APPENDIX I6

SOCIO-ECONOMIC IMPACT ASSESSMENT

Department: Water and Sanitation Republic of South Africa

PROPOSED MOKOLO AND CROCODILE RIVER (WEST) WATER AUGMENTATION PROJECT (PHASE 2A) (MCWAP-2A) WATER TRANSFER INFRASTRUCTURE IN THE LIMPOPO PROVINCE

SOCIO-ECONOMIC IMPACT ASSESSMENT REPORT

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Executive Summary

The Department of Water and Sanitation (DWS) proposed the construction of the Mokolo and Crocodile River (West) Water Augmentation Project (Phase 2A) (MCWAP-2A): Water Transfer Infrastructure in the Limpopo Province. The purpose of the project is to augment water supply due to developments associated with the coalfields within the Lephalale Local Municipality.

The proposed project will transfer water from the Crocodile River (West) to the Steenbokpan and Lephalale areas. The project's major components are the water transfer infrastructure, borrow pits and a river management system to manage the water flows into and from the Crocodile River (West). The water transfer infrastructure comprises: a weir on the Crocodile River (West) at Vlieëpoort; an abstraction works and pumping station in close proximity to such weir; a pumped pipeline of approximately one hundred kilometres in length; which discharges into an operational reservoir; and a thirty-kilometre-long gravity pipeline to the project termination point near Steenbokpan.

The MCWAP-2A project is located within the western part of Limpopo Province with the footprint of the proposed project traversing the Thabazimbi Local Municipality and the Lephalale Local Municipality. The project will have an impact on the operations of the existing Hartbeespoort Dam in the North West Province, the dam is located within three wards of the Madibeng Local Municipality.

The increased water supply to the Lephalale region is to be used to reduce the air quality impact of the Medupi, and subsequently, Matimba Power Stations. Water releases to meet this and other demands in the Lephalale region will involve greater fluctuation in the level of the existing Hartbeespoort Dam than has been the case in the recent past.

Dr. Neville Bews of Dr. Neville Bews & Associates and Ciaran Chidley of Nemai Consulting were appointed to carry out the Socio-Economic Impact Assessment (SEIA), which is a specialist study to the Environmental Impact Assessment for the project.

Project Alternatives

Various feasible alternatives for the main infrastructure have been analysed as part of this study. In this regard, the reader is referred to Figure 2 of the report for a graphical overview of the various alternatives.

In the southern section of the project area, there is one route alternative. A central route runs from the Vlieëpoort Weir, through an area of irrigated agriculture. The southern section is defined in this report as being from the weir to first northerly turn after the abstraction works. In this southern section of the project, route Alternative E is a pipeline route that reduces the impact upon buildings and infrastructure at the start of the pipeline, when compared to the Central route.

In the central section of the project, defined in this report as being from the first northerly turn after the abstraction works to the operational reservoir, there are three route alternatives, i.e. Central, A1 and A2. The Central route pipeline runs through grazing lands and meets up with a branch railway line running from Thabazimbi to Lephalale. From there on it runs in a planned servitude adjacent, and to the west, of the railway line servitude until the pipeline terminates at the Operational Reservoir. Route alternatives A1 and A2 are varying route alternatives in the first major northerly segment of this section, whilst the Central route alternative is a route that reaches the railway line using a planned servitude adjacent to existing roads in the area.

In the northern section of the project, defined as being from the Operational Reservoir to the termination point, there are also three alternatives. These alternative routes, i.e. D1, D2 and D3 are routes ending at three different termination points, each more westerly than the last. Route alternative D3 ends just south of the town of Steenbokpan and is the most westerly termination alternative. After the draft EIR was submitted to the public for review, a forth route alternative was proposed in this northern region. Route D4, which branches off from Route D1 so as to avoid a pan along the route of D1.

Each route option was considered within an approximately eight-hundred-meter corridor, four hundred meters on either side. A “No-Go” option was also considered by the study.

Methodology

The following activities were conducted as part of the SEIA: defining the study area; detailing the project scope; a situation analysis describing the socio-economic status of the study area, engagement with stakeholders through the EIA public participation process; an impact assessment and recommended mitigation measures to reduce the identified impacts. The report concludes with an alternative analysis which makes recommendations with regards the preferred alternative from a socio-economic perspective.

Two study areas have been defined for the purposes of analysing the project and its socio-economic impacts: a regional study area which comprises the Thabazimbi Local Municipality and the Lephalale Local Municipality; and a local study area which comprises the wards which are directly affected by project infrastructure. A further two study areas were defined for the purposes of analysing the impact of the project on the Hartbeespoort Dam.

Situation Analysis

The land use in the area is predominantly agricultural, with grazing lands forming the bulk of the land use. There is irrigated agriculture in the south of the project in the Mooivallei area. Grazing land is used both for cattle rearing and for use by game on game farms. All land is privately owned in the project area.

The route options impact upon farm buildings and dwellings, irrigation pivots, road and powerline crossings and the pipeline routing is set to run along farm boundaries as a default. There are some cases where land portions are traversed.

The regional study area has a population of 201 000, living within 55 000 households. In general, the households in the regional study area are impoverished and have low access to services such as water and sanitation. Thabazimbi Local Municipality generates R28 billion of gross value added per year, a measure that is similar to geographic domestic product, but defined for a specific geographical area. The economy is highly skewed towards mining, with agriculture contributing R348 million (1,24%) of that value. The economy of Lephalale Local Municipality is smaller, at R9 billion gross value added, with agriculture contributing R370 million (4,11%) of that total. The labour force in both municipalities is mainly comprised of semi-skilled and unskilled workers with a substantial minority of the workforce being engaged in the informal sector.

The local study area has 58% of households who earned less that R38 000 per year in 2011, this for an average household size of 3,5. Education outcomes reveal that 69% of the residents of the area have not completed matric. Approximately two percent have gained an education level higher than matric. 33% have not completed primary school.

The Madibeng Local Municipality has a diverse economy with strong mining, manufacturing and trade components. The municipality has strong economic linkages to the surrounding cities of Tshwane and Johannesburg.

Stakeholder Engagement

Stakeholder engagement was carried out using the public participation process during the EIA. Stakeholders involved in the engagement were landowners, community groups and other interested groups. During this engagement the following social and economic issues were identified: noise; dust; land acquisition and land rights concerns; security and access issues; loss of business productivity; land use; and direct local economic benefits derived from the project.

Identification of Activities, Aspect and Impacts

The socio-economic impacts of the proposed development were divided into categories and were identified as follows:

- Health and socio-economic well-being impacts – annoyance due to dust and noise, security/Increase in crime, increased risk of HIV and AIDS, personal safety and increased hazard exposure;
- Quality of the living environment (Liveability) impacts - Disruption of daily living activities including aspects such as damage to property, access to land and livelihoods during construction; perceived quality of life;
- Economic and material well-being impacts (positive) – the economic benefits of increased water supply, the social benefits of reduced air pollution, increase in employment opportunities, increased opportunities for SMMEs and indirect employment impacts;

- Economic and material well-being impacts (negative) – loss of productive land, servitudes being registered over land, impacts on game farming income, loss of land for productive agriculture and loss of property value;
- Cultural impacts – possible heritage impacts;
- Institutional, legal, political and equity impacts - Effect on existing infrastructure facilities and socio-economic services, attitude formation towards project, decreased level of community participation in decision making, loss of empowerment, compliance with municipal by-laws; and
- Gender relations impacts - cultural resistance towards women, division of labour.

Mitigation Measures

Relevant and appropriate mitigation measures are proposed in the report and the implementation of these mitigation measures is expected to reduce the social impacts of the project to lower levels.

The final routing selection of the pipeline, the fairness and transparency of the land rights acquisition process and the management of construction so as to impacts upon properties and livelihoods as little as possible are considered to be the primary mitigation measures of the project. Where alternative route selection cannot be used to avoid impacts, the mitigation measures provide for the compensation of any losses that may be encountered during the planning and construction phases of the project.

Local labour and business stand to benefit from the economic stimulus of construction of the proposed project. As a result, mitigation measures encourages active participation of the local community.

Disturbances that may occur during the construction phase can be successfully mitigated through contractor agreements and engagement with directly affected parties.

Discussion of Alternatives

The 'No-Go' option, where the project was not to go ahead was not supported by the study team owing to the benefits to be derived from the project and there being no socio-economic fatal flaws evident from the study.

The alternative route selection was based on selecting a route which would create the least number of impacts.

In the southern section, route Alternative E was preferred, whilst in the central section no preference was expressed from either the Central route or the two alternatives A1 and A2 in this area. The Central route was preferred over route Alternative C in the section leading up to the railway line, whilst route Alternative D1 was considered the best option for the northern section of the project, with D4 being the preferred option for the final length of pipeline, rather than following the rest of D1.

Hartbeespoort Dam

The socio-economic impact of the project on the dam during the operational phase was assessed. The project will cause fluctuations in the water level of the dam, mainly during winter. These fluctuations will reduce the dam surface area to between 60% and 70% during periods of low water. The impacts were assessed as being: making existing boat mooring facilities high and dry; reduced surface area of the dam for recreational use; increased beach area; changes in the sense of place for residents of properties surrounding the dam; possible property value impacts and possible tourism revenue declines. Both of the last two items were dealt with qualitatively.

To the extent that these impacts are mitigatable, they will be addressed through information sharing and awareness raising. This will allow affected property owners to make the necessary adjustments to account for periods of low water. The impacts are viewed through the lens of development having been carried out around the existing dam with the unchanged legal framework of the dam being a government water work, and that an optimally operated waterworks will necessitate level fluctuations.

The positive impact of the water level fluctuations will be the installation of clean air technology at the Medupi and Matimba Power Stations which will reduce air pollution resulting from the power stations in the Lephalale region.

Summary and Conclusion

This study assessed the socio-economic impacts which would be created as a result of the proposed project. As expected, development and construction create both positive and negative impacts and whilst the positive impacts are accepted, the negative impacts for the most part can be successfully mitigated. Where they are not easily mitigated, communication of the changes would assist affected parties in making adjustments to the changing conditions.

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List of Abbreviations

AIDS	Acquired immunodeficiency syndrome
CRR	Comments and Response Report
DC36	Waterberg District Municipality
DEA	Department of Environmental Affairs
DFA	Development Facilitation Act (Act 67 of 1995)
DWAF	Department of Water Affairs and Forestry
EIA	Environmental Impact Assessment
EMPr	Environmental Management Programme
GIS	Geographic Information System
HBD	Hartbeespoort Dam
HIV	Human Immunodeficiency Virus
IAP	Interested and Affected Party
INGAA	Interstate Natural Gas Association of America
ILO	International Labour Organisation
ISO	International Organisation for Standardization
km	Kilometre (1 000m)
LIM361	Thabazimbi Local Municipality
LIM362	Lephalale Local Municipality
LDP	Limpopo Development Plan
MCWAP	Mokolo Crocodile (West) Water Augmentation Project
MCWAP-2A	Mokolo Crocodile (West) Water Augmentation Project (Phase 2A)
MTSF	Medium Term Strategic Framework
NDP	National Development Plan
NEMA	National Environmental Management Act (No. 107 of 1998)
NW372	Madibeng Local Municipality
OHS	Occupational Health and Safety
OR	Operational Reservoir
PAJA	Promotion of Administrative Justice Act ((PAJA) Act 3 of 2000)
PGDS	Provincial Growth and Development Strategy
SEIA	Socio-Economic Impact Assessment

1 INTRODUCTION

Dr. Neville Bews and Associates and Ciaran Chidley of Nemai Consulting have been appointed to undertake the Socio-Economic Impact Assessment (SEIA) as part of the environmental authorisation process for the proposed Mokolo and Crocodile River (West) Water Augmentation Project (Phase 2A) (MCWAP-2A): Water Transfer Infrastructure.

This water infrastructure project aims to supply bulk raw water to the Lephalale area of the Limpopo Province using an abstraction weir on the Crocodile River near Thabazimbi and a pipeline that runs towards Lephalale. The principal project components are the abstraction weir and pumping station, located at Vlieëpoort (near Thabazimbi), a pumped and gravity fed water pipeline of approximately 93 km in length to the Operational Reservoir, followed by a gravity pipeline of approximately 30 km in length which takes the water to end-users near Lephalale.

The water for the scheme is sourced from the Crocodile River (West), which is in the Mokolo-Crocodile catchment, and transfers it, over the catchment divide, into the Limpopo River catchment. In this way the project is transferring water that is sourced from northern central Gauteng, via the Hartbeespoort and Roodeplaat Dams, and putting it to use in a most northerly catchment, near Lephalale.

The proposed project traverses the Thabazimbi and Lephalale Local Municipalities, which fall within the Waterberg District Municipality of the Limpopo Province.

One of the specialist studies required by the Environmental Impact Assessment (EIA) is a Socio-Economic Impact Assessment. This report fulfils the requirements of the Socio-economic Impact Assessment and its recommendations will be included into the EIA.

1.1 Terms of Reference

The terms of reference for the study are as follows:

- Describe the socio-economic baseline conditions that may be affected by the project;
- Describe the approach proposed for assessing the potentially significant issues that should be addressed by the SEIA during the EIA phase;
- Determine the specific local socio-economic impacts of the project;
- Identify the potential socio-economic issues associated with the project;
- Suggest suitable mitigation measures to address the identified impacts; and
- Make recommendations on preferred options from a socio-economic perspective.

1.2 Structure of the report

The remainder of the report is structured as follows:

Section 2: Legislation – A description of the statutory and regulatory requirements that informed this report.

Section 3: Project Description – This section provides an introduction and motivation to the project. It includes a description of the study area.

Section 4: Methodology – Outline the methodology used to determine the socio-economic impacts of the proposed project.

Section 5: Situational Analysis – A desktop analysis of the baseline situation in the study area. The section includes a discussion on the findings that resulted from community engagement, site visits and stakeholder participation.

Section 6: Identification of Impacts - Aspects and Impacts – The identification of the project activities and an investigation into what aspects of these activities will result in socio-economic impacts.

Section 7: Analysis of Alternatives – Decision making with regards the preferred project alternatives from a socio-economic perspective.

Section 8: Hartbeespoort Dam Socio-Economic Impacts – Analysis of the impacts that proposed project will have on the Hartbeespoort Dam area.

2 LEGISLATION

Legislation, policy, plans and strategy provide an important framework and governance of the SEIA. This section provides a summary of the prevailing acts, policies, plans and strategy which were considered by this study.

2.1 Constitution of the Republic of South Africa (Act 108 of 1996)

As contained in the Constitution the rights of all South Africans are protected as outlined in Chapter 2: The Bill of Rights. These rights form the basis of democracy in South Africa. The Constitution (including the Bill of Rights) binds the Legislature, the Executive, the Judiciary and all organs of state and is the overriding legislation of South Africa.

While all items in the Bill of Rights are considered to be of equal importance, key items in the Bill of Rights that have a bearing on socio-economic rights and issues in this project include (but are not necessarily limited to):

- Life: Everyone has the right to life;
- Human Dignity: Everyone has inherent dignity and the right to have their dignity respected and protected;
- Equality: Everyone is equal before the law and has the right to equal protection and benefit from the law;
- Freedom of religion, belief and opinion: Everyone has the right of freedom of conscience, religion, thought, belief and opinion;
- Environment: Everyone has the right to an environment that is not harmful to their health or well-being, and to have the environment protected for the benefit of present and future generations, through reasonable legislative and other measures that prevent pollution and ecological degradation, promote conservation and secure ecologically sustainable development and the use of natural resources while promoting justifiable economic and social development;
- Property: No person may be deprived of property except in terms of the law of general application, and no law may permit arbitrary deprivation of property. Property may be expropriated only in terms of the law of general application for a public purpose (e.g. National Water Act, Act No. 36 of 1998 and Expropriation Act, Act No. 63 of 1975) or in the public interest. The public interest includes South Africa's commitment to land reform and to reforms to bring about equitable access to all South Africa's natural resources. Property is not limited to land;
- Health care, food, water and social security: Everyone has the right to have access to health care services, including reproductive health care, sufficient food and water and social security,

including, if they are unable to support themselves and their dependents, appropriate socio-economic assistance;

- Language and culture: Everyone has the right to use the language and participate in the cultural life of their choice, but no one exercising these rights may do so in a manner inconsistent with any provision of the Bill of Rights;
- Cultural, religious and linguistic communities: Persons belonging to cultural, religious or linguistic communities may not be denied the right, with other members of the that community to enjoy their culture, practice their religion and use their language, and to form, join and maintain cultural, religious and linguistic associations and other organs of civil society. These rights must be exercised in a manner that is consistent with any provision in the Bill of Rights;
- Access to information: Everyone has the right of access to any information held by the state and any information that is held by another person and that is required for the exercise or protection of any rights; and
- Just administrative action: Everyone has the right to administrative action that is lawful, reasonable and procedurally fair. Everyone whose rights have been adversely affected by administrative action has the right to be given written reasons. This right has been given effect via the Promotion of Administrative Justice Act ((PAJA) Act 3 of 2000).

