations and institutions individual / community on a physical and / or cognitive level.

The social impacts identified during the specialist assessments can be classified into the following broad categories:

8.4.1.1 Objective social impacts

These are impacts that can be quantified and verified by independent observers, such as changes in population size or composition, in employment patterns, in standard of living or in health and safety.

8.4.1.2 Subjective social impacts

These are impacts that occur "in the imagination" or emotions of people, such as negative public attitudes, psychological stress or reduced quality of life. This kind of impact is much more difficult to identify and describe, as one cannot readily quantify perceptions or emotions.

For the purpose of this SIA the following categories were investigated:

- Social well-being;
- Quality of the living environment;
- Economic impacts and material well-being;
- Family and community impacts;
- Institutional impacts, and
- Gender impacts.

The general criteria for selecting significant social impacts included the following:

- Probability of the event occurring;
- Number of people that will be affected;
- Duration of the impact;
- Value of benefits or costs to the impacted group;
- Extent to which identified social impacts are reversible or can be mitigated;
- Likelihood that an identified impact will lead to secondary or cumulative impacts; and
- Uncertainty over possible effects.

8.4.1.3 Predicted impacts during construction

Positive impacts associated with the project include:

- The creation of temporary employment opportunities and social benefits; and
- The development of black economic empowerment (BEE) opportunities.

Negative impacts that may be associated with this phase include:

- Influx of job seekers;
- Creation of informal settlements;
- Possible social pathologies arising from the population influx (such as crime);
- Increase in crime levels;
- The need to secure accommodation for construction staff;
- Impacts related to traffic and roads;
- Impacts related to physical intrusion (i.e. the impacts of dust, noise, etc. on sense of place, etc.); and
- Community perceptions and responses.

8.4.1.3.1 Impact assessment: Creation of temporary employment opportunities and social benefits

The results of the socio-economic survey indicate that the surrounding environment of the project are characterised by poverty and underdevelopment. Notable socio-economic statistics include:

- A *very high unemployment rate* – 45 percent of the surveyed population is unemployed;
- There is a significant *dependency ratio* in these areas, with 1 or 2 employed household members often having to provide for households with between 3 and 6 household members; and
- Stats SA indicates that a large proportion of the population in Msukaligwa Local Municipality is still *young* (30 percent under 15 years of age), and are therefore set to enter the labour market within the next few years. This will place more strain on employment, with its existing shortage of employment opportunities.

From these figures, it is clear that the households in the project area face significant socio-economic challenges. The creation of employment opportunities can therefore be seen as a significant positive impact on the surrounding communities, even if these opportunities are only of a temporary nature.

During the household survey, the issue regarding creation of employment opportunities was most frequently mentioned in the area. There is a widespread high expectation Transnet should provide employment opportunities to the residents in the local area.

Construction activities on the proposed Davel Yard upgrade project will create a number of temporary employment opportunities. The magnitude of this impact is related to the number of construction workers to be employed, either by Transnet itself or by contractors. It is recommended that local labour must be used as much as possible.

Sourcing of construction workers from the local labour pool is likely to be limited to unskilled and semi-skilled workers. This could have some economic benefits for surrounding communities, although only of a temporary nature. It is recommended that recruitment for new positions be undertaken through the *Employment Forum* that has been established by the local municipality.

In addition to creating job opportunities for construction workers, the project may also lead to *indirect employment creation* in the informal sector, for instance in terms of food stalls for the convenience of construction workers. Additionally, more informal employment opportunities may be created through a multiplier effect from the project's activities.

The table below describes the impact for the creation of employment opportunities as well as recommended mitigation (or maximisation) measures.

Table 53: Impact description for the creation of employment opportunities

IMPACT DESCRIPTION: Creation of employment opportunities				
Predicted for project phase:	Pre-construction	Construction	Operation	Decommissioning
Dimension	**Rating**	**Motivation**		
PRE-MITIGATION				
Duration	Short-term	Construction activities will create a number of temporary jobs.	Consequence: Slightly beneficial	Significance: Moderate - positive
Extent	Local	Sourcing of construction workers from the local		

		labour pool is likely to be limited to unskilled and semi-skilled workers.		
Intensity	Moderate - positive	In addition to creating job opportunities for construction workers, the project may also lead to indirect employment creation in the informal sector.		
Probability	Certain	Semi-skilled and unskilled jobs will be created.		
MITIGATION: Proactively manage: • Make use of local labour as far as possible; and • Liaise with local community structures to identify local labour pool.				
POST-MITIGATION				
Duration	Short-term	As for pre-mitigation.	Consequence: Moderately beneficial	Significance: Moderate - positive
Extent	Local	As for pre-mitigation.		
Intensity	High - positive	Increase in the number of locals employed will increase.		
Probability	Certain	Semi-skilled and unskilled jobs will be created		

8.4.1.3.2 Impact assessment: BEE opportunities

Transnet sets certain targets in terms of *procurement progression* – in other words, procurement of goods and services from BEE companies. In terms of this commitment, it is likely that a significant proportion of the goods and services required for the construction phase of the project will be procured from companies owned by historically disadvantaged South Africans. In so doing, it will contribute toward BEE.

The table below describes the impact for the possibilities of BEE opportunities as well as recommended mitigation (or maximisation) measures.

Table 54: Impact description for the possible creation of BEE opportunities

IMPACT DESCRIPTION: BEE opportunities				
Predicted for project phase:	Pre-construction	Construction	Operation	Decommissioning
Dimension	**Rating**	**Motivation**		
PRE-MITIGATION				
Duration	Short-term	Goods and services for the construction phase will be procured from companies owned by PDIs.	Consequence: Slightly beneficial	Significance: Moderate - positive
Extent	Local	Benefits will accrue to local entrepreneurs and service providers.		
Intensity	Moderate - positive	Certain goods and services will still have to be acquired from outside the local ambit.		
Probability	Certain	Transnet has set certain targets in terms of procurement progression, i.e. procurement from BEE companies..		
MITIGATION: • Include conditions in construction contract to involve and train emerging BEE Companies.				
POST-MITIGATION				
Duration	Short-term	As for pre-mitigation.	Consequence: Slightly beneficial	Significance: Moderate - positive
Extent	Local	As for pre-mitigation.		
Intensity	Moderate - positive	Increase in procurement from BEE companies.		
Probability	Certain	Local BEE companies will benefit.		

8.4.1.3.3 Impact assessment: Influx of job seekers

As news regarding the proposed project spreads, expectations regarding possible employment opportunities may also take root. Consequently, the area surrounding the site may experience an influx of job seekers.

The magnitude of this impact depends on the severity of unemployment in surrounding areas. It could be expected that migrant labours will flock to the area. Furthermore, poverty is a widespread problem in the municipality, with an unemployment rate of more than 27 % given these figures, it is likely that a large enough number of job seekers will flock into the area to have a fairly significant population impact on the immediate social environment. This population increase may impact on the area in terms of additional demand for services and infrastructure.

Although this impact is listed here under the heading of "Potential impacts during construction" it is possible that it may commence prior to construction, and may continue after construction has been completed. Contact between newcomers and locals could also create various social problems.

The table below describes the impact for the possible influx of job seekers as well as recommended mitigation (or maximisation) measures.