2.2 National Environmental Management (Act 107 of 1998)

The National Environmental Management Act (NEMA) and the principles contained therein have a significant influence on the need to identify and assess socio-economic impacts. The NEMA principles are based on the basic rights as set out in Chapter 2 (Bill of Rights) of the Constitution as referred to above.

According to Barber (2007:16) the following NEMA principles have an important impact on socio-economic issues:

- Environmental management must place people and their needs at the forefront of its concern, and serve their physical, psychological, developmental, cultural and socio-economic interests equitably;
- Development must be socially, environmentally and economically sustainable;
- Environmental management must be integrated, acknowledging that all elements of the environment are linked and interrelated, and it must consider the effects of decisions on all aspects of the environment and all people in the environment by pursuing the selection of the best practicable environmental option;
- Environmental justice must be pursued so that adverse environmental impacts shall not be distributed in such a manner as to unfairly discriminate against any person, particularly vulnerable and disadvantaged persons;

- Equitable access to environmental resources, benefits and services to meet basic human needs and ensure human well-being must be pursued and special measures may be taken to ensure access thereto by categories of persons disadvantaged by unfair discrimination;
- The participation of all interested and affected parties in environmental governance must be promoted, and all people must have the opportunity to develop the understanding, skills and capacity necessary for achieving equitable and effective participation, and participation by vulnerable and disadvantaged persons must be ensured;
- Decisions must consider the interests, needs and values of all interested and affected parties, and this includes recognising all forms of knowledge, including traditional and ordinary knowledge;
- Community well-being and empowerment must be promoted through environmental education, the raising of environmental awareness, the sharing of knowledge and experience and other appropriate means;
- The social, economic and environmental impacts of activities, including disadvantages and benefits, must be considered, assessed and evaluated, and decisions must be appropriate in light of such consideration and assessment;
- The right of workers to refuse work that is harmful to human health or the environment and to be informed of dangers must be respected and protected;
- Decisions must be taken in an open and transparent manner, and access to information must be provided in accordance with the law;
- The environment is held in public trust for the people. The beneficial use of environmental resources must serve the public interest and the environment must be protected as the peoples' common heritage; and
- The vital role of women and youth in environmental management and development must be recognised and their full participation therein must be promoted.

2.3 Development Facilitation Act (Act 67 of 1995)

The Development Facilitation Act (DFA) outlines various principles concerning land development in Section 3 of the Act. Some of the relevant principles are briefly highlighted below (Babour, 2007). These principles include (but are not limited to):

- Promoting the integration of the social, economic, institutional and physical aspects of land development;
- Promoting integrated land development in rural and urban areas in support of each other;
- Promoting the availability of residential and employment opportunities in close proximity to or integrated with each other;
- Optimising the use of existing resources including such resources relating to agriculture, land, minerals, bulk infrastructure, roads, transportation and social facilities;

- Promoting a diverse combination of land uses, also at the level of individual erven or subdivisions of land;
- Discouraging the phenomenon of "urban sprawl" in urban areas and contributing to the development of more compact towns and cities;
- Contributing to the correction of the historically distorted spatial patterns of settlement in the Republic and to the optimum use of existing infrastructure in excess of current needs;
- Encouraging environmentally sustainable land development practices and processes;
- Promoting land development which is within the fiscal, institutional and administrative means of the Republic;
- Promoting the establishment of viable communities; and
- Promoting sustained protection of the environment.

2.4 Restitution of Land Rights Act 22 of 1994

The aim of the Restitution of Land Rights Act 22 of 1994 is as follows:

- To provide for the restitution of rights in land in respect of which persons or communities were dispossessed under or for the purpose of furthering the objects of any racially based discriminatory law;
- To establish a Commission on Restitution of Land Rights and a Land Claims Court; and
- To provide for matters connected therewith.

2.5 National Development Plan (2011)

The National Development Plan (NDP) of 2010 proposes to “invigorate and expand economic opportunity through infrastructure, more innovation, private investment and entrepreneurialism.

The Plan aims to ensure that all South Africans attain a decent standard of living through the elimination of poverty and reduction of inequality. The core elements of a decent standard of living identified in the Plan are:

- Housing, water, electricity and sanitation;
- Safe and reliable public transport;
- Quality education and skills development;
- Safety and security;
- Quality health care;
- Social protection;
- Employment;
- Recreation and leisure;
- Clean environment; and
- Adequate nutrition.

2.6 Guideline for Involving Social Assessment Specialists in EIA Processes (Barbour, 2007)

These guidelines direct the role of social assessment specialists in the Environmental Impact Assessment (EIA) process within the South African context.

2.7 Socio-Economic Impact Assessment: Guidance document (2015) (Vanclay, Esteves, Aucamp, & Franks, 2015)

This document encapsulates the core values of the international SEIA community providing a set of principles to guide SEIA practitioners in incorporating the socio-economic element into environmental impact assessments.

2.8 International Labour Organisation

A guide on gender issues in employment and labour market policies: working towards women's economic empowerment and gender equality

"The objective of this resource guide is to strengthen the capacities of International Labour Organisation (ILO) constituents and development policy makers in the formulation of employment policies. There is a well-known proclivity among many policy-makers and practitioners to treat employment as a "residual" of economic growth" (Otobe, 2014).

2.9 Limpopo Development Plan (LDP) 2015-2019

The purpose of the Limpopo Development Plan is to:

- "Outline the contribution from Limpopo Province to the National Development Plan (NDP) and national Medium-Term Strategic Framework (MTSF) 1 for this period;
- Provide a framework for the strategic plans of each provincial government department, as well as the IDPs and sector plans of district and local municipalities;
- Create a structure for the constructive participation of private sector business and organised labour towards the achievement of provincial growth and development objectives; and
- Encourage citizens to be active in promoting higher standards of living in their communities."

The plan promotes the improvement of service delivery across the province.

2.10 International Organisation for Standardization, ISO 14001:2004

The International Organisation for Standardization (ISO) is used for identifying impacts. The ISO 14001: 2004 – Environmental Management Systems definitions for aspect, activity and impact are used in keeping with best practice.

ISO 14001:2004 specifies requirements for an environmental management system to enable an organization to develop and implement a policy and objectives and information about significant environmental aspects. It applies to those environmental aspects that the organization identifies as those which it can control and those which it can influence.

3 PROJECT DESCRIPTION

Due to developments associated with the coalfields within the Lephalale Local Municipality (LIM362), which is located within the Waterberg District Municipality (DC36), demand for water is expected to increase significantly resulting in a need to augment the current water supply to the area.

3.1 Location

The MCWAP-2A project is located within the western part of Limpopo Province with the footprint of the proposed project traversing the following district and local municipalities:

- Waterberg District Municipality (DC36);
- Thabazimbi Local Municipality (LIM361); and
- Lephalale Local Municipality (LIM362).

The proposed route of the pipeline commences in the south-west from the Vlieëpoort Mountains at the weir site on the Crocodile River (West). From there it runs in a northerly direction along existing roads, farm boundaries and a railway line, until reaching its destination near Steenbokpan. Thabazimbi is situated approximately 10 km to the north-east of the Vlieëpoort weir site and Lephalale is situated approximately 30 km to the east of the Alternative D1 pipeline route's terminal point. The project infrastructure is mainly located on privately-owned properties that are primarily used for agricultural and game-farming. The location of the project is illustrated in Figure 1 below.

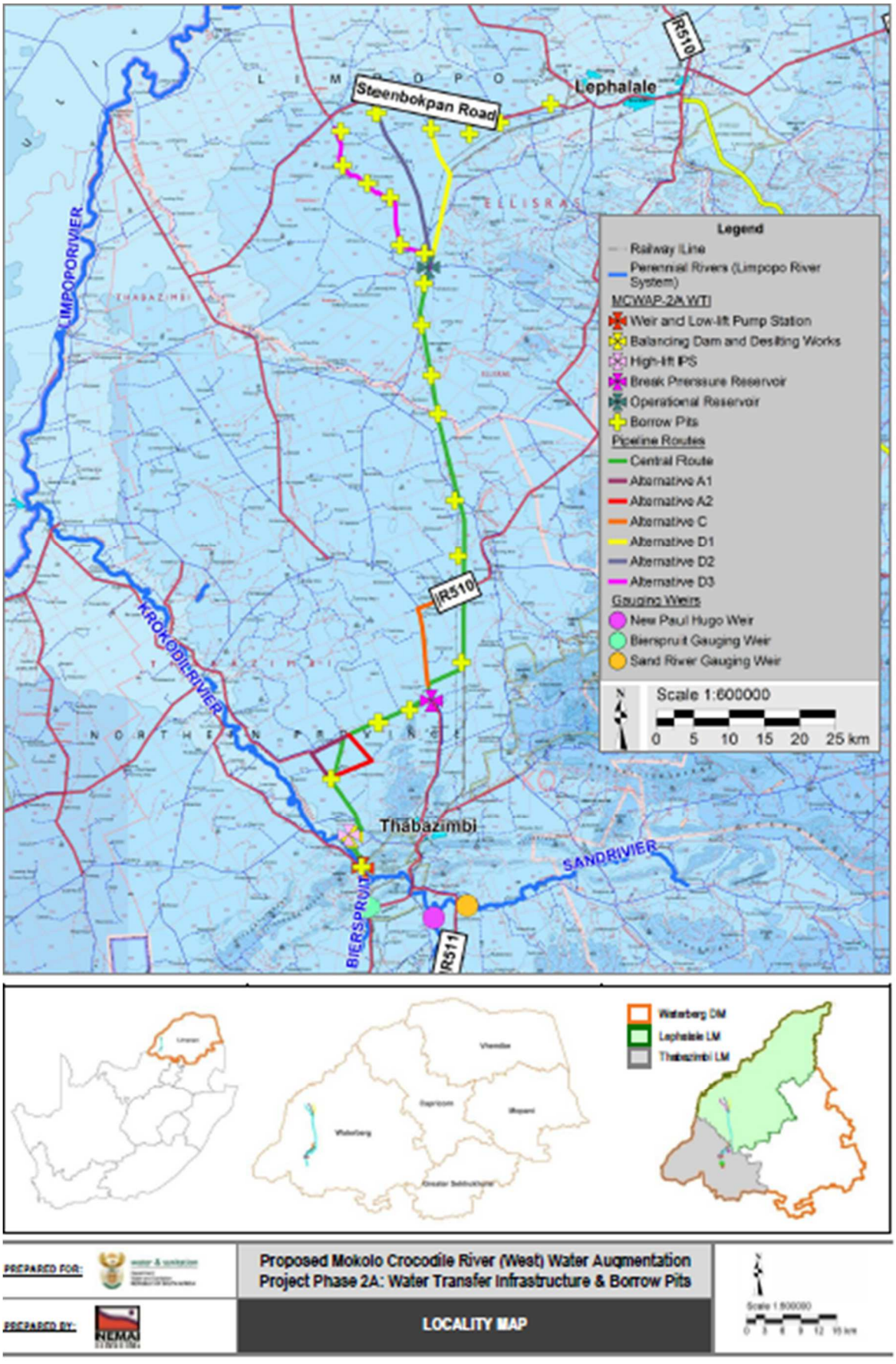

Figure 1: Project Locality

The directly affected local municipalities for the proposed project are listed in Table 1 below.

Table 1: Affected Local Municipalities

Local Municipality	Affected Wards
Lephalale - LIM362	Ward 3
Thabazimbi - LIM361	Ward 1
	Ward 9

3.2 Project Description

The former Department of Water Affairs and Forestry (DWAF) undertook a feasibility study of the Mokolo Crocodile River (West) Water Augmentation Project to establish how the future water demands could be met. This study was completed in 2010 and proposed the following project phases:

- **Mokolo Crocodile River (West) Water Augmentation Project (Phase 1):** Augment the supply from Mokolo Dam to provide for the growing water use requirement over the interim period until a transfer pipeline from the Crocodile River (West) can be implemented. Over the long term the solution must optimally utilise the full yield from Mokolo Dam and will be operated as a system together with Mokolo Crocodile River (West) Water Augmentation Project (Phase 2A). Phase 1 has been operational since June 2015; and
- **Mokolo Crocodile River (West) Water Augmentation Project (Phase 2A):** Transfer water from the Crocodile River (West) to the Steenbokpan and Lephalale areas, including the implementation of a River Management System in the Crocodile River (West) and its tributaries. MCWAP-2A is the focus of the Environmental Impact Assessment of which this Socio-Economic Impact Assessment forms part.

The overall MCWAP-2A consists of the following components:

- **Water Transfer Infrastructure –** Transfer of water from Crocodile River (West) to Lephalale. This infrastructure comprises a weir on the Crocodile River (West) near the Vlieëpoort Mountains, abstraction works and pumping station close to the weir, a pumped pipeline of 34 kms in length to a Break Pressure Reservoir, then a 60 km long gravity water pipeline to the Operational Reservoir. This is followed by a thirty-kilometre-long gravity pipeline to the project termination point near Lephalale;
- **Borrow Pits –** Sourcing of construction material; and
- **River Management System –** The management of abstractions from, and the river flow in, the Crocodile River (West) between Hartbeespoort Dam and Vlieëpoort Weir, the Moretele River from Klipvoor Dam to the confluence with the Crocodile River (West), the stretch of Elands River from Vaalkop Dam to Crocodile confluence, and also the required flow past Vlieëpoort.

3.3 Description of Route Alternatives

Various alternatives were considered during the scoping phase of the project (Nemai Consulting, 2018) and it is assumed in this report that, based on this analysis, that the best practical and environmental options are proposed as the preferred options for analysis considering alternative location, technological application, design and environmental justification.

On this basis, the following feasible alternatives for the main infrastructure have emerged. These are the alternatives that are considered to have differing socio-economic impacts, and as such are considered in this report. A wider range of project alternatives are considered in the environmental impact assessment, but these do not generate socio-economic impacts that are different from one another. The alternatives that have been considered in this report are:

- Transfer System - Vlieëpoort Abstraction Site to the Operational Reservoir
  - Central Route;
  - Alternative A1;
  - Alternative A2;
  - Alternative C; and
  - Alternative E – an alternative to the central route in the Mooivallei area;
- Delivery System - Operational Reservoir to Terminal Point
  - Alternative D1
  - Alternative D2
  - Alternative D3
- "No-go" Project Option

Subsequent to the submission of the draft Environmental Impact Assessment report to the public for a further round of comments, a further route alternative was identified. This alternative was designated D4 and is located at the northern end of the project along route alternative D1. The route alternative was provided to avoid a pan that is located on the Farm Taaiboschpan. This route effectively shortens route D1 and traverses the farm Enkeldraai, which is utilised for grazing. There is not buildings or infrastructure located along this route.

3.4 Definition of the Study Area

Two study areas have been defined for the purposes of analysing the project and its socio-economic impacts: a regional study area which comprises the two affected local municipalities; and a local study which comprises the wards which are directly affected by project infrastructure.

This division allows, at once, a broader scale social and economic analysis to gain understanding of the socio-economic context of the project, whilst also allowing detailed analysis of the project local area which is will receive the project components and receive most of the impacts.

3.4.1 Regional Study area

The regional study area is the two directly affected local municipalities. These are:

- Thabazimbi Local Municipality (LIM361)
- Lephalale Local Municipality (LIM362)

The municipalities are both situated within the Waterberg District Municipality, which forms part of the Limpopo Province of South Africa.

The Thabazimbi Local Municipality has its seat in Thabazimbi and is known as a regional iron-ore mining hub. Lephalale Local Municipality has its seat in Lephalale and is known as the site of two Eskom power stations, Medupi and Matimba. Both local municipalities have a rural character with strong agricultural roots.

3.4.2 Local Study Area

The local study area is defined as the directly affected wards in which project infrastructure will be constructed.

Thus, the local study area is as set out in Figure 2below:

- Lephalale Local Municipality - Ward 3
- Thabazimbi Local Municipality - Ward 1
- Thabazimbi Local Municipality - Ward 9

These wards are shown in the Google Earth Image below:

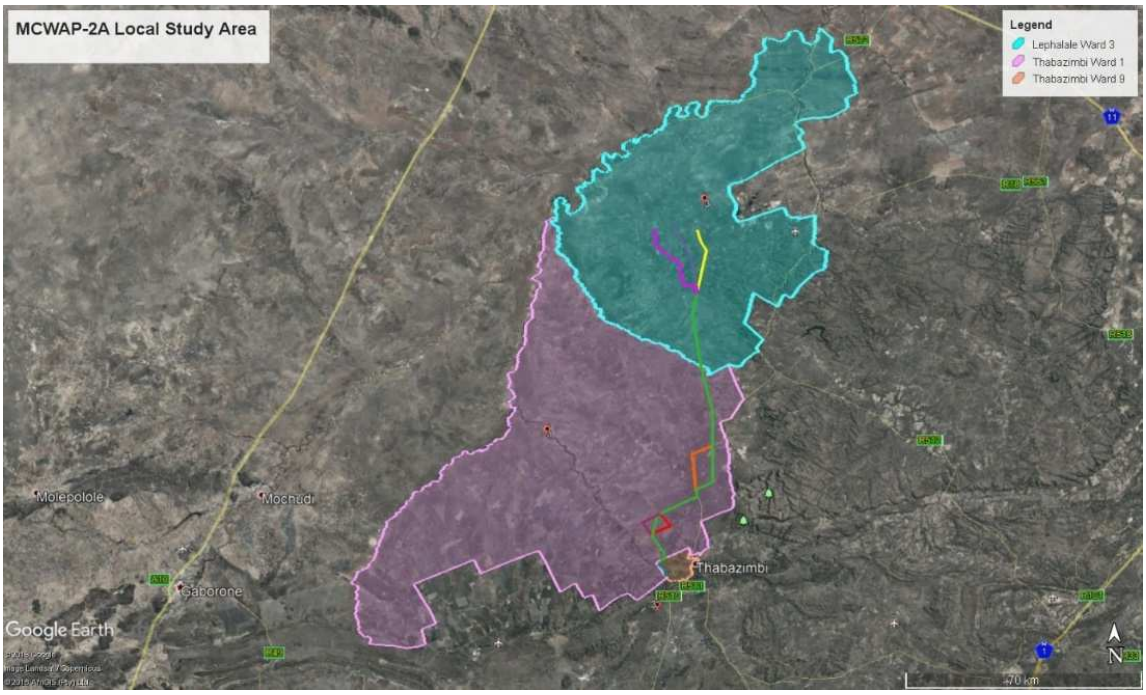

Figure 2: Local Study Area

4 METHODOLOGY

The approach to the study was based on The Western Cape Department of Environmental Affairs and Development (DEA&DP) Planning Guidelines for Socio-Economic Impact Assessment (Barbour, 2007). These guidelines are based on accepted international best practice guidelines and principles which include the Guidelines and Principles for Socio-Economic Impact Assessment (Inter-organizational Committee on Guidelines and Principles for Social Impact Assessment, May 1994). Accordingly, the study includes a review of:

- Relevant socio-economic data;
- Relevant planning and policy frameworks for the area;
- Information gathered while undertaking similar studies; and
- Socio-economic issues associated with similar projects.

4.1 Sourcing of Information and Data Analysis

The SEIA sets out the socio-economic baseline of the study area, predicts social and economic impacts and makes recommendations for mitigation of negative social and economic impacts and measures which can be taken to enhance the positive social and economic impacts.

The baseline study is based on both primary and secondary data. Primary data was collected directly from engagements with community members, landowners and business owners. Secondary data was accessed through South African economic and social databases. Reports, articles and internet searches were also used and are referenced in the text and in the reference section of this report.

The profile of the baseline conditions includes describing the current status quo of the community, including information on a number of social and economic issues such as:

- Demographic factors;
- Socio-economic factors such as income and population data;
- Access to services;
- Institutional environment;
- Social Organisation (Institutional Context); and
- Statutory and Regulatory Environment.

4.1.1 Primary Data

4.1.1.1 Public Participation

Affected landowners and members of the public were given an opportunity to comment on the project during the public participation process carried out during the Scoping and EIA phases of the MCWAP-2A. Comments and responses used during this process have been included into this report and have formed one of the bases the analysis of the socio-economic impacts considered in this report.

Further primary data was collected for the purposes of the study, these were collected using the following approaches:

- ***Rapid Rural Assessment***: A survey was conducted to capture visual observations on the social dynamics, community proceedings, community resources and infrastructure;
- ***Stakeholder Consultations***: Consultations with the affected communities carried out by members of the project team along each project component to discuss the proposed project and to gather their concerns and feedback on the project; and
- ***Key Informant Interviews***: Informal discussions with the IAP's to help inform the baseline were conducted during site visits and as well as during the scoping phase. These included community members and authority members.

4.1.2 Secondary Data

An assessment of the scoping phase was conducted to provide an understanding of the project details, location and possible impacts.

The required information was collected using different sources, these included Statistics South Africa Census data, economic data supplied by Quantec Enterprises (Pty) Ltd as well as a review of relevant municipal, district and other literature.

The discussion of the demographics and the development profile of the study area is carried out using Census 2011 data produced by Statistics South Africa.

The Census 2011 data is the most comprehensive dataset available for the subject areas, and it is currently the best data at hand. The ward and municipal data have been extracted using the project Geographic Information System, and the data for the affected areas will be presented in tables and figures throughout the report.

4.1.3 Geographic Information System

A Geographic Information System (GIS) was used to conduct an analysis of the area. The use of GIS brings together the demographic and socio-economic data to enable a thorough analysis of the project area.

4.2 Impact Assessment

Barrow (1977) advise that an impact assessment should be designed as a bridge that integrates the science of environmental analysis with the policies of resource management. Furthermore, an impact assessment allows for an estimate of the significance of the identified socio-economic impacts to those who will be affected. In addition, the response of the affected parties to such impacts also needs to be clarified (Centre for Good Governance, 2006). All impacts will be analysed with regard to their nature, extent, magnitude, duration, probability and significance (Barbour, 2007). Section 7 of this report lists the definitions that apply to the impact assessment.

The determined impacts are clustered around a common-issue and are assessed before and after mitigation. The identification of the socio-economic impacts associated with the project is issues-based, with the main headings referring to a common theme addressing several related impacts. Under each of these issues, the specific impacts and potential mitigation strategies are discussed for pre-construction, construction, operation and decommissioning phases.

4.3 Assumptions and Limitations

The following assumptions and limitations underlie this socio-economic impact assessment:

- It was assumed that information obtained during the public participation phase provide a comprehensive account of the community structure and community concerns for the project;
- The study was done with the information and time frames available to the specialist at the time of executing the study. The specialist took an evidence-based approach in the compilation of this report and did not intentionally exclude information relevant to the assessment; and
- It is assumed that no relocation of families or people will take place for this project.

5 STATUS QUO ANALYSIS

The socio-economic status quo within the project study area is an important input to the impact study of the proposed project. Here the status quo is described using data obtained from Statistics South Africa's Census 2011 as well as by observations made during site visits to the project area.

5.1 Provincial Socio-Economic Overview

Limpopo Province, which covers a geographical area of approximately 125 754 km^2 and accounts for some 10,2% of the land mass of South Africa, incorporates the following five District Municipalities:

- Mopani (DC33);
- Vhembe (DC34);
- Capricorn (DC35);
- Waterberg (DC36); and
- Sekhukhune (DC47).

5.1.1 Demographics

During Census 2011, the population of Limpopo was calculated at 5 404 868 people distributed within 1 418 102 households giving the province a population density of 43/km^2 and a household density of 11 per square kilometre. By 2017 the population was estimated to have increased to 5 778 400 people (Statistics South Africa, 2017, p. 2). In respect of population grouping, 96,7% of the population of Limpopo comprises of black African people, followed by white people at 2,6%, Indian/ASEIA people at 0,33% and coloured people at 0,27%. The most prolific home language spoken across the province is Sepedi which is spoken by 52,9% of the population followed by Xitsonga at 17%, Tshivenda at 16,7%, Afrikaans at 2,6% and Setswana at 2%. The dependency ratio of the province, which indicates the burden placed on the population of working age, between 15 and 64 years, who support children under 15 years and people over 65 years, is 67,3%. The sex ratio, which measures the proportion of males to females, is 87,6 indicating a higher proportion of females in the province. Between 1996 and 2001 the population growth rate was 1,75% p.a. while between 2001 and 2011 it was 0,79% p.a. The population pyramid of Limpopo is illustrated in Figure 3below (Statistics South Africa, 2011).

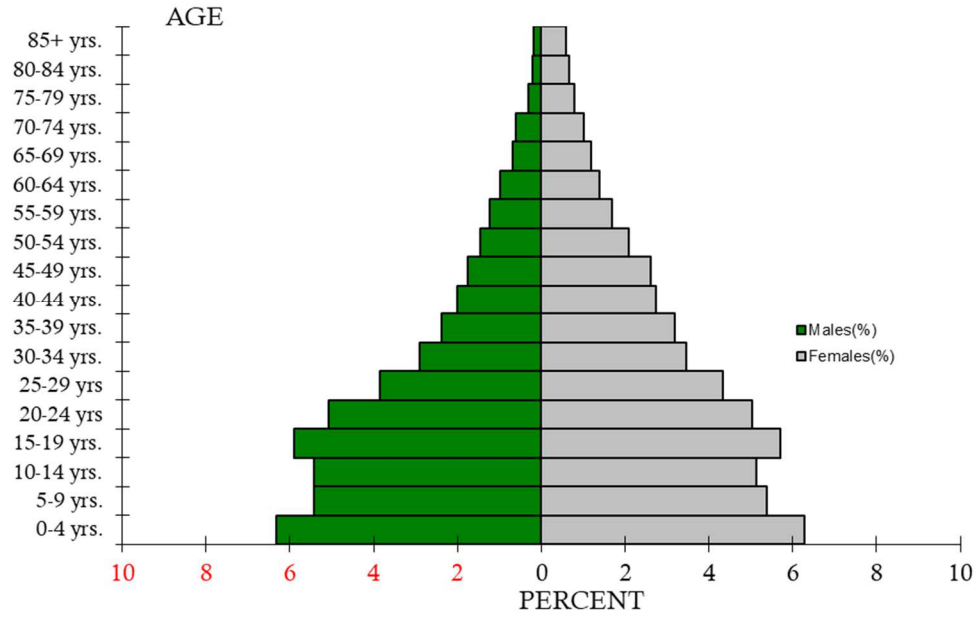

Figure 3:

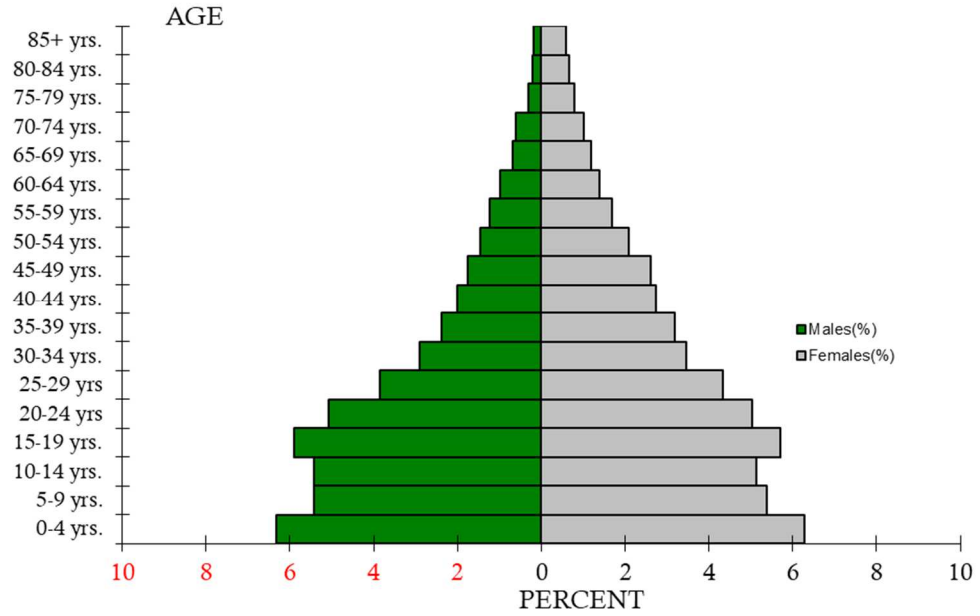

Figure 3: Population Pyramid Limpopo Province

5.1.2 Labour Force

A comparison of the unemployment figures for Limpopo Province indicates that the level of official unemployment in the province increased on a year-on-year basis from 18,3% in the 1st Quarter of 2016 to 20,8% in the 2nd Quarter of 2017. When compared to that of the rest of South Africa, Limpopo has the second lowest level of official unemployment in the country with only the Western Cape Province having a lower level at 20,7%. It is, however, important to note that when considering the unemployment levels discussed above, Statistics South Africa's official definition of unemployment is

used. This definition includes amongst the unemployed, those persons between 15 – 64 years who, "[a]ctively looked for work or tried to start a business in the four weeks preceding the survey interview" (Statistics South Africa 2017, 20). This, being the narrow definition of unemployment excludes those discouraged work seekers who may no longer have been actively looking for work but who remained unemployed and disillusioned. Considering this, over the same period unofficial unemployment decreased marginally from 38,5% to 38,2%. (Statistics South Africa, 2017, p. 19). The labour force data is presented below in Figure 4 below (Statistics South Africa, 2017, p. 12).

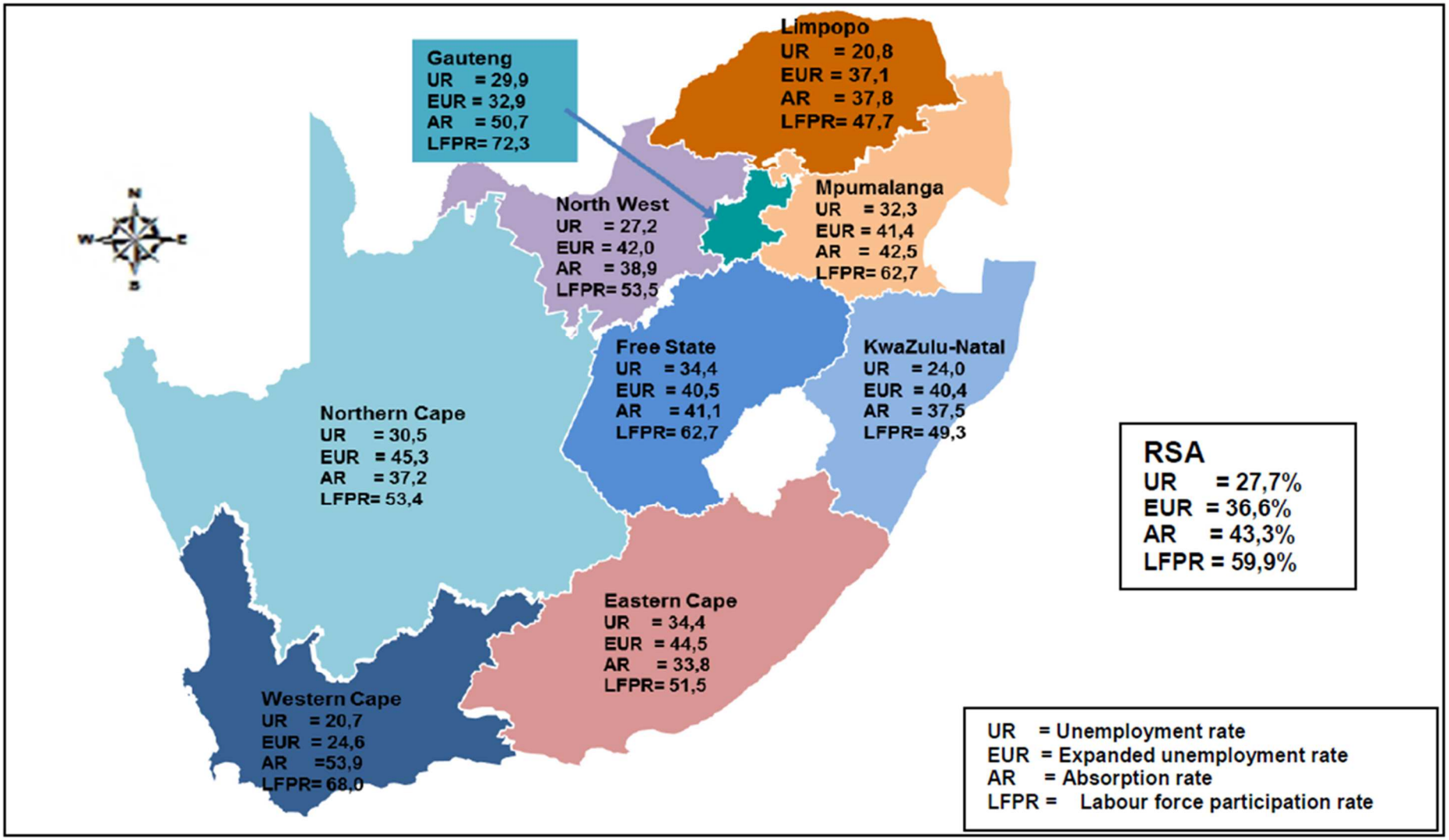

Figure 4: Unemployment in South Africa, Quarter 2, 2017

5.1.3 Human Immunodeficiency Virus (HIV)

Turning towards the HIV prevalence rate, research undertaken by the National Department of Health (2015) indicated that in 2013 Limpopo Province had an HIV prevalence rate amongst antenatal women of 20,3% compared to the national prevalence rate of 29,7%. The HIV prevalence rate amongst antenatal women between 2009 and 2013 is compared across all provinces, in Figure 5 (National Department of Health, 2015, p. 27) while the situation as it unfolds across the district municipalities is illustrated in Figure 6 (National Department of Health, 2015, p. 29).