Table 55: Impact description for the influx of job seekers

<table>
<tr><td colspan="5">IMPACT DESCRIPTION: Influx of job seekers</td></tr>
<tr><td>Predicted for project phase:</td><td>Pre-construction</td><td>Construction</td><td>Operation</td><td>Decommissioning</td></tr>
<tr><td>Dimension</td><td>Rating</td><td colspan="3">Motivation</td></tr>
<tr><td colspan="5">PRE-MITIGATION</td></tr>
<tr><td>Duration</td><td>Short-term</td><td>Knowledge of the project will in all probability attract unemployed people to the area during the construction phase.</td><td rowspan="3">Consequence:
Slightly detrimental</td><td rowspan="4">Significance:
Low - negative</td></tr>
<tr><td>Extent</td><td>Local</td><td>Will affect local communities.</td></tr>
<tr><td>Intensity</td><td>Moderate - negative</td><td>A large number of job seekers could flock to the area to cause fairly significant impact on the social issues in the local arena.</td></tr>
<tr><td>Probability</td><td>Fairly likely</td><td colspan="2">In view of the high unemployment levels in the area, this project will create expectations of job opportunities.</td></tr>
<tr><td colspan="5">MITIGATION:
• Proactively manage:
• As far as possible, make use of local labour;
• Liaise with farmers, local community structures and the local municipality to identify mutually acceptable means of controlling the influx of job seekers or, if this is not possible, to mitigate the negative effects of such an influx; and
• Recruitment is to be conducted via the Employment Forum and not within the project area itself.</td></tr>
<tr><td colspan="5">POST-MITIGATION</td></tr>
<tr><td>Duration</td><td>Short-term</td><td>Through appropriate mitigation measures the impact will be restricted to the construction phase.</td><td rowspan="3">Consequence:
Slightly beneficial</td><td rowspan="4">Significance:
Low - positive</td></tr>
<tr><td>Extent</td><td>Local</td><td>As for pre-mitigation.</td></tr>
<tr><td>Intensity</td><td>Low - positive</td><td>The proposed mitigation measures will ensure the employment of more locals and thereby also reduce other social pathologies.</td></tr>
<tr><td>Probability</td><td>Fairly likely</td><td colspan="2">Mitigation will increase the number of local people employed by the project.</td></tr>
</table>

8.4.1.3.4 Impact assessment: Creation of informal settlements

One of the contributors to the expansion of informal settlements is the influx of job seekers into the area, as these job seekers tend to settle in the informal settlements. However, many other factors are also responsible for the growth of informal settlements, which cannot all be attributed to the proposed Davel Yard expansion project. Therefore, this expansion in informal settlements is the result of many cumulative impacts, such as influences of other mines in the area, current socio-economic conditions in the country and region and so forth.

Many impacts also arise from the expansion of informal settlements, especially an increase in associated social pathologies. The informal settlements are highly underdeveloped in terms of infrastructure. Most houses have no electricity supply, buy bottled water and have no refuse disposal systems. These informal settlers are also mostly unemployed as they are job seekers who migrate to the area.

In most instances the local communities would claim that the informal settlements are contributing directly to a number of problems. In particular, the community believes that these settlements lead to a higher crime rate in the area. It is therefore clear that there is a cumulative impact of various preceding factors that influence the extent of this impact. It is possible that an influx of job-seekers moving into the area because of the Davel Yard project will cause informal settlements to expand even more, and thereby exacerbate the social problems mentioned above.

Measures to mitigate or control the expansion of informal settlements will have to be implemented with considerable sensitivity so as not to infringe on people's constitutionally guaranteed right to freedom of movement. To this end, it is recommended that Transnet facilitate the establishment of a "Community Safety Committee" with the aim of monitoring and controlling illegal squatting. The suggested membership of such a committee would include:

- The Community Relations Department of Transnet;
- Msukaligwa Local Municipality;
- Local landowners;
- Representatives of local community; and
- Local police and the Community Policing Forum.

The functions of this committee would include:

- Frequent monitoring of the area to detect the establishment of new informal settlements. (It is foreseen that this function could be carried out by Community Relations Department of Transnet in cooperation with the local Community Policing Forum, as well as other stakeholders in the area);
- The establishment of a "hotline" at a local police station or at the local municipality for reporting of illegal squatting. The number of this hotline should be widely disseminated among local communities and landowners to ensure that the erection of new informal settlements is reported as soon as possible, thereby allowing for timeous response ; and
- The formulation, in consultation with all relevant stakeholders, of an appropriate plan for responding to illegal squatting.

The table below describes the impact for the possible creation of informal settlements as well as recommended mitigation (or maximisation) measures.

Table 56: Impact description for the creation of formal settlements

IMPACT DESCRIPTION: Creation of informal settlements				
Predicted for project phase:	Pre-construction	Construction	Operation	Decommissioning
Dimension	**Rating**	**Motivation**		
PRE-MITIGATION				
Duration	Short-term	Shortage of housing might lead to the establishment of informal settlements during the construction phase.	Consequence: Slightly detrimental	Significance: Low - negative
Extent	Local	Will affect local communities.		
Intensity	Low - negative	The establishment of informal settlements will have a negative impact on social aspects in the area		
Probability	Fairly likely	In a region with high levels of unemployment this is very likely to happen when job seekers flock to the area of the project.		

MITIGATION:
• Proactively:
• Establishment of a "Community Safety Committee" to monitor and control illegal squatting. Committee to consist of:
  ○ The Community Relations Department of Transnet;
  ○ Its counterparts at other mines in the area;
  ○ The Local Municipality;
  ○ Local landowners;
  ○ Representatives of local community structures; and
  ○ Local police and the Community Policing Forum.
• Align social investment strategies with municipal development;
• Transnet employees who receive living-out allowances should be required to provide proof that this allowance is used for formal accommodation; and
• Include a requirement in the Conditions of Service of construction contractors that construction workers must be vacated from the area once construction is completed.				

POST-MITIGATION				
Duration	Short-term	As for pre-mitigation.	Consequence: Negligible	Significance: Very low
Extent	Local	As for pre-mitigation.		
Intensity	Very low	Mitigation will reduce the need for non-local people to travel to the area.		
Probability	Unlikely	Reduced need for non-locals to move to the area in search of jobs will reduce the likelihood of establishment of informal settlements.		

8.4.1.3.5 Impact assessment: Social pathologies arising from population influx

It is assumed that the construction workforce for the Davel Yard expansion will be locals, while the remainder will have to be housed reasonably close to the construction site. It is possible that *conflict* might arise between the newcomers and local residents. One possible reason for such conflict would be the perception among locals that the outsiders are taking up jobs that could have gone to unemployed members of the local community. An influx of unemployed job seekers (which was discussed in the preceding sections) could add to the potential for conflict.

An influx of construction workers and job seekers might be accompanied by an increase in *crime*. Even if particular instances of crime are not as a result of the newcomers, they may still be attributed to them by local communities. Another possibility is that a population influx will contribute to *alcoholism*, *drug abuse*, *prostitution* and the spread of *sexually transmitted diseases* in the local population.

The table below describes the impact for the possible social pathologies arising from population influx as well as recommended mitigation (or maximisation) measures.

Table 57: Impact description for possible social pathologies arising from population influx

IMPACT DESCRIPTION: Social pathologies arising from population influx				
Predicted for project phase:	Pre-construction	Construction	Operation	Decommissioning
Dimension	**Rating**	**Motivation**		
PRE-MITIGATION				
Duration	Short-term	Influx of job seekers during the construction phase could lead to conflict between locals and newcomers.	Consequence: Negligible	Significance: Very low
Extent	Site-specific	Will affect local communities.		
Intensity	Low - negative	• An influx of unemployed job seekers could add to the potential for conflict; • An influx of construction workers and job seekers might be accompanied by an increase in crime; and • Another possibility is that a population influx will contribute to alcoholism, drug abuse, prostitution and the spread of sexually transmitted diseases in the local population.		
Probability	Fairly likely	Even if particular instances of crime are not as a result of the newcomers, they may still be attributed to them by local communities.		
MITIGATION: Proactively manage: • Additional security must be provided during this period by the contractors, which should be integrated with existing community security systems; • Implement alcohol abuse campaigns in the communities; • Align awareness campaigns with those of other organisations in the area (i.e. the Local Municipality etc.); and • Implement methods to create HIV and STI awareness amongst construction workers and communities.				
POST-MITIGATION				
Duration	Short-term	The potential impact will be management during the construction phase.	Consequence: Negligible	Significance: Very low
Extent	Site-specific	As for pre-mitigation.		
Intensity	Very low	Management of the social interaction between locals and newcomers will reduce the potential impact.		
Probability	Fairly likely	By appropriate management of the issue the potential intensity for the development of such pathologies will be reduced.		

8.4.1.3.6 Impact assessment: Increase in crime levels

One of the potential social pathologies that may arise from a rapid increase in population numbers in an existing underdeveloped area is an increase in crime levels. The extra strain that the influx of job seekers will place on limited employment opportunities in the area will potentially increase the unemployment rate, which will increase the crime rate.

During the household survey, respondents mentioned that they are already experiencing a rapid increase in crime levels. They recommended that Transnet should assist the community to provide additional safety at night.

The table below describes the impact for the potential increase in crime levels as well as recommended mitigation (or maximisation) measures.

Table 58: Impact description for the potential increase in crime levels

IMPACT DESCRIPTION: Increase in crime levels				
Predicted for project phase:	Pre-construction	Construction	Operation	Decommissioning
Dimension	**Rating**	**Motivation**		
PRE-MITIGATION				
Duration	Short-term	The impact would mainly manifest itself during the construction phase.	Consequence: Slightly detrimental	Significance: Low - negative
Extent	Local	Local communities will be affected.		
Intensity	Low - negative	A rapid increase in population numbers in an existing underdeveloped area could lead to an increase in crime levels.		
Probability	Fairly likely	An increase in population in confined areas, linked with the current low employment level could lead to an increase in crime.		
MITIGATION: Proactively manage: • Establishment of a "Community Safety Committee" to monitor and control illegal squatting. Committee to consist of: o The Community Relations Department of Transnet; o Its counterparts at other mines in the area; o The Local Municipality; o Farmers Association; o Local landowners; o Representatives of local community structures; and o Local police and the Community Policing Forum. • Additional security must be provided during this period by the contractors, which should be integrated with existing community security systems; • Implement crime awareness campaigns in the communities; and • Align awareness campaigns with those of other organisations in the area (i.e. the local municipality etc.).				
POST-MITIGATION				
Duration	Short-term	The impact would mainly manifest itself during the construction phase.	Consequence: Negligible	Significance: Very low
Extent	Local	As per pre-mitigation.		
Intensity	Very low	Mitigation could reduce severity of impact.		
Probability	Fairly likely	Mitigation could reduce likelihood of impact occurring at the intensity predicted.		

8.4.1.3.7 Impact assessment: Accommodation for construction staff

It may be necessary to find accommodation for a number of construction workers in the vicinity of the proposed developments. One option would be to house them in a c*onstruction village*. The other option will be to house them in nearby settlements. This may require that the local municipality or Transnet invest in the construction of additional housing units.

A major concern for communities in the area relates to the management of housing for the construction workers who are employed by the contractors. Construction contractors also reportedly do not construct adequate housing facilities for their workers, resulting in the expansion of informal settlements and other social pathologies, such as increased crime levels.

The construction of additional housing units for construction workers will increase the pressure on the service infrastructure. In addition, there is an existing perception among community members that construction workers from contractors move into the area and stay there even after construction activities have completed. The construction of additional housing units for construction workers might reinforce this perception and cause resentment.

Therefore, it is recommended that a construction village be used as housing for the construction workers. It is recommended that one construction village be used to house construction workers of the project components to minimise the extent of pressure the additional housing will exert on social and municipal infrastructure. Since the construction timeline of the proposed project components is sequential with some overlapping time periods, it is necessary to ensure that the construction village is large enough to accommodate the maximum number of construction workers that will be employed at any given time.

Furthermore, it would be preferable if sufficient entertainment facilities could be included in the construction camp. Entertainment facilities could comprise a lounge with pool table, television, vending machines for soft drinks, etc. By providing entertainment facilities, the workers' motivational levels may increase and the risk to social pathologies will decrease. If entertainment facilities cannot be included in the camp layout, attendance of alternative entertainment facilities must be encouraged.

Once construction of the project components is completed, the construction camp should be demolished completely to avoid settling of informal residents. As an alternative, the construction contractor may negotiate with the Msukaligwa Local Municipality about possibly selling or donating the construction camp to the Local Municipality for use as formal housing in the area.

The table below describes the impact which could arise due to the accommodation for construction staff as well as recommended mitigation (or maximisation) measures.

Table 59: Impact description for the accommodation of construction staff on site

IMPACT DESCRIPTION: Accommodation for construction staff				
Predicted for project phase:	Pre-construction	Construction	Operation	Decommissioning
Dimension	**Rating**	**Motivation**		
PRE-MITIGATION				
Duration	Short-term	Influx of job seekers during the construction phase could lead to the need for additional accommodation.	Consequence: Negligible	Significance: Very low
Extent	Site-specific	Impact will be restricted to sites where additional accommodation is required.		
Intensity	Low - negative	Additional accommodation will have an impact on resources and possible conflict with locals.		
Probability	Fairly likely	Local communities frequently, rightly or wrongly, associate newcomers with social problems.		
MITIGATION: Proactively manage: • Housing of construction workers in a construction village site; • Maximisation of the proportion of job opportunities allocated to locals, thus reducing the need for outsiders; • Provision of sufficient entertainment facilities (e.g. lounge with TV, pool table, etc.); and • Demolishing construction village after construction activities have finished, or donating the construction camp to the local municipality for formal housing, or alternatively convert the construction camp to permanent housing for labourers during the operational phase.				
POST-MITIGATION				
Duration	Short-term	Management of the issue could contain the impact to construction phase.	Consequence: Negligible	Significance: Very low
Extent	Site-specific	As per pre-mitigation.		
Intensity	Very low	Mitigation will alleviate the pressure on local housing.		
Probability	Fairly likely	Even with mitigation potential still exists, albeit at a lower intensity.		

8.4.1.3.8 Impact assessment: Physical intrusion

Impacts related to noise, visual aspects, air quality and the like are discussed under this heading, as all these impacts are related to the physical presence of project-related infrastructure and the intrusion this imposes on surrounding communities. Such intrusion could impinge on the lives of surrounding communities by affecting the area's *sense of place*.

Several factors have to be borne in mind when assessing the potential magnitude of such an impact. One of these factors is the *current state of the landscape* in which the development is situated. The landscape already bears the marks of development and as such sense of place will not be such a major issue.