In this regard, at 27,3%, the Waterberg District Municipality has the 23rd highest prevalence rate amongst antenatal women compared with all district and metropolitan municipalities in South Africa.

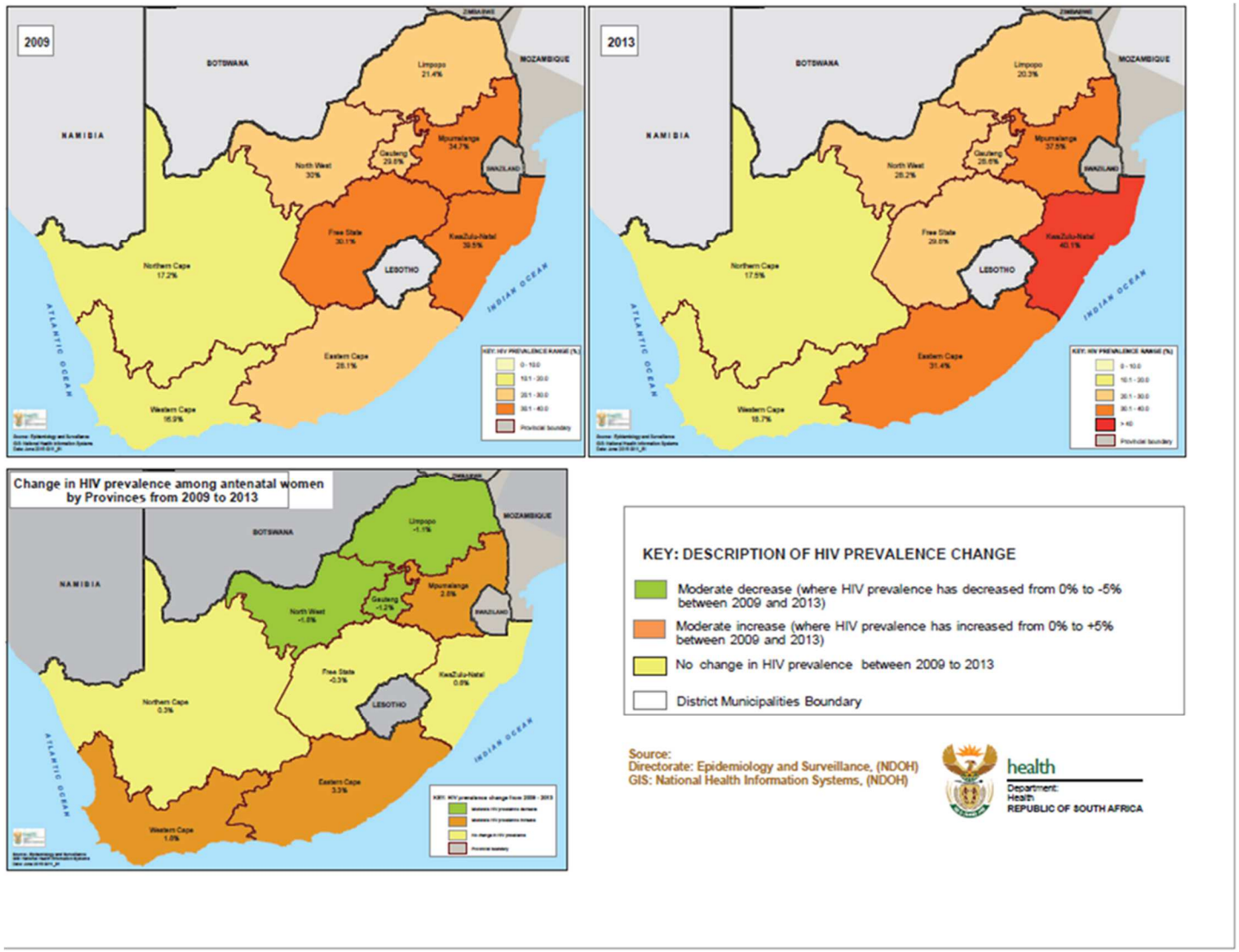

Figure 5: Prevalence of HIV amongst antenatal women - 2013

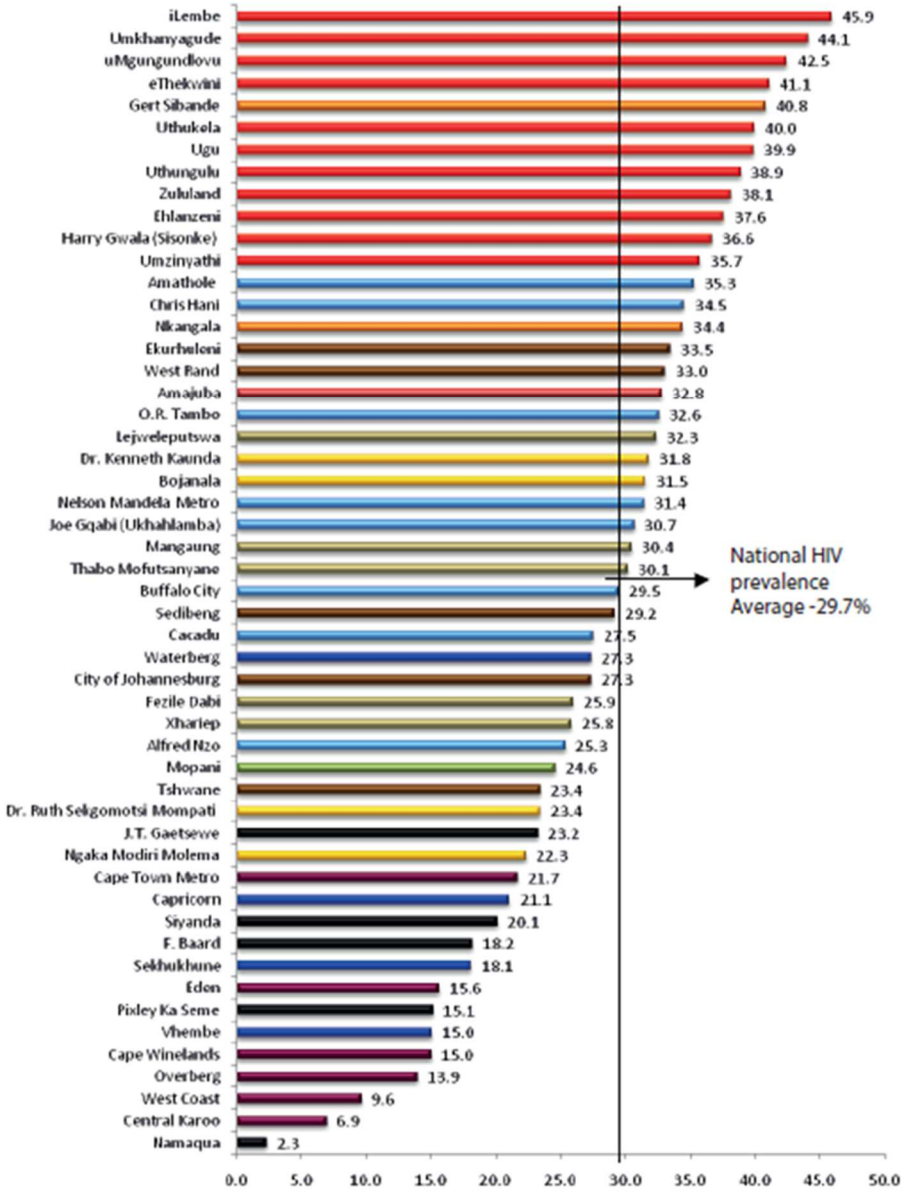

Figure 6: HIV prevalence rate: Antenatal women by district 2009 – 2011

5.1.4 Economic Overview

Limpopo Province is largely a rural area and, in 2004, was identified as the poorest province in South Africa with 77% of its population living in poverty, just above the Eastern Cape which has 72% of its population living in poverty (Schwabe, 2004).

Gross value added in real terms, relative to a 2010 baseline, is used in the Figure 7 below to show the components of the provincial economy in 2017.

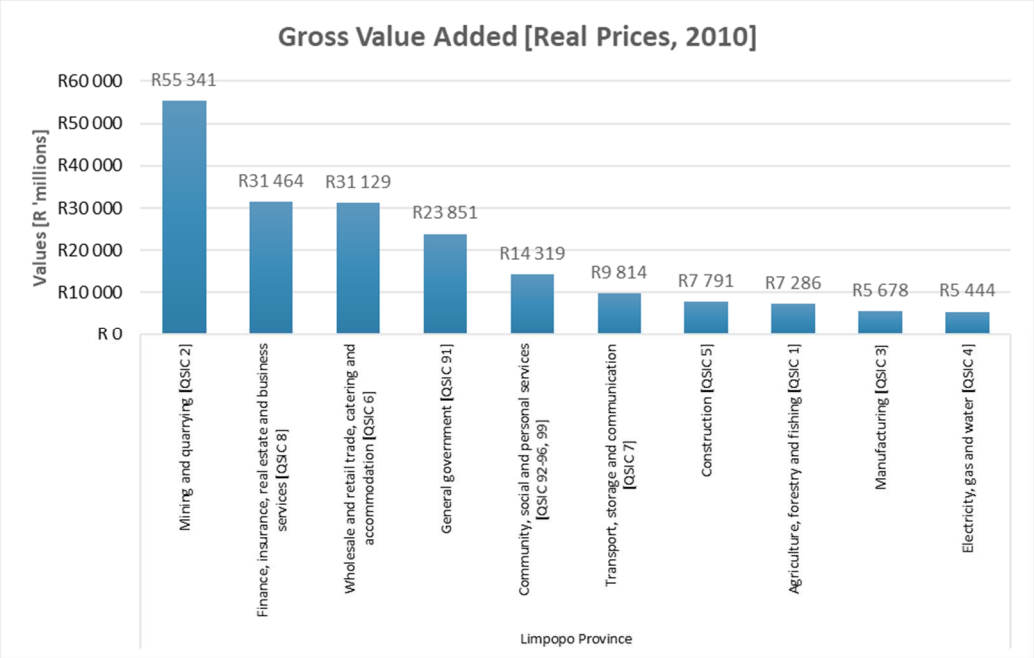

Figure 7: Gross Value Added by Sector, Limpopo Province, 2017

The provincial economy is dominated by mining and quarrying, contributing 29% of the total economic activity. The next largest sector is the financial and real estate sector at 16% of the total. Wholesale and retail trade is an important contributor to economic activity at a further 16%. General government is the last of the major sectors and contributes 12% to the total economy. It is interesting to note that the value of agriculture in this predominantly rural province contributes just 4% of the total economy activity.

Important sub-sector breakdowns for the purposes of this project include agriculture and wholesale and retail trade, which includes the supply of accommodation.

Table 2 below ranks key sectors of the provincial economy by contribution to gross value added, using 2017 results at constant 2010 prices. The table has only included economically important sectors and those sectors that are relevant to this study, hence there are gaps in the rank numbering. In total, there are 50 economic sectors for which data is available.

Table 2: Provincial Economy – Sector Breakdown – Project Related Sectors

Rank	Sector	Sub-Sector	RGVA, 2017 [R 'millions]	% of Total
1	Mining and quarrying	Metals (predominantly iron ore)	R47 696	25%
2	Wholesale and retail trade, catering and accommodation	Wholesale and retail trade	R29 342	15%
3	General government	National and Provincial government	R21 057	11%
8	Agriculture, forestry and fishing	Agriculture	R6 576	3%
9	Community, social and personal services	Other community, social and personal services	R5 914	3%

Rank	Sector	Sub-Sector	RGVA, 2017 [R 'millions]	% of Total
11	Community, social and personal services	Education (Private)	R4 854	3%
14	Community, social and personal services	Health and social work (Private)	R3 551	2%
18	Wholesale and retail trade, catering and accommodation	Catering and accommodation services	R1 786	1%

Table 2 above demonstrates that metals mining (predominantly iron ore), wholesale and retail and national and provincial government dominate the provincial economy with a combined total of 51% of total economic activity.

Sectors of the economy that are relevant to the socio-economic study: agriculture and catering and accommodation services together total four percent of the provincial economy. The agriculture sector includes all of following activities: growing of crops; market gardening; horticulture; farming of animals; growing of crops combined with farming of animals (mixed farming); agricultural and animal husbandry services, except veterinary activities; hunting; trapping and game propagation, including related services; and production of organic fertilizer

At constant 2010 prices, agriculture contributes R6,5 billion to the provincial economy

5.2 Regional Study Area Overview

The regional study area is the two local municipalities of Thabazimbi and Lephalale.

5.2.1 Basic Data

Thabazimbi Local Municipality covers a geographical area of 11 190,14 square kilometres and has a population of 85 234 people living within 25 080 households. This gives Thabazimbi a population density of 7,62 people per square kilometre and a household density of 2,24/km².

Lephalale Local Municipality covers a marginally larger geographical area at 13 784,18 square kilometres and has a larger population with 115 767 people living within 29 880 households. The population density of Lephalale is 8,4/km² while the household density is 2,17/km². A comparison of the geographical area covered by each of the municipalities as well as populations, households, gender, population group and home language spoken across the area is provided in Table 3 below.

Table 3: Geographical area, gender population grouping and home language

	LIM361: Thabazimbi	LIM362: Lephalale
Geographical Area	11,190,14 km²	13,784,18 km²
Population	85 234	115, 767
Households	25 080	29 880

		LIM361: Thabazimbi	LIM362: Lephalale
Population Density		7,62/km²	8,40/km²
Household Density		2,24/km²	2,17/km²
Gender	**Female**	41,48%	45,74%
	Male	58,52%	54,26%
Population Group	**Black African**	84,29%	90,67%
	White	14,44%	7,88%
	Coloured	0,62%	0,88%
	Indian/Asian	0,24%	030%
First Language		Setswana 41.24%	Sepedi 51,65%
		Afrikaans 15.71%	Setswana 24,13%
		isiXhosa 12.32%	Afrikaans 8,08%
		Sepedi 7.97%	English 3,10%

5.2.2 Population

The population pyramid of Thabazimbi is illustrated in Figure 8 below, while that of Lephalale is illustrated in Figure 9 below (Statistics South Africa, 2011).