Another factor to take into account when assessing the impact on sense of place is the *meanings* that people who live or work in an area attach to the anticipated changes. If a development promises to offer tangible *benefits* to surrounding communities (in terms of job creation, etc.), it is unlikely that its impact on the character of the landscape will be perceived in a negative light – even if that impact is substantial from an aesthetic point of view.

Although this impact is listed here under the heading of "Potential impacts during construction" it is possible that it may continue during the project's operational phase.

Dust generated by construction activities, and by vehicles moving on access roads during construction could affect air quality in the area. The air quality specialist study reports on the potential impacts on air quality in the area.

Construction activities may also increase *noise* in the area. Communities most likely to be affected are those at Davel.

As indicated above, the impact of a development on the character of the landscape may not be experienced as negative if that development offers tangible benefits. To the extent that the project benefits local communities (in terms of job creation, etc.), it is therefore *unlikely* that they will experience it as a significant negative impact on the area's sense of place.

The table below describes the impact which could arise due to the physical intrusion brought about by the construction of the Davel Yard as well as recommended mitigation (or maximisation) measures.

Table 60: Impact description for the physical intrusion during construction phase

<table>
<tr><th colspan="5">IMPACT DESCRIPTION: Physical intrusion (Construction phase)</th></tr>
<tr><td>Predicted for project phase:</td><td>Pre-construction</td><td>Construction</td><td>Operation</td><td>Decommissioning</td></tr>
<tr><th>Dimension</th><th>Rating</th><th colspan="3">Motivation</th></tr>
<tr><td colspan="5">PRE-MITIGATION</td></tr>
<tr><td>Duration</td><td>Short-term</td><td>The construction activities will impact on the sense-of-place.</td><td rowspan="3">Consequence: Slightly detrimental</td><td rowspan="4">Significance: Moderate - negative</td></tr>
<tr><td>Extent</td><td>Local</td><td>Local communities will be affected.</td></tr>
<tr><td>Intensity</td><td>Moderate - negative</td><td>Impacts related to noise, visual aspects, air quality and the like are related to the physical presence of project-related infrastructure and the intrusion this imposes on surrounding communities by affecting the area's sense of place.</td></tr>
<tr><td>Probability</td><td>Certain</td><td colspan="2">Due to the nature of the project these impacts will be generated and affect the communities.</td></tr>
<tr><td colspan="5">MITIGATION:
• Implement mitigation measures recommended in separate specialist reports on noise impacts and air quality;
• Do not engage in construction activities during church gatherings or at night; and
• Liaise with local communities as to activities scheduled and avoid construction during these times, if possible.</td></tr>
<tr><td colspan="5">POST-MITIGATION</td></tr>
<tr><td>Duration</td><td>Short-term</td><td>Will be mainly limited to the construction phase.</td><td rowspan="3">Consequence: Slightly detrimental</td><td rowspan="4">Significance: Low - negative</td></tr>
<tr><td>Extent</td><td>Local</td><td>Impact will be contained at local level.</td></tr>
<tr><td>Intensity</td><td>Low - negative</td><td>Mitigation will lower the crime levels.</td></tr>
<tr><td>Probability</td><td>Certain</td><td colspan="2">Due to the nature of the project these impacts will be generated and affect the communities, albeit a lower level of intensity</td></tr>
</table>

Table 61: Impact description for the physical intrusion during operational phase

IMPACT DESCRIPTION: Physical intrusion (operational phase)				
Predicted for project phase:	Pre-construction	Construction	Operation	Decommissioning
Dimension	**Rating**	**Motivation**		
PRE-MITIGATION				
Duration	Long-term	Impacts related to noise, visual aspects, air quality and the like are related to the physical presence of project related infrastructure and the intrusion this imposes on surrounding communities will continue for the life span of the project.	Consequence: Moderately detrimental	Significance: High - negative
Extent	Local	Impacts will affect local communities.		
Intensity	Moderate - negative	Such intrusion could impact on the lives of the communities by affecting their sense-of-place.		
Probability	Certain	Due to the nature of the project these impacts will be generated and affect the communities.		
MITIGATION: • Do not engage in construction activities during church gatherings or at night. Strictly adhere to the working hours as stipulated in the EMP. Should construction activities be absolutely necessary outside of these working hours, permission from all affected residents and communities must be obtained prior to works commencing; and • Liaise with local communities as to activities scheduled and avoid construction during these times, if possible.				
POST-MITIGATION				
Duration	Long-term	As per pre-mitigation.	Consequence: Moderately detrimental	Significance: Moderate - negative
Extent	Local	As per pre-mitigation.		
Intensity	Low - negative	Mitigation will alleviate the pressure on local housing.		
Probability	Certain	Due to the nature of the project these impacts will be generated and affect the communities albeit at a lower level of intensity.		

8.4.1.3.9 Impact assessment: Community perceptions and responses

The communities in the area are generally having no major problems with the proposed upgrade, as they expect it will create employment opportunities in the area. However, significant concerns have also been raised about the possible negative impacts of the project. In particular, influx of construction workers and job seekers and concomitant social effects associated with the two.

While the potential impacts related to these effects were discussed earlier, they are mentioned here due to the fact that *community perceptions and concerns* regarding these effects may in themselves constitute a significant social impact. If community members believe that the project will have a negative effect on their lives – regardless of whether or not this perception is justified – they are likely to be extremely resistant to the proposed developments. This constitutes a source of social risk to the project, which should be addressed by allaying unjustified community fears regarding the project, and instituting appropriate mitigation measures to address realistic concerns.

The table below describes the impact on the community perceptions and responses as well as recommended mitigation (or maximisation) measures.

Table 62: Impact description for the perceptions and responses of the community

IMPACT DESCRIPTION: Community perceptions and responses				
Predicted for project phase:	Pre-construction	Construction	Operation	Decommissioning
Dimension	**Rating**	**Motivation**		
PRE-MITIGATION				
Duration	Short-term	Negative perceptions of the impacts of the project by the local communities will develop prior to and during the construction phase.	Consequence: Slightly detrimental	Significance: Low - negative
Extent	Local	Localised impact.		
Intensity	Low - negative	• Generally no major problems with the proposed upgrade, as communities expect it will create employment opportunities in the area; and • Concerns have been raised about the possible negative impacts of the project, in particular, influx of construction workers and job seekers and concomitant social effects, including air quality due to dust during construction.		
Probability	Certain	If community members and farmers believe that the project will have a negative effect on their lives – regardless of whether or not this perception is justified – they are likely to be resistant to the proposed developments.		
MITIGATION: • Involve communities and farmers continuously in the construction process; • Continued communication; • Implement mitigation measures that have been promised; • Maintain a transparent approach to the EIA process; and • Provide for local employment.				
POST-MITIGATION				
Duration	Short-term	Will be limited to the construction phase.	Consequence: Negligible	Significance: Very low
Extent	Local	Localised impact.		
Intensity	Very low	Allaying unjustified community / farmer fears regarding the project will reduce the potential resistance to the project.		
Probability	Fairly likely	Effective implementation of the mitigation measures will contribute to the change in attitude of the communities towards the project.		

8.4.1.4 Predicted impacts during operation

Positive impacts associated with the operational phase of the project include:

- The creation of employment opportunities and social benefits; and
- Local and regional economic benefits.

8.4.1.4.1 Impact assessment: Creation / sustaining of employment opportunities

As discussed earlier, the generation of employment opportunities is the main concern for the communities surrounding the project area. The existing poor socio-economic conditions suggest that provision of employment opportunities will have a significant impact in the local communities. These employment opportunities will have downstream impacts on the economic activity of the area, as the salary and wages earned will mostly be spent in the vicinity of the affected area.

The table below describes the impact due to the creation / sustaining of employment opportunities as well as recommended mitigation (or maximisation) measures.

Table 63: Impact description for the creation/sustaining of employment opportunities for the operational phase

IMPACT DESCRIPTION: Creation / sustaining of employment opportunities (operational phase)				
Predicted for project phase:	Pre-construction	Construction	Operation	Decommissioning
Dimension	**Rating**	**Motivation**		
PRE-MITIGATION				
Duration	Long-term	Generation and sustaining of employment opportunities is the main concern for the communities surrounding the project area which will have long term downstream impacts on the economic activity of the area.	Consequence: Moderately beneficial	Significance: Low - positive
Extent	Local	Localised impact.		
Intensity	Moderate - positive	Salary and wages earned will mostly be spent in the vicinity of the affected area.		
Probability	Fairly likely	The project will generate jobs which will persist after the construction phase.		
MITIGATION: • Maximise local employment opportunities through training and capacity building.				
POST-MITIGATION				
Duration	Long-term	Using local employment for permanent jobs will contribute to the long term local economy.	Consequence: Highly beneficial	Significance: Moderate - positive
Extent	Local	Localised impact.		
Intensity	High - positive	Increased employment levels will increase local economy.		
Probability	Fairly likely	Mitigation will further enhance the positive impacts of the project.		

8.4.1.4.2 Impact assessment: Local and regional economic benefits

In addition to the economic benefits derived from employment, the development will also contribute to the local and regional economy in other ways. For instance, *local expenditure* by employees will have multiplier effects in various sectors of the economy, thereby stimulating business activity and further employment creation.

The project could also have *fiscal impacts* – in other words, an impact on government revenues and expenditures. In particular, payment of business and personal tax could contribute to government revenue at a national level, while rates and payment for services could strengthen the income base of the local municipality.

The table below describes the impact of local and regional economic benefits as well as recommended mitigation (or maximisation) measures.

Table 64: Impact description for local and regional economic benefits during the operational phase

IMPACT DESCRIPTION: Local and regional economic benefits (operational phase)				
Predicted for project phase:	Pre-construction	Construction	Operation	Decommissioning
Dimension	**Rating**	**Motivation**		
PRE-MITIGATION				
Duration	Long-term	Creating employment will increase the spending regime in the area. Long term jobs will persist for the life span of the project.	Consequence: Highly beneficial	Significance: Moderate - positive
Extent	Regional	The project could also have fiscal impacts.		

		Payment of business and personal tax could contribute to government revenue at a national level, while rates and payment for services could strengthen the income base of the district and local municipalities.		
Intensity	Moderate - positive	Local expenditure by employees will have multiplier effects in various sectors of the economy, thereby stimulating business activity and further employment creation.		
Probability	Fairly likely	Increased employment levels will contribute to the economy.		
MITIGATION: • Maximise local employment and recruitment; • Support BEE initiatives; • Skills development initiatives; • Maintain a transparent approach to the EIA process; and • Provide for local employment.				
POST-MITIGATION				
Duration	Long-term	Economic benefits will persist for the duration of the project.	Consequence: Highly beneficial	Significance: Moderate - positive
Extent	Regional	The region will benefit from the implementation of the project.		
Intensity	High - positive	Increased employment rate and available expenditure will contribute to the regional economy.		
Probability	Fairly likely	As per pre-mitigation, albeit at an increase intensity.		

8.4.1.5 Summary of the predicted SIA impacts and recommendations

Based on the discussion presented in the previous sections, it can be concluded that many of the significant socio-economic impacts of the proposed Davel Yard upgrade will occur during their *construction phase*.

Positive impacts during this phase will include temporary creation of employment opportunities as well as concomitant economic benefits and possible creation of opportunities for black economic empowerment.

Negative impacts include the potential influx of job seekers, creation of informal settlements, possible social pathologies arising from the influx of construction workers and job seekers, as well as increased traffic, damage to roads and impacts related to physical intrusion (dust, noise and vibration).

As far as the *operational* phase of the proposed developments is concerned, the most significant *positive* impacts will include the creation of a number of long-term employment opportunities (202 employees).

The effects of the *BEE opportunities* will be a significant positive during this phase, as well as the *local and regional economic benefits* emanating from the BEE opportunities and employment that is created.

It is expected that income will accrue to the area from BEE opportunities, with income emerging from the total annual wage bills for all project components. Social investment initiatives and upgrading of infrastructure in the area can also be regarded as significant positive impacts.

The most significant *negative* impacts likely to occur during the operational phase of the proposed developments will include increase of noise levels due to an increase in rail traffic at the Davel Yard.

It is recommended that the mitigation and maximisation measures included in this report be implemented to decrease the effect of negative impacts on communities and maximise the effect of positive impacts.

In conclusion the proposed Davel Yard expansion project poses a number of potential positive and negative social impacts. With appropriate measures, the negative impacts can be reduced to acceptable levels while the positive impacts can be maximised to provide significant benefits to the region.

8.4.2 Socio-economic assessment

Due to the nature of assessing the socio-economic impact the project might have on the environment, it is necessary to view the impact holistically. Therefore, the findings presented in this chapter are representative of the entire Swaziland Railway Link project, and not only for that of the Davel Rail Yard. The complete specialist report can be found in Appendix B, Annexure I.

The capital investment in rail infrastructure for this project will boost the transport and export sectors in the respective economies. However, it will also have an immediate direct and indirect positive impact on the growth and development of South Africa and Swaziland. The economic impact analysis reveals a positive impact on major macro-economic variables such as Output, Gross Value Added (GVA), income and employment on the provinces of Mpumalanga and KwaZulu-Natal as well as Swaziland.

The impact evaluation uses economic multipliers from Social Accounting Matrices (SAMs). A SAM is a widely used tool to assess the macro-economic impact of changes in final demand induced by events such as large scale developments or shifts in policy.

In addition to the short-run implications of a large scale capital investment injection, the on-going operational expenditure effect on the provincial economies and Swaziland is estimated.

The static framework of the SAM will not be able to capture the structural changes occurring in subsequent years due to the construction of the rail link. The model only takes into account one particular shock to the system, while everything else is assumed to remain constant. Therefore the magnitude and direction of the response variables could have been cushioned or increased by other changes in the economy.

The CAPEX or investment is estimated at approximately R 19 billion. The terms CAPEX and investment are used interchangeably in this report but are identical. In order to understand how this shock will affect and filter through the respective economies it is important to understand how investments are recorded in the system of national accounts (SNA).

8.4.2.1 Capital investment expenditure

Investment in capital goods is the same as the concept of Gross Capital Formation (GCF) in the SNA which includes produced capital goods (machinery, buildings, roads etc.). Gross capital formation measures the additions to the capital stock or the capacity to produce more goods and income in the future and is subdivided into Gross Fixed Capital Formation (GFCF) and changes in inventories.

GFCF includes all goods and services that can be used repeatedly for more than one year to produce other goods and services while changes in inventories include materials and supplies, work-in-progress, finished goods and goods for resale. Gross capital formation or capital investment is financed through savings by households, firms, government and foreign investment.