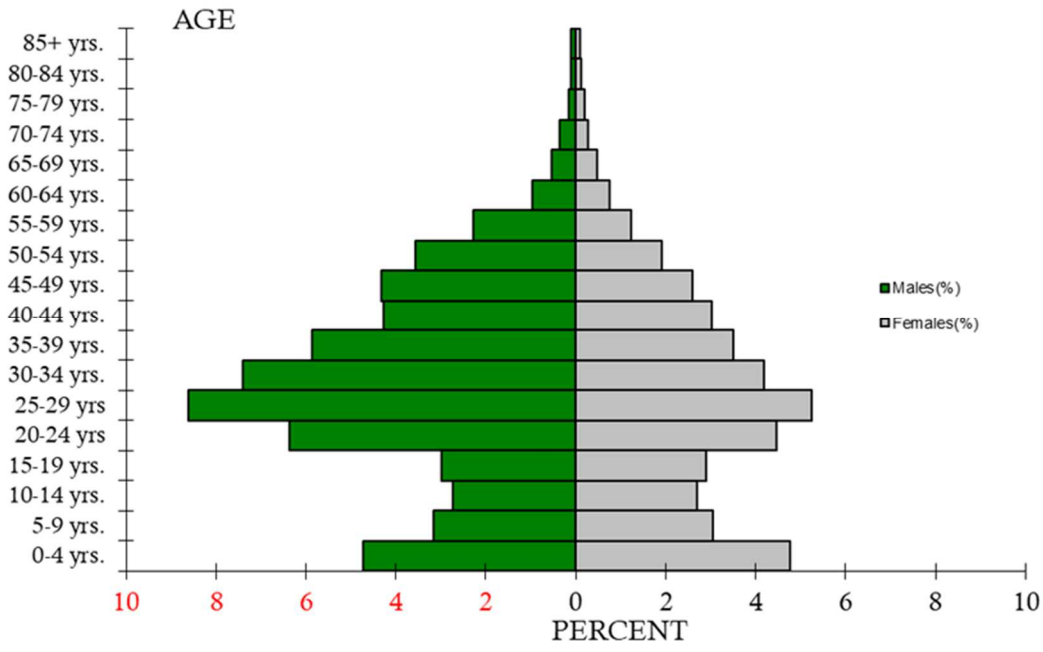

Figure 8: Population pyramid Thabazimbi Local Municipality

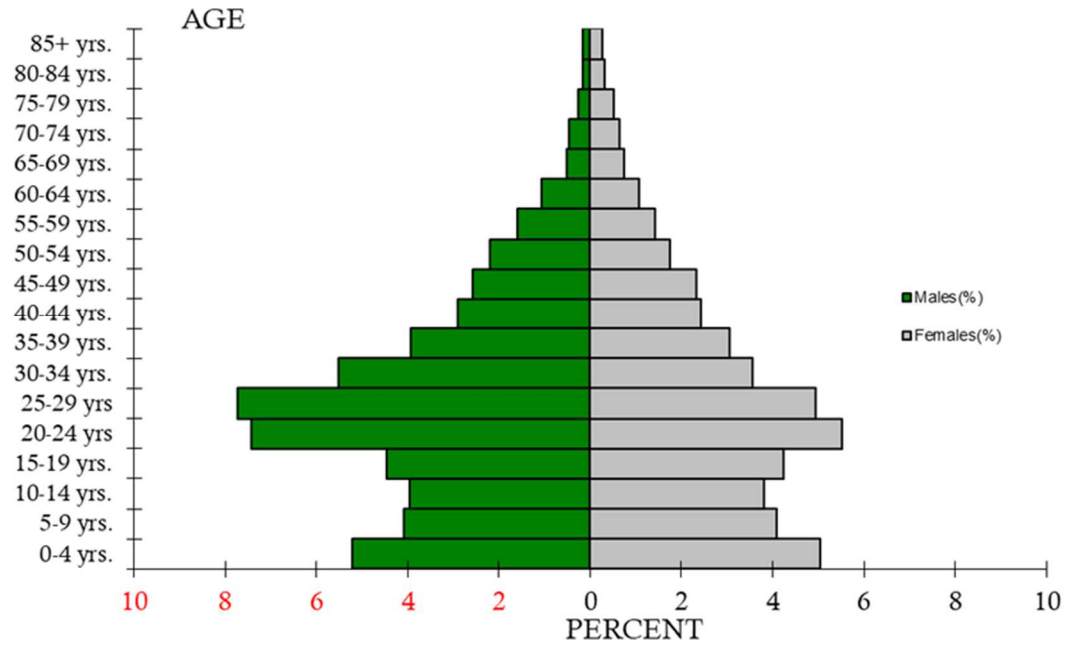

Figure 9: Population pyramid Lephalale Local Municipality

In respect of age structure, 64,3% of the population of the Waterberg district fall within the economically active population range of between 15 and 64 years of age thus giving the area a dependency ration of 55,5. With 76,4% of the population falling within the economically active sector of the population, Thabazimbi has the lowest dependency ratio at 30,8, while at 43,5 the dependency ratio of Lephalale is somewhat higher than that of Thabazimbi but is lower than across the district.

With an annual population growth rate of 3,06% between 2001 and 2011, Lephalale has the highest population growth rate, followed by Thabazimbi with a growth rate of 2,63%. These high population growth rates are indicative of in migration as people flock to the area in search of work. While in contrast other areas in the district, such as Modimolle with a negative population growth rate of -0,07, indicate an outmigration of people seeking employment in more economically active areas.

Another indicator of levels of out and in migration in certain areas is the gender ratio. Men are more inclined to leave home in search of work while women may remain to tender to the family. In this sense areas with better job opportunities usually have higher male to female gender ratios than those areas with few job opportunities. In this respect the population of Thabazimbi has an extremely high male to female ratio at 141,1 with Lephalale also having a fairly high male to female ratio at 118,6. At 102,1 the male to female ratio also indicated a higher proportion of males to females across the Waterberg District. The statistical data described in the last three paragraphs above is presented in Table 4 below.

Table 4: Population, age structure, dependency and gender ratios

Category	Detail	Limpopo Province	LIM361: Thabazimbi	LIM362: Lephalale
Population	2001	4 995 426	65 533	85 272

Category	Detail	Limpopo Province	LIM361: Thabazimbi	LIM362: Lephalale
	2011	5 404 868	85 234	115 767
Age Structure [2011]	<15	34,0%	21,1%	26,2%
	15-64	59,8%	76,4%	69,7%
	65+	6,3%	2,4%	4,1%
Dependency Ratio [2011]	Per 100 (15-64)	67,3	30,8	43,5
Gender Ratio [2011]	Males per 100 females	87,6	141,1	118,6
Population Growth	(% p.a.)	0,79	2,63	3,06

5.2.3 Employment

In 2011 the official unemployment rates across the Waterberg District stood at 28,1% while the official unemployment rate in Thabazimbi and Lephalale came in at 20,6 and 22,2 percent respectively. With regard to unemployment amongst the youth, that sector of the population between the ages of 15 and 34 years, the Waterberg District has a youth unemployment rate of 35,5% with both Thabazimbi and Lephalale having the same youth unemployment rate at 26,9%. Data pertaining to the labour market and levels of education across the study area are illustrated in Table 5 below.

Table 5: Regional Labour Market

Municipality	Labour Market			
	Unemployment Rate (official)		Youth Unemployment Rate (Official) 15-34 years	
	2001	2011	2001	2011
Limpopo Province	47,3%	38,9%	58,5%	49,4%
LIM361: Thabazimbi	21,0%	20,6%	31,0%	26,9%
LIM362: Lephalale	18,5%	22,2%	24,0%	26,9%

5.2.4 Education

Amongst that sector of the population who are 20 years and older, 8,8% have no education in Thabazimbi with 9,9% having no education in Lephalale and 12,4% having no education across the Waterberg district. This trend in respect of education continues with the population of Thabazimbi having a marginally higher level of education in respect of those having gained a matric or having a higher than matric level of educational when compared to the situation in Lephalale, which in turn fairs better than is the case across the district and province. Data pertaining to the labour market and levels of education across the study area are illustrated in Table 6 below.

Table 6: Regional Education Levels, Age 20 and above

Municipality	Education (age 20 +)					
	No Schooling		Matric		Higher Education	
	2001	2011	2001	2011	2001	2011
Limpopo Province	33,1%	17,3%	14,1%	22,6%	6,8%	9,1%
LIM361: Thabazimbi	17,5%	8,8%	16,0%	26,6%	4,3%	7,6%
LIM362: Lephalale	24,3%	9,9%	13,7%	24,5%	6,2%	10,6%

5.2.5 Economy

The regional economy is substantially smaller than the economy of the province, Thabazimbi's economy contributes R28 billion of gross value added to the province's total of R192 billion, whilst Lephalale, which contributes R8,7 billion to the province's economy. Thabazimbi's economy is thus currently three times larger than the economy of Lephalale.

The reasons for the varying sizes of the two segments of the regional study area become apparent when comparing the sectoral contribution of the two municipalities. Thabazimbi's sector composition is shown in Table 7 below.

Table 7: Thabazimbi Local Municipality Economic Sectors

Economic Sector	Gross Value Added [2010, R' millions]	% of Total
Mining and quarrying	R25 050	89%
Wholesale and retail trade	R603	2%
Business services	R446	2%
Agriculture, forestry and fishing	R348	1%
Construction	R302	1%
Community, social and personal services	R259	1%
General government	R258	1%
Finance and insurance	R212	1%
Transport and storage	R157	1%
Electricity, gas and water	R117	<1%
Metals, metal products, machinery and equipment	R88	<1%
Catering and accommodation services	R48	<1%

Economic Sector	Gross Value Added [2010, R' millions]	% of Total
Remaining Sectors	R103	0%
Grand Total	R27 991	100%

The economy of Thabazimbi is totally dominated by iron ore mining, which contributes 89% of the economy in the local municipality. The remaining portions include wholesale and retail trade, business services and agriculture. Agriculture contributes 1,2% of the total economy.

If mining were excluded from the economy, apart from making the economy activity vastly smaller, other sectors would contribute greater percentages to the remaining activity. Assuming, for the sake of illustration, that the removal of mining would not impact on the contributions of the remaining sectors, the total economy would be at R3 billion and agriculture would contribute 12%.

When data for the value accruing to employees is analysed, Table 8 below is produced. It provides the value of compensation paid to employees within the municipality, in the various sectors at constant 2010 prices.

Table 8: Thabazimbi Local Municipality Employee Compensation

Economic Sector	Gross Value Added [2010, R' millions]	% of Total
Mining and quarrying	R10 594	89%
Wholesale and retail trade	R237	2%
General government	R218	2%
Community, social and personal services	R188	1,6%
Business services	R156	1%
Construction	R140	1%
Finance and insurance	R106	1%
Agriculture, forestry and fishing	R96	1%
Metals, metal products, machinery and equipment	R60	1%
Transport and storage	R49	<1%
Electricity, gas and water	R32	<1%
Catering and accommodation services	R20	<1%
Remaining Sectors	R48	<1%
Grand Total	R11 944	100%

The values related to employee compensation are closely tied to the overall contribution of each sector to the economy. Noteworthy differences are the relatively higher rank of general government

in employee compensation when compared with the overall contribution to economic activity. Conversely, agricultural employee compensation is of a lower rank than its overall contribution to the economy would indicate.

Similar conclusions can be drawn when analysing data for the Lephalale Local Municipality. Lephalale's sector composition is shown in Table 9 below.

Table 9: Lephalale Local Municipality Economic Sectors

Economic Sector	Gross Value Added [2010, R' millions]	% of Total
Mining and quarrying	R3 257	38%
Electricity, gas and water	R1 285	15%
Construction	R951	11%
Wholesale and retail trade	R669	8%
Business services	R595	7%
General government	R403	5%
Agriculture, forestry and fishing	R370	4%
Community, social and personal services	R337	4%
Transport and storage	R232	3%
Food, beverages and tobacco	R198	2%
Finance and insurance	R171	2%
Catering and accommodation services	R67	1%
Remaining Sectors	R150	2%
Grand Total	R8 685	100%

The economy of Lephalale is more diverse, though smaller, than Thabazimbi's. Mining plays an important role, lying as it does on rich coal fields, but the overall contribution of mining to the economy is 38%. The next largest sectors are: electricity, gas and water at 15%, construction at 11% and wholesale and retail trade at 8%. These three are likely to be related in that the Matimba Power Station falls within this area, and the construction of the Medupi Power Station is ongoing. The remaining portions include business services, general government and agriculture. Agriculture contributes 4% of the total economy.

When data for the value accruing to employees is analysed, Table 10 below is produced. It provides the value of compensation paid to employees within the municipality, in the various sectors at constant 2010 prices.

Table 10: Lephalale Local Municipality Employee Compensation

Economic Sector	Gross Value Added [2010, R' millions]	% of Total
Mining and quarrying	R1 058	30%
Construction	R465	13%
Electricity, gas and water	R366	11%
General government	R351	10%
Business services	R278	8%
Wholesale and retail trade	R270	8%
Community, social and personal services	R227	7%
Agriculture, forestry and fishing	R101	3%
Food, beverages and tobacco	R92	3%
Finance and insurance	R85	2%
Transport and storage	R74	2%
Metals, metal products, machinery and equipment	R31	1%
Catering and accommodation services	R29	1%
Remaining Sectors	R45	1%
Grand Total	R3 471	100%

The values related to employee compensation are closely tied to the overall contribution of each sector to the economy. The same trend as with Thabazimbi with regards the relatively higher rank of general government in employee compensation when compared with the overall contribution to economic activity is also observed. Conversely, and similarly, agricultural employee compensation is of a lower rank than its overall contribution to the economy would indicate.

Economic growth within the regional economy is an indicator of the vulnerability of residents to economic shocks. Table 11 below provides statistics for economic growth for the ten years between 2007 and 2017.

Table 11: Regional Economic Performance

Economic Sector	Gross Value Added [2007, R' millions]	Gross Value Added [2017, R' millions]	Compound Annual Growth Rate [%]
Mining and quarrying	R28 051	R28 307	0,1%
Finance, insurance, real estate and business services	R1 112	R1 424	2,5%
Electricity, gas and water	R1 311	R1 402	0,7%

Economic Sector	Gross Value Added [2007, R' millions]	Gross Value Added [2017, R' millions]	Compound Annual Growth Rate [%]
Wholesale and retail trade, catering and accommodation	R1 060	R1 387	2,7%
Construction	R661	R1 253	6,6%
Agriculture, forestry and fishing	R444	R718	4,9%
General government	R507	R661	2,7%
Community, social and personal services	R581	R596	0,3%
Transport, storage and communication	R348	R466	3,0%
Manufacturing	R473	R461	-0,3%
Grand Total	**R34 548**	**R36 675**	**0,6%**

Table 11 shows that the overall average annual growth rate for the economy of the regional study area is an anaemic 0,6% per year. Owing to the predominance of mining, it is the lack of growth in this area of the economy that has contributed to this overall low level of growth.

Low economic growth can be compared to South Africa's annual average growth in seasonally adjusted, annualised gross domestic product growth. This was 2,9% (Statistics SA, 2018), between these years. The growth in the overall economy is not keeping pace with growth in the general economy. The noteworthy exclusion is the construction sector, owing to the Medupi Power Station's construction, growing at 6,2% per year. Agriculture, transport and general government, growing at 4,9%, 3,0% and 2,7% respectively are also out pacing the general growth rate.

These figures should be mirrored in trends in employee compensation between these years. The relevant figures are contained in Table 12 below

Table 12: Regional Employee Compensation Performance

Economic Sector	Real Employment Compensation [2007, R' millions]	Real Employment Compensation [2017, R' millions]	Compound Annual Growth Rate [%]
Mining and quarrying	R8 052	R11 652	3,8%
Finance, insurance, real estate and business services	R399	R625	4,6%
Construction	R324	R605	6,4%
General government	R417	R569	3,2%
Wholesale and retail trade, catering and accommodation	R444	R557	2,3%
Community, social and personal services	R392	R415	0,6%
Electricity, gas and water	R758	R398	-6,2%

Economic Sector	Real Employment Compensation [2007, R' millions]	Real Employment Compensation [2017, R' millions]	Compound Annual Growth Rate [%]
Manufacturing	R160	R242	4,2%
Agriculture, forestry and fishing	R119	R197	5,2%
Transport, storage and communication	R103	R154	4,1%
Grand Total	R15 414	R11 168	3,3%

It shows that the overall average annual growth rate for real employee compensation was 3,3% per year between 2007 and 2017.

The growth in employee compensation should be compared to the inflation rate for the same period. The average of the consumer price index between these years was 6,6% (Statistics SA, 2018). These figures demonstrate the real employee compensation is eroding and does not keep pace with inflation. The figures also show that employee compensation is rising faster than economic growth, and unless employee productivity keeps pace with this faster growth rate, companies and institutions will not be able to sustain the compensation growth rate.

The above points to a vulnerability in the economy and amongst employees. If there are further economic shocks, or the growth stimulus provided by the construction of the Medupi Power Station is not replaced with other similar sized stimuli, economic distress will become evident in the area.

5.2.6 Labour Force

The labour force in the regional study area numbered some 86 000 people in 2017. The total population of the regional study area is approximately 201 000. Figure 10 below provides detail on the composition of the labour force.

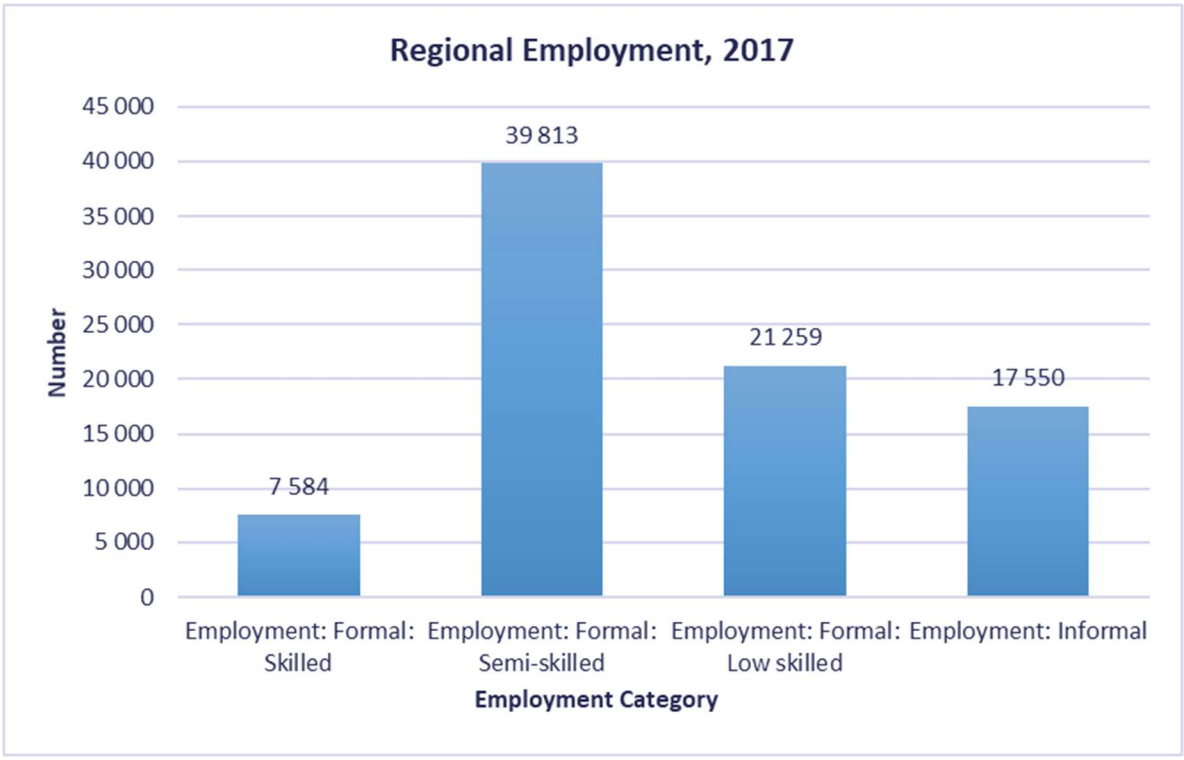

Figure 10: Regional Study Area Employment

Nine percent of the regional labour force is suitable for employment in the formal skilled sector of the economy, a further 46% are suitable and capable of being employed in the formal semi-skilled sector. The remaining 25% of the labour force forms part of the low skilled members of the formal labour force, whilst a further 20% form part of the informal economy.

These figures mirror those on education, where less than ten percent of the population has tertiary education.

Labour force compensation is detailed in Figure 11 below. This includes compensation across all industries in 2017. It reveals that compensation received by skilled members of the workforce is relatively higher than that received by semi-skilled and unskilled workers.

Total real compensation, adjusted to 2010 values, is measured at R10 billion in 2017.

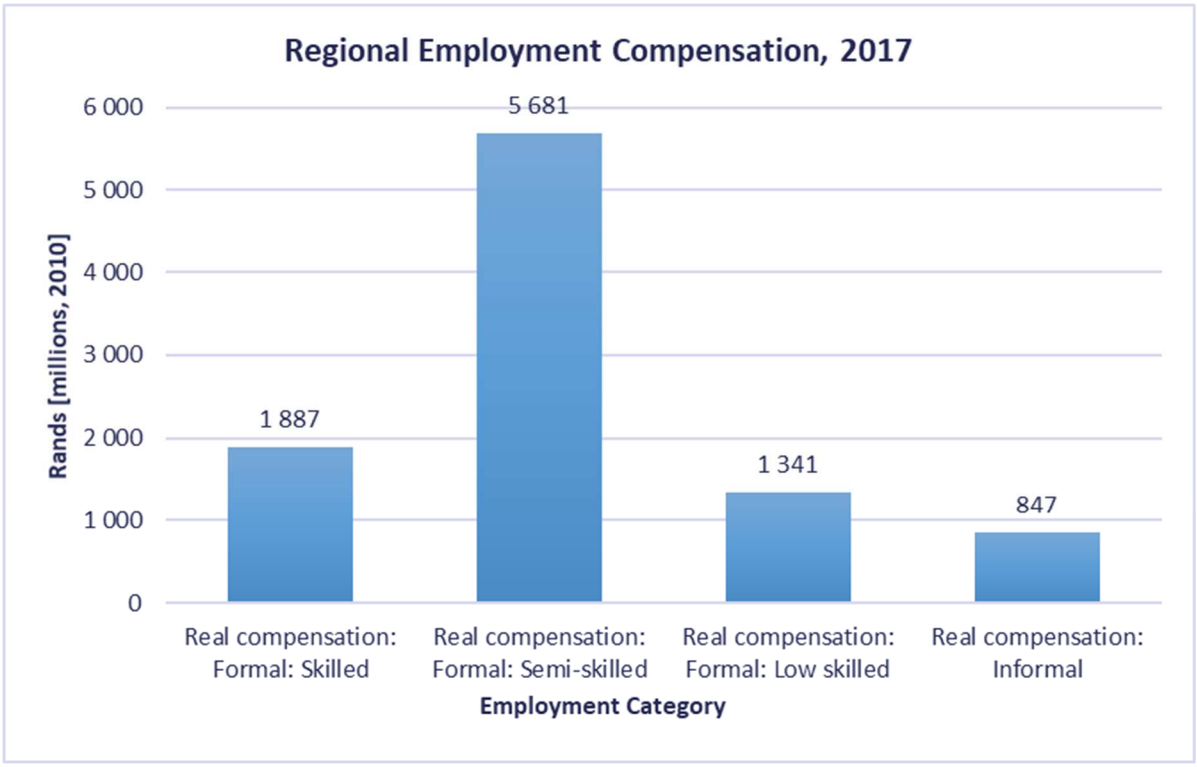

Figure 11: Regional Study Area Employment Compensation

Compensation of low-skilled members of the formal economy is much smaller than the numbers of workers would indicate, compensation of informal sector workers is lower still. This gives credence to the hypothesis that wage competition at the lower levels of skill is high, leading to downward pressure of this category of wages.

This situation can be contrasted to that in the agricultural sector. Figure 12 below shows agricultural compensation in the regional study area. The quantum of compensation in 2017 was R189 million at constant 2010 prices, approximately 2% of the total employee compensation paid within the regional study area.

Noteworthy here is the lower informal compensation figure, which indicates that a higher number of workers in the agricultural sector are formally employed than across the broader regional economy.

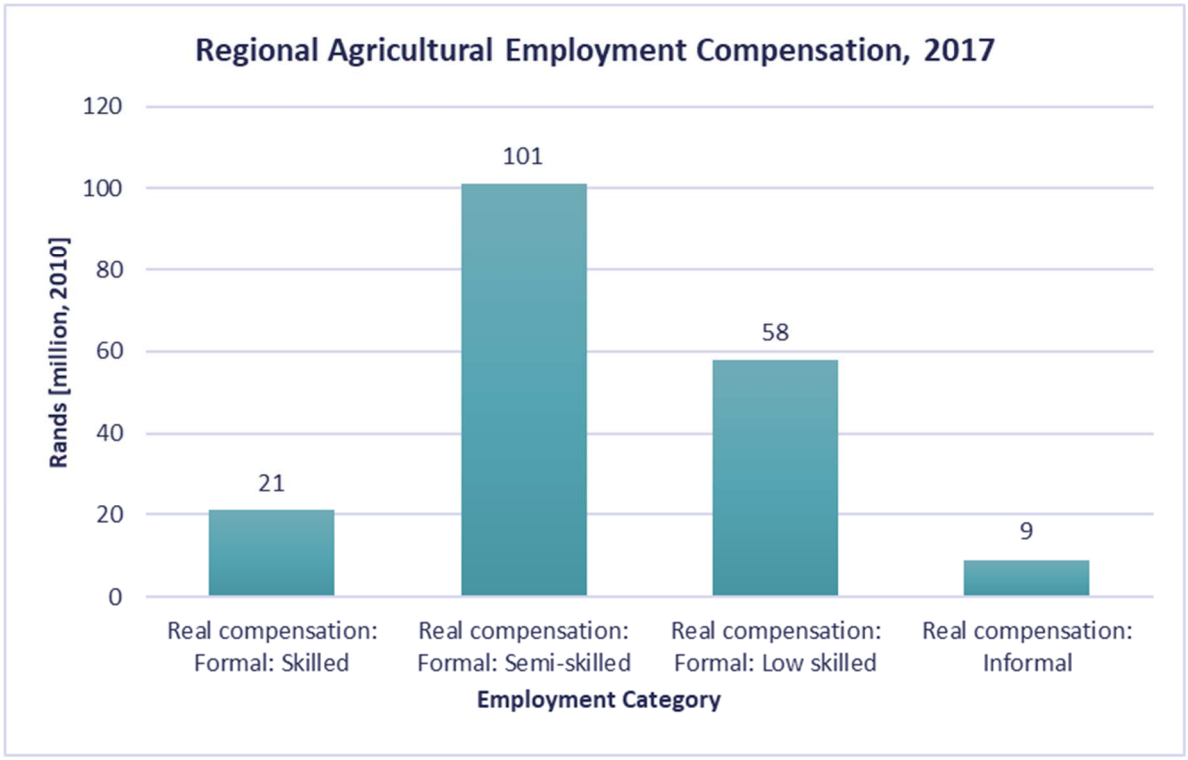

Figure 12: Regional Study Area Agricultural Employment Compensation

The figure below, Figure 13, shows the composition of the agricultural labour force in the regional study area.

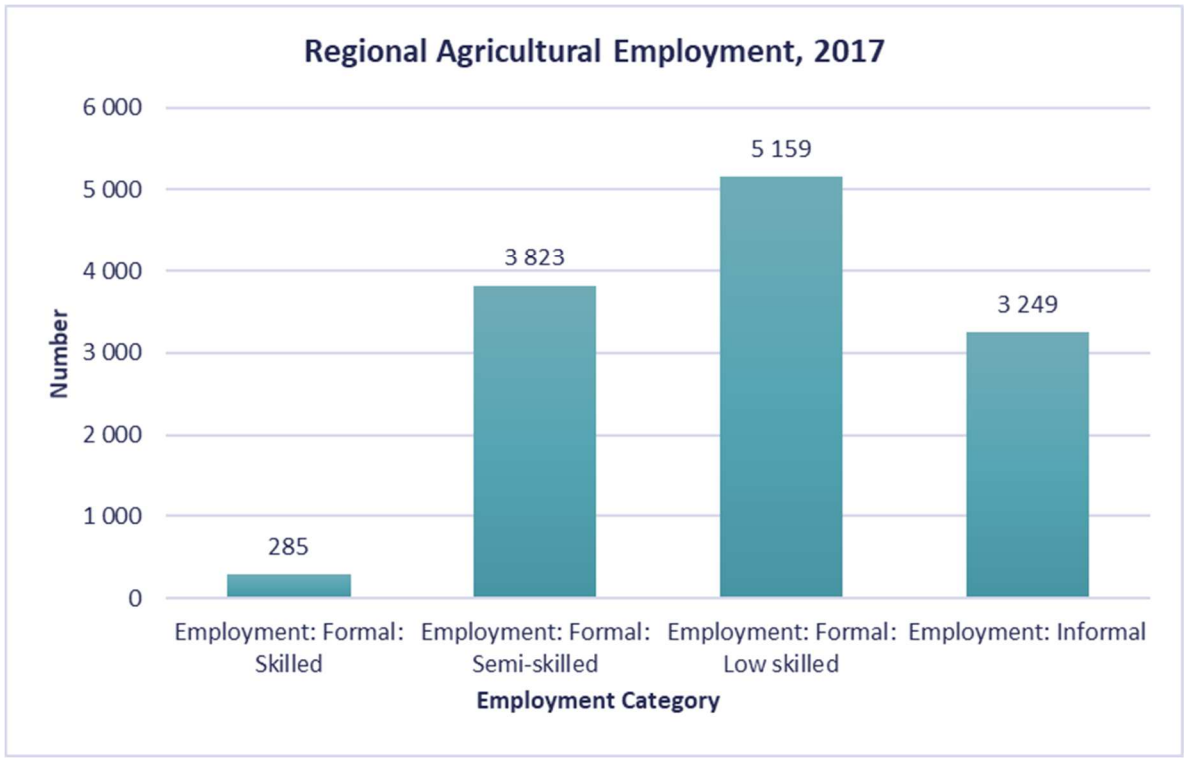

Figure 13: Regional Study Area Agricultural Employment

By contrast with the broader regional economy, there is a lower proportion of skilled workers in the agricultural sector (2%), and a higher proportion of unskilled and informal workers (67%) than in the broader economy: 9% versus 45%. Thus, the agricultural sector employment is skewed towards lower skilled workers and, given the previously highlighted wage competition in this skills bracket, disruption to employment in the agricultural sector will impact upon a greater proportion of workers than in the broader economy.

A further noteworthy point about agricultural employment is the very low compensation in the informal economy within this sector. This is evidenced by the high numbers of people within the informal agricultural economy, compared with the very low compensation level. This further highlights the vulnerability of agricultural livelihoods in the regional study area.

5.2.7 Household Dynamics

The average household size, at 3,9, is marginally higher in the Lephalale municipality compared to 3,4 in Thabazimbi and 3,8 across the province. While 50,47% of households across the province district are headed by females, 39,1% are headed by females in Lephalale with the lowest percentage of female headed households, 24,7%, occurring within Thabazimbi. This matches with data provided by the gender ratio which shows the population of Thabazimbi is male skewed, likely owing to inward migration for economic reasons. Hence the high percentage of male headed households and smaller average household size.

At 89,8% the province has the highest number of formal dwellings as opposed to traditional (1,2%) and informal dwellings (11,1%). Thabazimbi has the lowest proportion of formal dwellings at 70,7% and the highest proportion of informal dwellings at 25,9% with traditional dwellings only accounting for 1,9% of the dwelling types in the municipality. The distribution of dwelling types across Lephalale is as follows; 82,3% are formal, 15,2% are informal while traditional dwelling types account for 1,4% of the dwellings within the Lephalale municipality.

Table 13: Regional Household Dynamics

Municipality	Household dynamics				
	Households	Average household size	Female headed households	Formal dwellings	Housing owned/paying off
	2011	2011	2011	2011	2011
Limpopo Province	1 418 102	3,8	50,4%	89,8%	57,7%
LIM361: Thabazimbi	25 080	3,4	24,7%	70,7%	24,4%
LIM362: Lephalale	26 880	3,9	39,1%	82,3%	40,7%

At 57,7% the province has the highest proportion of housing being owned or being paid off, followed by Lephalale at 40,7% with the Thabazimbi Local Municipality only having 24,4% of its housing being either own or being paid off. The data pertaining to household dynamics across the study area as discussed above and based on Census 2011, is provided in Table 13 above.

5.2.8 Household Services

Concerning the provision of household services, Thabazimbi enjoys a higher level of service delivery in respect of flush toilets connected to the sewerage system at 63,1%, weekly refuse removal at 60,4% and piped water delivered inside the dwelling at 47,3%. The province as whole, at 87,3%, enjoys the highest level of electricity delivery across the study area measured in terms of electricity use for lighting. Apart from the delivery of electricity, the Lephalale Local Municipality has the lowest level of household service delivery as illustrated in Table 14 below.

Table 14: Household services

Municipality	Household services							
	Flush toilet connected to sewerage		Weekly refuse removal		Piped water inside dwelling		Electricity for lighting	
	2001	2011	2001	2011	2001	2011	2001	2011
Limpopo Province	16,6%	19,7%	15,6%	21,1%	10,3%	18,4%	63,2%	87,3%
LIM361: Thabazimbi	49,5%	63,1%	42,5%	60,4%	24,7%	47,3%	57,3%	76,8%
LIM362: Lephalale	30,1%	39,5%	24,0%	41,0%	22,4%	31,4%	69,3%	85,0%

5.2.9 Child Headed Households

Regarding the distribution of child headed households across the study area, the province as a whole has the highest percentage at 1,4% of all households, followed by Lephalale at 0,9% and Thabazimbi at 0,5%. This data is illustrated in Table 15 below.