8.4.2.2 Gross domestic product

An economic impact is typically measured in terms of changes in labour income; employment; Gross Domestic Product (GDP) or Gross Value Added (GVA). Both GDP and GVA are measurements of final goods and services (output) produced within a region in a given period of time, serving as a measure of the size of a region's economy. GVA equals GDP plus taxes on products minus subsidies on products and is typically used for measuring gross *regional* domestic product of entities smaller than a whole economy.

GDP can be determined in three ways, all of which should, in principle, give the same result. They are the production approach, the income approach, and the expenditure approach. This study will use the production approach which calculates GDP as follows:

$$Total\ output\ by\ industries\ -\ intermediary\ inputs = GVA\ at\ market\ prices$$

$$GVA\ at\ market\ prices + \ taxes - subsidies = GDP\ at\ market\ prices$$

Capital projects create additional demands for labour, materials, technology etc. and increase production, both during construction phase as well as the operations. A macro-economic impact analysis evaluates and quantifies the effect of a capital project on the economy of a given area.

Imports of capital goods are excluded from the CAPEX estimates used in this study in order to isolate the effects on the local economy.

Economic multipliers from SAMs were used to estimate the effects of the capital project. Economic effects in terms of output, GVA, employment and income are calculated annually for the duration of the project period based on preliminary cash flow estimates. These annual estimates are then aggregated to give a lump-sum economic effect of the capital expansion for the duration of the project's construction phase as well as effects due to annual OPEX.

The estimated effects are based on the CAPEX and OPEX numbers, estimated at current 2013 prices, as reported in the FEL-2 study. OPEX estimates used are the average cost of repairs and maintenance over the 24 analysis period for both rail and rolling stock.

8.4.2.3 Results of the assessment undertaken

The following sub-sections present and expand upon the applications and results of the analysis conducted. A separate analysis was done for each province, Mpumalanga and Kwazulu-Natal and for Swaziland. The CAPEX values were assigned to Mpumalanga, KwaZulu-Natal and Swaziland according to the three sections of the Swaziland Railway Link project, namely Mpumalanga, Swaziland and KwaZulu-Natal. Table 65 presents the CAPEX breakdown by work packages and regions.

Table 65 and Table 66 reflect the changes in final demand and were used as inputs for determining the macro-economic impact of CAPEX and OPEX.

CAPEX was apportioned to the respective provinces and Swaziland according to the cost breakdown per work package. Railway repair and maintenance (OPEX) were apportioned to the ratio of the rail track distances in the respective regions. Repairs and maintenance to rolling stock, locomotives and wagons, were apportioned to Mpumalanga and KwaZulu-Natal as no such activities are currently being performed in or planned for Swaziland.

Table 65: CAPEX of work packages assigned to Mpumalanga, Swaziland and KwaZulu-Natal

Location	Work Package	Description / Start Location	Description / End Location	Primary Purpose
Mpumalanga	WP1A	Lothair	Nerston	New link line
	WP2	Davel Yard and Connections		New terminal, network links
	WP3	Davel Yard	Lothair	Line upgrade
Swaziland	WP1B	Nerston	Sidvokodvo	New link line
	WP4	Sidvokodvo	Phuzamoya	Line upgrade (new line)
	WP5	Phuzamoya	Golela	Line upgrade (new line)
KwaZulu-Natal	WP6	Golela	Nsezi	Line upgrade (new line)

Table 66: Estimated capital expenditure (CAPEX) project values and imports (Current 2013 prices, Rand Million)

	Mpumalanga	Swaziland	KwaZulu-Natal	Total
Estimated Total Project Value	**4,965**	**7,850**	**6,344**	**19,159**
Domestic	**4,491**	**1,453**	**5,824**	**11,767**
Building & Construction	2,850	1,008	3,956	7,813
Mining & Quarrying	250	66	298	614
Manufactured goods	541	111	493	1,146
Wholesale & Retail Trade	9	1	-	10
Real Estate	71	43	183	297
Business Services	769	223	894	1,886
Imported Goods & Services	**474**	**6,397**	**520**	**7,392**

The loss of biological assets, forestry plantations and natural vegetation, due to expropriation and reclamation of land as well as the loss of production from such assets could be included in the CAPEX and OPEX changes in final demand, respectively. Such effects would reflect in negative changes in final demand due to reduced economic output.

Due to the lack of sufficient information regarding the quantum and value of the likely loss of biological assets, the effect was omitted from the analysis. Such reductions in final demand would lead to a marginal reduction in economic output and other metrics. It is possible to estimate the effects using the SAM multipliers.

8.4.2.3.1 Macro-economic impact results

The effects on total output associated with the total CAPEX as well as the annual effect of OPEX are summarised in and Table 68.

The output multiplier combines all direct, indirect and induced effects and shows the final increase in gross output of all the production activities. The output CAPEX ratio falls between 2.1 and 2.7 for both the provinces and Swaziland. Thus, for every one Rand increase in CAPEX, output increases between 2.1 and 2.7 Rand.

Table 67 represents the changes in GVA, in response to the projected capital expenditures. Similar to total output, KwaZulu-Natal experiences a greater effect on GVA than Mpumalanga and Swaziland. The gross value added is

significantly lower than total output as it does not include all the intermediate consumption, inputs which are used in the production of final goods and services.

In addition, the gross value added portion in the form of factor payments to labour can be disaggregated by skills level. Representing the estimated effects as follow gives a sense of which skill groups are most likely to benefit from this capital project.

Table 67: Annual estimated total operational expenditure and capitalised operational expenditure (Current 2013 prices, Rand Million)

	Mpumalanga	Swaziland	KwaZulu-Natal	Total
Estimated total OPEX	**174**	**47**	**190**	**411**

Table 68: Macro-economic impact of CAPEX (Current 2013 prices, Rand Millions)

	Mpumalanga	Swaziland	KwaZulu-Natal	Total
Domestic CAPEX	**4,491**	**1,453**	**5,824**	**11,767**
Output	**9,443**	**3,938**	**15,622**	**29,003**
Gross Value Added	**2,199**	**1,024**	**4,064**	**7,287**
Labour	1,015	466	1,847	3,328
Skilled	300	187	740	1,227
Semi-Skilled	319	171	676	1,166
Unskilled	396	109	431	936
Capital	1,185	558	2,217	3,959
Income	**1,395**	**771**	**3,059**	**5,226**
Enterprises	450	225	894	1,569
Households	945	546	2,166	3,657
Low income	192	40	159	391
Middle income	232	120	477	829
High income	279	386	1,530	2,194
Employment creation	**14,910**	**9,415**	**16,513**	**40,838**

Unskilled and semi-skilled workers in all the regions will receive more than half of the increase in factor payments in the form of wages, to the equivalent of R 715 million in Mpumalanga, R 279 million in Swaziland and R 1.1 billion in KwaZulu-Natal. Factor payments to skilled workers will increase by R 300 million in the Mpumalanga, R 187 million in Swaziland and R 740 million in KwaZulu-Natal.

Annual employment effects during the construction period were estimated by using the assumed cash flows adjusted for imports. Retention of labour in subsequent years is incorporated. As labour demand increases with increased capital expenditure, it is assumed that 80 per cent of the previous year's labour would be retained. Employment created during a period is the difference between the total demand for labour and the retained labour from the previous period. More than 40 000 jobs could be created across all three regions during the construction phase of the project. This is not a reflection of permanent employment changes for the permanent residents but merely reflects the increases employment needed for the rail component construction located in each region. In addition, labour demand does not solely pertain to the unemployed but also includes people moving from one sector to the next. Employment at all levels is an increasing function of the total project value. KwaZulu-Natal experiences the greatest effects on employment.

The income effect focuses on the factor payments that are destined for Mpumalanga, Swaziland and KwaZulu-Natal households and enterprises, permanently based in the respective provinces. The income multiplier measures

the additional income generated by households and institutions due to additional direct and indirect production activity. The size of the multiplier effect will depend on the structural features of the economy such as the component of domestically produced goods and the share of tradable and non-tradable goods in the consumption basket as well as the share of factor income actually received by households. The greater the import component of domestic consumption the greater the sum of funds not spent in the local economy. This is referred to as an import leakage which will decrease the multiplier effect.

The income effect is much smaller than the gross valued added effect as a large portion of the wages and capital payments are accrued by enterprises and individuals residing outside of the provinces reflecting there leakages towards other provinces and abroad. Potential import leakages for the regions can be quite significant as the factors of production namely labour may not reside or spend their income in the province of interest. In addition, taxes and savings will decrease household disposable income and ability to purchase locally produced goods.

Income can be disaggregated by income group which gives a sense of which income groups are most likely to benefit from this capital project. High income earners in KwaZulu-Natal stand to gain much more relative to the other income groups. In Mpumalanga and Swaziland the income effect seems to be more balanced.

Table 69 represents the effects from the annual OPEX. Output increases substantially for all three regions whilst the change in GVA is relatively small, especially in Mpumalanga and KwaZulu-Natal. The annual labour demand for the on-going operations and maintenance amounts to 935 jobs.

Table 69: Macro-economic impact of annual OPEX (Current 2013 prices, Rand Millions)

	Mpumalanga	Swaziland	KwaZulu-Natal	Total
Annual OPEX	**174**	**47**	**190**	**411**
Output	**245.6**	**146.8**	**473.3**	**865.6**
Gross Value Added	**27.4**	**35.7**	**88.6**	**151.7**
Labour	13.1	17.1	40.6	70.7
Skilled	3.8	6.6	15.8	26.2
Semi-Skilled	4.1	6.3	15.0	25.4
Unskilled	5.2	4.2	9.8	19.2
Capital	14.3	18.6	48.0	80.9
Income	**17.5**	**27.0**	**65.1**	**109.6**
Enterprises	5.4	7.5	18.4	31.3
Households	12.0	19.5	46.8	78.3
Low income	2.4	1.5	3.5	7.4
Middle income	2.9	4.5	10.5	17.9
High income	3.7	8.0	19.0	30.7
Employment creation	**247**	**324**	**364**	**935**

The tables below describe the impact for macro-economic CAPEX and OPEX as well as proposed mitigation measures.

Table 70: Impact description for the Macro-economic CAPEX on a regional scale

IMPACT DESCRIPTION: Macro-economic CAPEX Regional

Predicted for project phase:	Pre-construction	Construction	Operation	Decommissioning
Dimension	**Rating**	**Motivation**		
PRE-MITIGATION				
Duration	Short-term	Generation and sustaining of employment opportunities is the main concern for the communities surrounding the project area which will have long term downstream impacts on the economic activity of the area.	Consequence: Moderately beneficial	Significance: Moderate - positive
Extent	Regional	Localised impact.		
Intensity	High - positive	Salary and wages earned will mostly be spent in the vicinity of the affected area.		
Probability	Very likely	The project will generate jobs which will persist after the construction phase.		
MITIGATION: • Maximise local employment opportunities through training and capacity building.				
POST-MITIGATION				
Duration	Short-term	Using local employment for permanent jobs will contribute to the local economy.	Consequence: Negligible	Significance: Very low
Extent	Site-specific	Localised impact.		
Intensity	Very low	Increased employment levels will increase local economy.		
Probability	Very unlikely	Mitigation will further enhance the positive impacts of the project.		

Table 71: Impact description for the macro-economic CAPEX on a local scale

IMPACT DESCRIPTION: Macro-economic CAPEX Local				
Predicted for project phase:	Pre-construction	Construction	Operation	Decommissioning
Dimension	**Rating**	**Motivation**		
PRE-MITIGATION				
Duration	Short-term	Creating employment will increase the spending regime in the area. Long term jobs will persist for the life span of the project.	Consequence: Moderately beneficial	Significance: Moderate - positive
Extent	Local	The project could also have fiscal impacts. Payment of business and personal tax could contribute to government revenue at a national level, while rates and payment for services could strengthen the income base of the district and local municipalities.		
Intensity	High - positive	Local expenditure by employees will have multiplier effects in various sectors of the economy, thereby stimulating business activity and further employment creation.		
Probability	Very likely	Increased employment levels will contribute to the economy.		
MITIGATION: Not applicable.				
POST-MITIGATION				
Duration	Short-term	Increased levels of employment will persist for the duration of the project.	Consequence: Negligible	Significance: Very low
Extent	Site-specific	As per pre-mitigation.		
Intensity	Very low	As per pre-mitigation.		
Probability	Very unlikely	As per pre-mitigation.		

Table 72: Impact description for the macro-economic OPEX on a regional scale

IMPACT DESCRIPTION: Macro-economic OPEX Regional				
Predicted for project phase:	Pre-construction	Construction	Operation	Decommissioning
Dimension	**Rating**	**Motivation**		
PRE-MITIGATION				
Duration	Long-term	Not applicable.	Consequence: Moderately beneficial	Significance: Moderate - positive
Extent	Regional	Not applicable.		
Intensity	Low - positive	Not applicable.		
Probability	Very likely	Not applicable.		
MITIGATION: Not applicable.				
POST-MITIGATION				
Duration	Short-term	Not applicable.	Consequence: Negligible	Significance: Very low
Extent	Site-specific	Not applicable.		
Intensity	Very low	Not applicable.		
Probability	Very unlikely	Not applicable.		

8.4.2.4 Conclusion

The proposed rail link between Davel - Lothair (South Africa) and Sidvokodvo (Swaziland) as well as additional upgrades to existing railways and a new terminal at Davel yard would have a significant macro-economic impact on the provinces of the Mpumalanga and KwaZulu-Natal as well as Swaziland. This is illustrated through the estimated changes in economic metrics caused by the changes in final demand during the project construction and operations, maintenance and upgrades.

The effect of the estimated project expenditure on employment, total output and value added were estimated. This was conducted on provincial level by the use of multipliers of Social Accounting Matrices.

It should be noted that the macro-economic impacts reported are high-level estimates based on estimated costs of preliminary designs. These figures are indicative of nature and should be treated as such. The rail link and additional infrastructure works are expected to have a robust positive effect on the economies of the Mpumalanga, KwaZulu-Natal and Swaziland.

The economic effects due to the loss of biological assets, plantations and vegetation, as a result of expropriation could not be estimated due to the lack of information regarding asset values and loss of annual economic outputs.

9 CONCLUSIONS AND RECOMMENDATIONS

9.1 Conclusions

The project is currently fast-tracked to an aggressive completion programme. By virtue of its international nature, cohesive and wide-ranging inter-governmental co-operation remains one of the key pillars to success. The creation of a strategic link between South Africa and the export Ports of Richards Bay and Maputo, through Swaziland, has been found to be technically feasible, with certain risks attached. Two possible corridors are proposed and the potential impact of the construction of the railway line on the environment needs to be assessed in terms of the process prescribed by the National Environmental Management Act, 107 of 1998.