Table 15: Distribution of child headed households

Municipality	Distribution of child headed households					
	1996		2001		2011	
Limpopo Province	24 180	2,7%	25,617	2,3%	19 668	1,4%
LIM361: Thabazimbi	107	0,7%	105	0,3%	115	0,5%
LIM362: Lephalale	308	1,7%	476	1,4%	254	0,9%

5.3 Local Study Area Overview

The local study area comprises Ward 1 and Ward 9 of the Thabazimbi Local Municipality, as well as Ward 3 of the Lephalale Local Municipality. The analysis below uses data drawn from Census 2011, published by Statistics South Africa.

Table 16 below provides an overview of the languages used in the area.

Table 16: Language in the Local Study Area

Language	Thabazimbi LM		Lephalale LM	Totals	% of Total
	Ward 1	Ward 9	Ward 3		
Setswana	4 261	9 468	2 919	16 648	49,8%
Sepedi	383	2 021	3 214	5 618	16,8%
Afrikaans	1 335	214	1 318	2 867	8,6%
Xitsonga	384	683	926	1 993	6,0%
English	264	434	398	1 096	3,3%
Other	379	296	2 364	3 039	9,1%
Totals:	7 006	13 116	11 139	31 261	100,0%

Setswana and Sepedi are the dominant languages in the local study area, becoming increasingly Sepedi the further north that one travels.

Figure 14 below, provides the gender balance in the local study area. The study area has a 56:44 split between male and female, a ratio that is most in keeping with that for the Limpopo Province than for the regional study area as a whole. This is since the mining and large industrial facilities that are present in the local municipalities do not fall within the local study area.

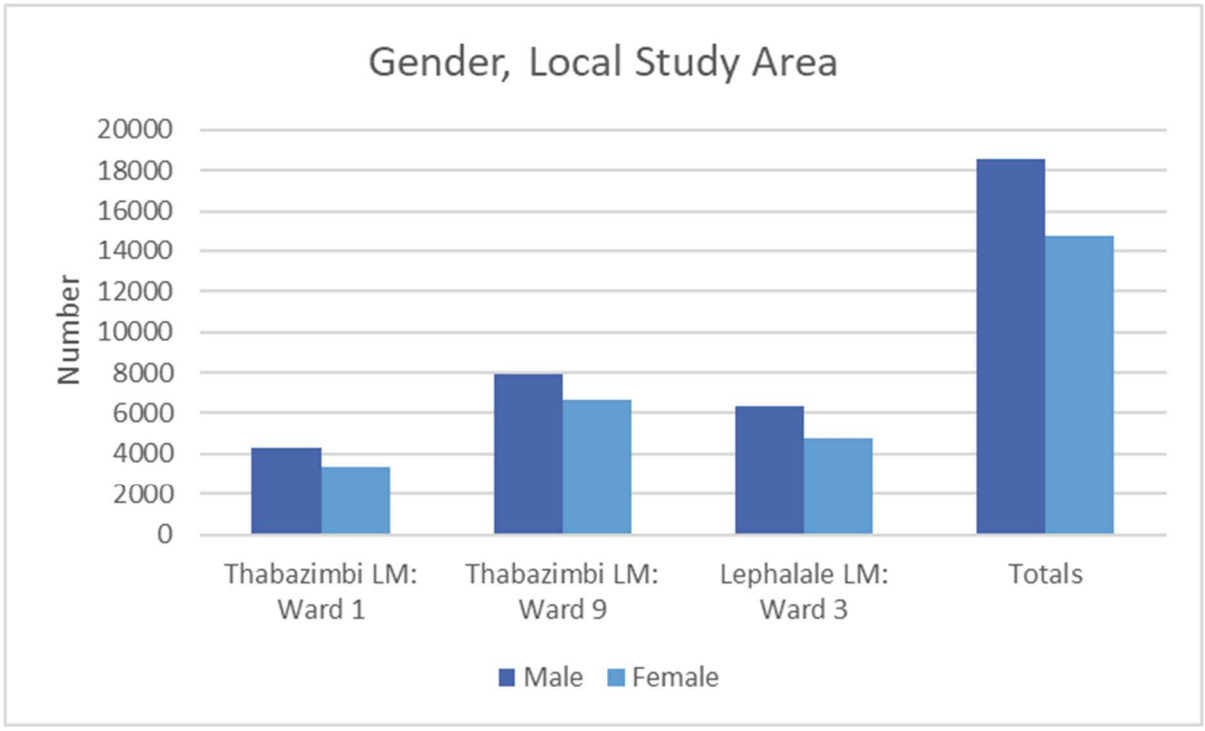

Figure 14: Gender in the Local Study Area

In this regard, the gender split in the local study area is more typically rural in nature than the regional study area as a whole.

5.3.1 Household Income

Annual household income is an indicator of the access to services and level of economy vulnerability that a house will face. Table 17 below provides data on the levels of annual household income I the local study area.

Table 17: Local Study Area Annual Household Income

Income Values	Thabazimbi LM [No. HH]		Lephalale LM	Totals	% of Totals
	Ward 1	Ward 9	Ward 3		
Very Low Income [R1 - R9 600 pa]	185	481	198	864	9,6%
Low Income [R9 601 to R38 200 pa]	1 285	1 484	1 639	4 408	49,0%
Middle Income [R38 201 to R614 400 pa]	669	1 867	894	3 430	38,2%
High Income [R614 60 and above pa]	139	65	83	287	3,2%
Totals :	2 278	3 897	2 814	8 989	100,0%
% of Totals :	25,3%	43,4%	31,3%	100,0%	

The table demonstrates that 60% of the households in the local study area earn less than R38 200 per year (or R3 160 per month), in 2011. Average household size across the local study area is 3,5. Thus,

the degree of economic vulnerability to external shocks is high, with most households living a subsistence livelihood.

5.3.2 Education Level Attained

Table 18 below provides detail on the education levels attained by residents of the local study area.

Table 18: Local Study Area Education Levels

Education Level Attained	Thabazimbi LM		Lephalale LM	Total	% of Total
	Ward 1	Ward 9	Ward 3		
No Schooling	999	1 171	1 251	3 421	10,2%
Some Primary School	1 826	3 431	2 564	7 821	23,4%
Primary School	506	789	876	2 171	6,5%
Some High School	2 025	4 667	3 331	10 023	30,0%
Matriculated	1 019	2 682	1 298	4 999	15,0%
Secondary Education	36	46	55	137	0,4%
Higher Degrees	225	125	300	650	1,9%
Other and Not Applicable	1 037	1 686	1 466	4 189	12,5%
Totals:	7 673	14 597	11 141	33 411	
% of Total :	23,0%	43,7%	33,3%	100,0%	

Education levels within the local study area reflect the low-income levels found in the previous section. Ten percent of the residents have no schooling, whilst a further 30% have completed up to primary school level, an additional 30% have completed some high school, but did not matriculate. The result is that 69% of the residents of the area have not completed matric. Approximately two percent have gained an education level higher than matric.

These results reinforce the conclusion that the residents of the local study area are vulnerable to economic shocks.

5.3.3 Dwelling Type

Dwelling type is a livelihood indicator that provides insight into the socio-economic conditions in the local study area. The characteristics of the dwellings in which households live and their access to various services and facilities provide an important indication of the well-being of household members. It is widely recognised that shelter satisfies a basic human need for physical security and comfort.

According to the Statistics South Africa household classification, the following definitions apply to formal and informal housing:

- **Formal dwelling**, refers to a structure built according to approved plans, i.e. house on a separate stand, flat or apartment, townhouse, room in backyard, rooms or flat let elsewhere. Contrasted with informal dwelling and traditional dwelling; and
- **Informal dwelling**, is a makeshift structure not erected according to approved architectural plans, for example shacks or shanties in informal settlements or in backyards.

Table 19 below provides data on the levels of annual household income I the local study area.

Table 19: Local Study Area Dwelling Type

Dwelling Type	Thabazimbi LM		Lephalale LM	Totals	% of Total
	Ward 1	Ward 9	Ward 3		
House, separate stand	64,1%	65,6%	48,7%	19 914	59,6%
Traditional Dwelling	3,5%	0,6%	1,9%	564	1,7%
Townhouses/Flats	0,8%	2,5%	1,1%	555	1,7%
Backyard Dwelling or Flatlet	1,1%	0,7%	4,6%	699	2,1%
Informal Dwelling	21,0%	24,8%	17,1%	7 134	21,4%
Not Applicable, Other and Unspecified	9,5%	5,8%	26,6%	4 530	13,6%

The analysis of dwelling type shows that 60% of the residents in the local study area live in brick houses located on separate stands. The next most common housing typology is an informal structure, which is home to 21% percent of residents. The last category in the table: “Not Applicable, Other and Unspecified”; is mainly a count of Not Applicable and can be ignored for the purposes of the analysis.

These figures can be viewed alongside those for the labour force, using the working assumption that lower skilled and informal members of the workforce would be most likely to live in informal structures. 45% of the labour force is low skilled or part of the informal sector and yet twenty-one percent of the dwellings are informal.

This disparity leads to the conclusion that housing typologies are not related to level of skill of the labour-force member. Hence it is concluded that living in a separate brick structure should not be taken as an indicator of lower economic vulnerability when compared to those living in informal structures.

5.4 Land Use and Infrastructure

The proposed routing of the pipeline passes through agricultural land which has been put to varying use including cattle raising, cropping and game farming. The route can be divided into three district sections:

1. Southern section – at the abstraction works and initial infrastructure sites;

2. Central section – the bulk of the pumped pipeline; and
3. Northern section – the gravity fed delivery pipeline.

The land use and infrastructure characteristics of each section is described below. This section of the report relies upon a census of the infrastructure and land-use impacts that has been conducted for this study. The results of the census are contained in **Appendix 1**.

5.4.1 Southern Section

The southern section of the project includes the abstraction point at the new Vlieëpoort Weir and continues until after the high lift pumping station. A Google Earth image of this section of the pipeline is shown in Figure 15 below.

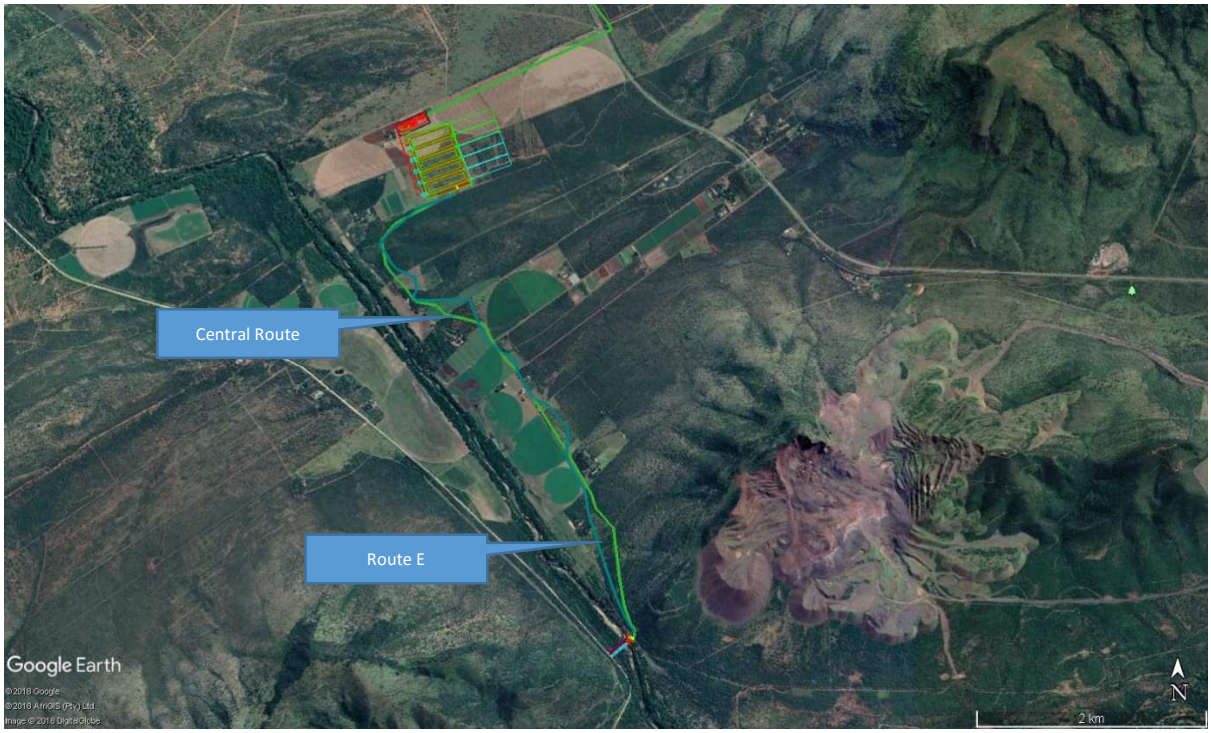

Figure 15: Southern Section of the Proposed Project

This section is located along the Crocodile River and as such it is dominated by irrigated farming. Although the weir itself does not impact any farming infrastructure, the proposed pipeline passes near five irrigation pivots as well as other irrigated land. The farms in question are Mooivallei 342KQ, Portions 1 – 10, with different owners.

The site for the proposed pumping station, desilting works and balancing dams is cultivated land, irrigated or otherwise. Large portions of this land will be occupied by the future infrastructure.

The pipeline runs past nine homesteads or farm buildings in this area, giving rise to the likelihood of construction phase impacts.

5.4.2 Central section

The central section of the pipeline route covers the bulk of the proposed project distance and runs through grazing land for the most part. A Google Earth image of this section of the pipeline is shown in Figure 16 below.

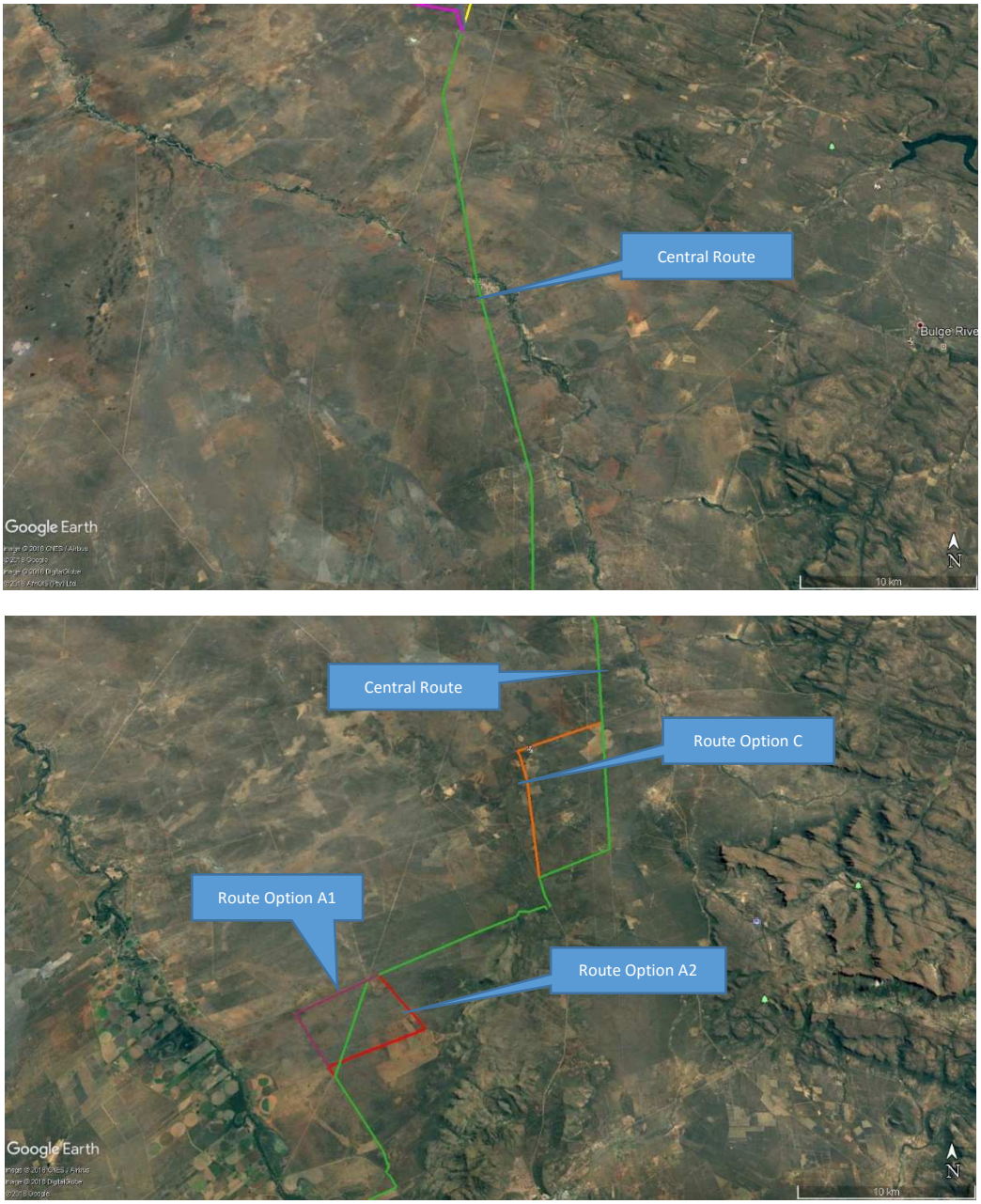

Figure 16: Central section of the Proposed Project

The central section contains route options A1 and A2, seen in Figure 16 above. It also contains route option C, also to be seen in the Figure 16 above.