Network upgrades

The additional demand on parts of the network brought about by increase in traffic volume from sources other than Mpumalanga and central Gauteng make upgrades of the network a critical planning driver. Expected Limpopo traffic is a major contributor to demand capacity on the southern section of the corridor. This refers particularly to the Phuzamoya-Nsezi section which has the addition of growing North-South line traffic to deal with. This fact should not be permitted to cloud or delay the original strategic intent, namely, to create a new rail link between Swaziland and South Africa.

In summary:

- The upgrade of the existing rail network from Davel to Lothair and from Sidvokodvo to Nsezi is key to the project feasibility, reflected in the viability of the new link section;
- Certain network upgrade activities equal or even surpass the new link in length and scope of civil works required. This is particularly true in respect of the section Sidvokodvo-Phuzamoya to Nsezi;
- Critical infrastructural elements are introduced under route upgrades, including:
    - Davel Yard. Penultimate Work Package, due to long term nature of load consolidation, but will be required for 200 wagon functionality;
    - New line between Breyten and Buhrmanskop, including links for existing and future traffic access and major Level Crossing elimination benefit;
    - New junctions at Lothair and Phuzamoya; and
    - New line between Sidvokodvo and Nsezi, (excluding Pongola River bridge and Mtubatuba tunnel) creating bypass lines at the towns of Golela, Mtubatuba and Hluhluwe.
- All public level crossings will be eliminated where practicable;
- Upgrades can be achieved with minimum disruption to current operations; and
- The line between Buhrmanskop and Lothair will need to be closed for the Commodities originating from Lothair will need to be transported by road to Buhrmanskop.

The above, notwithstanding that there are many planning and construction aspects (activities) and many areas of environmental concern attached to the project.

These arise by virtue of:

- The topography of the area, linked to stringent route geometry factors required to meet the design criteria for heavy haul operations as planned;

- The intensity of earthworks required (high banks and deep cuttings) as well as the number and size of structures involved;
- The rural nature of large sections of the route, environmentally sensitive land use (forestry, subsistence farming) and long linear impact on riverine / floodplain farming and land use;
- Point-type areas of impact such as the proximity to the Westoe Dam near Lothair and the Usuthu River and numerous other river and stream crossings;
- The impact on human settlement, particularly the rural settlement patterns prevailing in the Swaziland section and in the rural areas of KwaZulu-Natal of the project;
- The successful conclusion of the EIA process, culminating in Authorisations valid in each of the Partner States is critical to the viability of the Project, timeous commencement of the Works and commencement of train operations according to the agreed programme in the 2nd Quarter of 2017; and
- The EIA process will be complex from management and technical perspectives and exhaustive in extent by virtue of:
  - The multinational nature of the project;
  - Complexities inherent in differing legal and governance requirements per Partner State; and
  - The sensitive bio-physical and social setting of the project.

Other permitting processes must not be overlooked in the need to obtain environmental approval under the respective country regulations. Factors such as the need for water use or borrow pit licences need to be clarified as soon as possible, since these processes can be extensive.

An exhaustive and dedicated Stakeholder Engagement Plan (internal as well as external) has been compiled for early implementation. Social impacts in the form of site camp labour requirements are identified.

At this stage the direct labour force could reach 2,180 units, with a potential value of ZAR 2,080 million. This comprises labour components of both construction activities as well as material supply. The Swaziland / RSA split is estimated at approximately 45 % / 54 %. Viewed as an on-going project, the estimated annual labour budget to operate the corridor amounts to ZAR 115 million. This comprises direct personnel in the fields of Movement, Train Control and Yard functions, as well as Rolling Stock and Infrastructure maintenance.

The “Equator Principles” established by the Equator Principles Financial Institutions are described for applicability to the project. Visible compliance to this set of voluntary guidelines for the financing industry in assessing environmental and social risks is a prerequisite for funding and investment purposes. The criteria of the Equator Principles as applicable to the project are met.

The construction of the new Davel Railway Yard and the associated infrastructure development (as part of the Swazi Rail Link project) as proposed by Transnet potentially has certain impacts on the environment. These potential impacts are both positive and negative.

Positive impacts associated with the project include the following:

- Creation of employment opportunities;
- BEE opportunities;
- Creation and or sustaining of employment opportunities during the operational phase;
- Benefits to the local and regional economies during the operational phase;
- Macro-economic benefits at regional and local levels during the construction phase; and
- Macro-economic benefits at regional level during the operational phase.

- Negative impacts associated with the project include *inter alia*:
- Potential loss of corridors and habitat fragmentation;
- Noise pollution during the construction and operational phases;
- Physical intrusion through noise and air quality pollution and impact on sense of place during the construction phase; and
- Potential for contamination through hydrocarbon spillages.

Through identified mitigation measures the positive impacts of the project can be enhanced and the potentially negative impacts reduced. Impacts associated with the type of project such as for example railway noise during the operational phase cannot be avoided entirely but with appropriate mitigation measure the impact could be alleviated.

None of the potential negative impacts of the project can be considered a significant long term negative consequence on the affected social and biophysical environment that is extremely difficult to mitigate or undesirable to promote, in other words an environmental fatal flaw.

An issue that runs like a golden thread through the process is that the local communities and other stakeholders such as the farming and forestry community must be taken on-board for the entire project. The goodwill of these stakeholders is paramount for the success of the construction of the Davel Railway Yard which is a crucial element of the entire project to establish a railway link between Mpumalanga and Richards Bay through Swaziland.

Aurecon is of the opinion that the information contained in this EIA Report and the associated documentation will enable the DEA to make an informed decision that the proposed construction of the Davel Railway Yard and associated infrastructure can proceed.

9.2 Recommendations

Taking into account the mitigation measures proposed by the specialist as well as those contained in the EMP, the EAP is of the opinion that the potential impacts posed by the proposed development can be adequately mitigated to prevent detrimental impacts to the environment.

It is therefore recommended that the DEA considers the EIA Report and issues an Environmental Authorisation to Transnet to proceed with the construction of the Davel Railway Yard and associated infrastructure.

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Appendix A
Curriculum Vitae

Addendums:

A: Pieter Botha

B: Candice Dürr

C: Elise Vermeulen

Appendix B
Specialist Reports

Addendums:

A: Ecological

B: Geohydrological impact assessment

C: Hydrological impact assessment

D: Waste management plan

E: Social impact assessment

F: Air Quality impact assessment

G: Noise impact assessment

H: Heritage impact assessment

I: Socio-economic impact assessment

J: Plan of Study for EIA

Appendix C
Public Participation

Addendums

A: BID and landowner notification letters

B: Proof of landowner notification

C: Newspaper advertisements

D: Site notices

E: Request for assistance with landowner details

F: I&AP database

G: Issues and Response Report

H: Proof of notification of DSR

I: Proof of notification of FSR

J: Proof of notification of AFSR

K: Comments received

L: Attendance registers

M: Presentation for public meeting

N: Proof of Invitation to Public Meeting

O: Proof of Invitation to comment on the Draft EIA

Appendix D Communication with Authorities

Appendix heading 1

A: Exemption Application

B: Application from

C: Rejection of application form

D: DEA application acceptance

E: DEA rejection of SR

F: DEA approval of amended SR

Appendix E
Environmental Management Plan

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