Land in the vicinity of these routes is used for grazing, either for cattle raising or for game farming. Within a 300 m corridor either side of the proposed pipeline routes there are numerous dwellings and farm buildings.

The central section of the proposed route follows a railway line servitude for most of the route. This railway line is owned and operated by Transnet Freight Rail. This branch line, constructed to mainline standards, runs from Rustenburg to Lephalale, passing along its route the towns of Boshoek, Ledig/Sun City, Mogwase, Northam and Thabazimbi. This rail line transports some 5 million tons of coal per annum from Lephalale to the various steel works at Pretoria, Vanderbijlpark, Newcastle and Saldanha. In several instances the pipeline will interfere with existing crossing points across the railway line during the construction phase.

Route C follows the R510 for a longer portion of its length than the central route, and as such impacts upon a higher number of dwellings and commercial enterprises which are located along this relatively busy road. In contrast, the central route travels directly towards the railway line, impacting upon a lesser number of such buildings. Commercial enterprises which may be sensitive to pipeline construction in the section include Cheetah Safaris, and on the farms Leeuwbosch, Diepkuil, Schilpadfontein, Grootfontein and Buffelsvley.

5.4.3 Northern Section

The northern section of the project comprises of all of the route alternatives for the gravity main that runs down from the operational reservoir. The site for the operation reservoir remains the same in all route alternatives, but the termination points change for each alternative route. A Google Earth image of this section of the pipeline is shown in Figure 17 below.

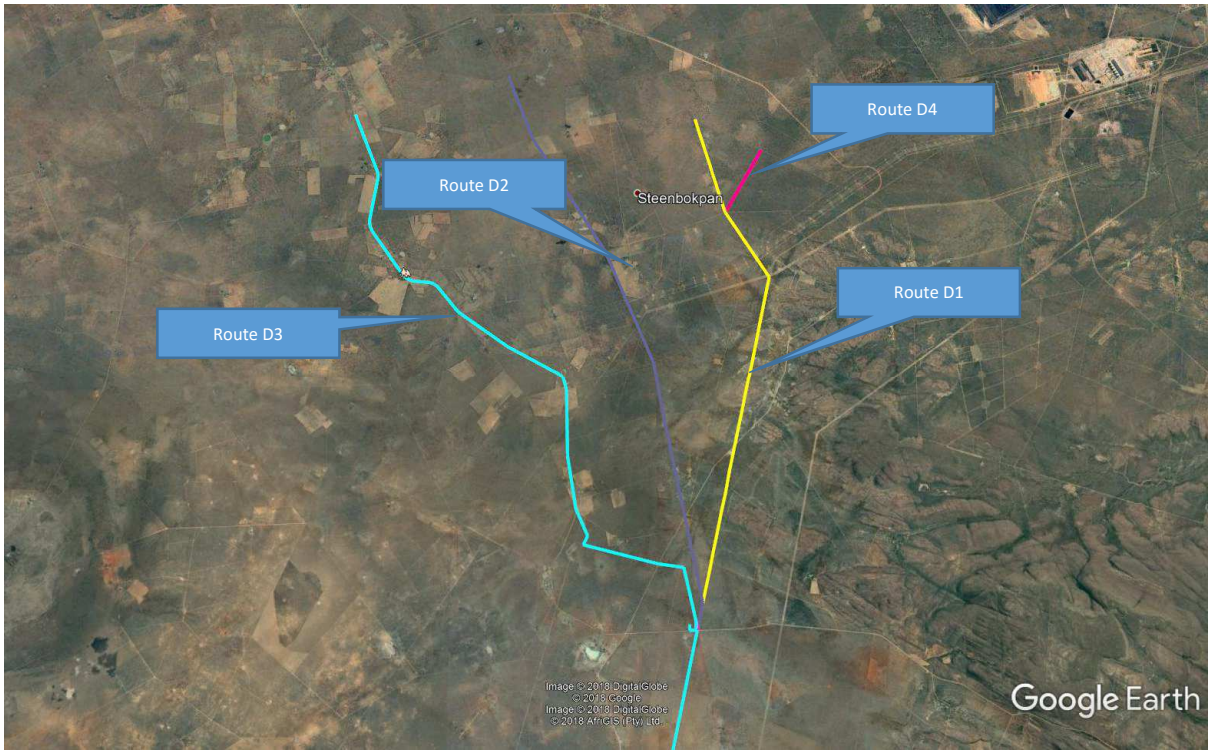

Figure 17: Northern Section of the Proposed Project

Route D1 passes, for most of its route, along a tarred road to Steenbokpan. As such it passes numerous dwellings and buildings that have been constructed along the road to allow owners and user good access. Route D2 has the same character as the central section of the proposed project, however there are more items of infrastructure along the route as it gets closer to Lephalale.

Route D3, the eastern most route continues along the railway line and veers westwards, through grazing land, to its termination point. This route passes farm dwellings close to its termination point.

Route D4, branches off from Route D1 and serves to avoid a pan in the most northern segment of D1. There is no infrastructure or buildings on the land traversed by D4 and the farm is used for grazing.

5.4.4 Summary of Impacts for Route Alternatives

Table 20 below provides a breakdown of the number of impacts (not necessarily of equal importance) for the various route alternatives. The impacts are documented in the census of impacts, contained in **Appendix 1**.

Table 20: Summary of Impacts Along Each Route Alternative

Nature of Impact	Route Alternative							
	Central	**E**	**A1**	**A2**	**C**	**D1**	**D2**	**D3**
Farm Dwellings*	1	2	1	2	7	3	4	14
Farm Buildings	7	4			2			
Orchards/Lands	2	2						
Irrigation Pivots	3							
Road Crossings	4				1			
Proximity to Road over Rail Bridge Crossing	6					1		
Proximity to Cattle/vehicle Rail Crossing	6							
Proximity to Rail level Crossing	1					2		
Rail Station	2							
Powerline Crossing	1		1			2	1	
Watering Point	1							
Totals	**39**	**8**	**2**	**2**	**10**	**8**	**1**	**14**

*Note: where uncertainty existing regarding whether a building is a dwelling or not, the building has been classified as a dwelling.

In respect of the project components and alternatives the dominant land use and land cover is as follows in Table 21 below:

Table 21: Project Components and Land Use

Project Component	Alternatives		Dominant Land Use and Cover
Vlieëpoort abstraction weir	N/A		Natural grassland and woodland.
Low-lift pumping station	N/A		Natural grassland and woodland.
Low-lift rising main	N/A		Natural grassland, woodland and cultivated land.
Balancing dam	N/A		Primarily cultivated land (including pivots). Minimal natural grassland and woodland along drainage channel.
High-lift pumping station	N/A		Cultivated land.
Pipeline		Central Route	Central Route Natural grassland, woodland & cultivated land.
		Route A1	Primarily woodland.
		Route A2	Primarily woodland with some cultivated land.
		Route B	Natural grassland and woodland.
		Route C	Natural grassland and woodland. Some cultivated land.
		Route D1	Primarily woodland with some grassland.
		Route D2	Primarily woodland with some grassland and cultivated land
		Route D3	Road based route, grassland
		Route D4	Woodland with grassland
Break Pressure Reservoir	BPR (Central Route)		Woodland
Operational Reservoir			Woodland

5.5 Stakeholder Engagement

The following stakeholder engagement was carried out as part of either the public participation process of the EIA and as part of this SEIA.

5.5.1 Contact with Directly Affected Landowners

Directly affected landowners were contacted, this was carried out as part of the Public Participation process of the Environmental Impact Assessment during the Scoping phase. This process included individual meetings with the IAP's, focus group meetings, public meetings and authority meetings of the impacted areas. During the meetings, there were socio-economic issues that were raised as resulting from the proposed project. The overall responses include the following:

- Many landowners were concerned about the **Financial Compensation** for the loss of land where the project infrastructure would be located. Most of the farmers raised issues which were related to the previous experience of being promised compensation for servitudes, but that this was never forthcoming. Impacts reported included the farm footprints where there would be physical construction and of reduced access to the landowner's farm;
- **Security concerns** were highlighted by participants. Concerns were mostly with regards to contractors having access to their properties throughout the duration of the project. Concerns were raised that the project would increase public movements which would increase the incidents of trespassing on private land;
- **Reduction of access to farmland**: landowners were concerned about the project reducing access to their land during the construction phase interfering with agricultural activities or permanent access roads cutting properties in half. This would have a knock-on effect on farm productivity;
- Concerns were raised with regards the **impact on game farms**. These impacts would occur mainly during the construction phase and would serve to deter hunters from farms whose natural features were the main drawcard to guests seeking to escape from urban settings. Other concerns included the impact on rare and valuable game during the construction phase from dust and noise;
- IAP's raised concerns about the change in **traffic conditions**. The study area consists of both tarred toads and gravel roads with the local roads being mostly gravel. The concerns around traffic were mostly directed at the heavy trucks that may have to utilise the roads, leading to long-term damage to these roads. Public safety was also highlighted since there will be an influx of construction vehicles which would make the roads more unsafe. In addition, damage to roads during the rainy seasons was raised as a concern;
- **Damage to private property** as a result of contractor action were raised as a concern, such damage would affect the operational efficiencies of farms;
- The possibility that the project would create **socio-economic** benefits was raised. This was with regards to the benefits that the project will introduce into the affected communities,

these can be in form of employment of labour for the project, the development of skills for future employment and development of the communities.

A detailed analysis of the concerns and comments during the public participations is outlined below. These concerns and comments were collected as parts of the EIA scoping phase, specialist's site visits as and consultation with the Comments and Response Report (CRR).

6 IDENTIFICATION OF IMPACTS

6.1 Impacts and Mitigation Framework

All impacts are analysed in the section to follow with regard to their nature, extent, magnitude, duration, probability and significance.

ISO 14001-2004 defines impacts as "any change to the environment, whether adverse or beneficial, wholly or partially resulting from an organization's environmental aspects".

When considering an assessment of the impacts and their mitigation, the following definitions as per Table 22 apply.

Table 22: Impact and Mitigation Quantification Framework

Nature	The project could have a positive, negative or neutral impact on the environment.
Extent	**Local** – extend to the site and its immediate surroundings. **Regional** – impact on the region but within the province. **National** – impact on an interprovincial scale. **International** – impact outside of South Africa.
Magnitude	Degree to which impact may cause irreplaceable loss of resources: **Low** – natural and socio-economic functions and processes are not affected or minimally affected. **Medium** – affected environment is notably altered; natural and socio-economic functions and processes continue albeit in a modified way. **High** – natural or socio-economic functions or processes could be substantially affected or altered to the extent that they could temporarily or permanently cease.
Duration	**Short term** – 0-5 years. **Medium term** – 5-11 years. **Long term** – impact ceases after the operational life cycle of the activity either because of natural processes or by human intervention. **Permanent** – mitigation either by natural process or by human intervention will not occur in such a way or in such a time span that the impact can be considered transient.
Probability	**Almost certain** – the event is expected to occur in most circumstances. **Likely** – the event will probably occur in most circumstances. **Moderate** – the event should occur at some time. **Unlikely** – the event could occur at some time. **Rare/Remote** – the event may occur only in exceptional circumstances.
Significance	Provides an overall impression of an impact's importance, and the degree to which it can be mitigated. The range for significance ratings is as follows- **0** – Impact will not affect the environment. No mitigation necessary. **1** – No impact after mitigation. **2** – Residual impact after mitigation. **3** – Impact cannot be mitigated.

Mitigation	Information on the impacts together with literature from socio-economic science journals, case studies and field work will be used to provide mitigation recommendations to ensure that any negative impacts are decreased and positive benefits are enhanced.
Monitoring	Monitoring usually involves developing and implementing a monitoring programme to identify deviations from the proposed action and to manage any negative impacts. The recommended mitigation measures will also include monitoring measures.

A well-designed, well implemented, well managed pipeline project expansion can bring significant socio-economic benefits to the communities that it serves. If configured or operated in a way that ignores significant socio-economic needs or potential impacts, a pipeline may have significant socio-economic costs or liabilities for the stakeholders and affected communities.

Therefore, assessing socio-economic impacts is a complex process due to the multi-dimensional nature of the human interactions. This occurs in situations where a particular impact affects a group of stakeholders differently. An inter-connection of impacts can also be encountered whereby a number of impacts are related and when assessed cumulatively, their impacts may be of significance.

The impact assessment scores both before and after mitigation were arrived at by the specialist team engaging in a modified version of the Delphi technique, where the team discussed the scores, and through a process of iteration arrived at a consensus for each of the values. Where additional information was needed to decide, the technique would be halted, the necessary information would be uncovered and included in the report, and the technique would be recommenced.

6.2 Identification of Activities and Aspects

An “Activity” is defined as a distinct process or risks undertaken by an organisation for which a responsibility can be assigned. Activities also include facilities or pieces of infrastructure that are possessed by an organisation (International Organization for Standardization, 2011).

An aspect is defined as elements of an organisation’s activities or products or services that can interact with the environment.

In order to capture the impacts associated with the proposed infrastructure, an activity – aspect – impact table was created refer to Table 23 below.

MCWAP-2A, which consists of a 100m wide corridor stretching 50m either side of the pipeline’s centre line, traverses what is mainly privately-owned property utilised for agricultural and game farming. In this sense the project will impact cultivated commercial fields, orchards and pivots found primarily in the Mooivallei area, agricultural infrastructure and facilities such as pipelines, boreholes and dams as well as sensitive game species such as exotic game. In addition to this, agricultural activities that require water for irrigation and stock watering purposes, are located downstream of the abstraction point.

Table 23 below presents an overview of the significant socio-economic impacts associated with project aspects.

Table 23: Activity, Aspects and Impacts of the Project

Activity	Aspect	Potential Impact – Positive	Potential Impact – Negative
Land and Servitude Rights Acquisition	Land Acquisition		Loss of agricultural production
			Loss of land (including structures and cultivated areas) through project infrastructure
			Impacts to smaller properties, where the servitude may affect the critical mass required to continue with the current land use (e.g. agricultural activities on Portions 1 and 2 of the Farm Mooivallei 342 KQ)
	Servitude Rights		Some restrictions on use of productive land
Scheme Operations	Water supply to Lephalale increased	Economic growth and induced impacts. Positive air quality impacts	
	Supply of goods and services to the scheme	Opportunity for local business	
		Opportunity for local labour force	
	Administration and Technical Input	Employment of local staff	
		Skills development	
Construction Phase	Access into properties		Security Concerns
			Damage to property or equipment
			Damage or wear to access roads
		Improvement of access in the project area	
	Pipeline Construction – excavation, pipe laying, backfill and rehabilitation		
		Employment of local people	
		Sourcing of equipment, machinery and services locally	
			Noise
			Temporary road closures
			Risk to game and livestock as a result of construction related hazards

Activity	Aspect	Potential Impact – Positive	Potential Impact – Negative
			Loss of income in eco-tourism sector (hunting and game farming)
			Dust
	Pumping station, Desilting Works, Vlieëpoort Weir – excavation, concrete works		Noise
			Influx of workers
		Employment of local people	
			Influx of people seeking employment and associated impacts (e.g. foreign workforce, cultural conflicts, squatting, demographic changes, anti-social behaviour, and incidence of HIV/AIDS)
		Sourcing of equipment, machinery and services locally	
			Increased traffic
	Transport of goods to site and employment of staff		Increased traffic
			Security
			Damage or wear to access roads
	Pumping station, Desilting Works, Vlieëpoort Weir – Mechanical and Electrical Works		Noise
		Employment of local people	
		Sourcing of equipment, machinery and services locally	
	Rehabilitation		Damage or wear to access roads
			Security Concerns
			Damage to property or equipment

6.3 Impact and Mitigation Assessment

Taking these impacts into account and based on the project description as well as the applicable legislation and policy and planning issues, the following socio-economic impact variables have been identified as being associated with the project. These impacts are in accordance with Vanclay's list of socio-economic impact variables (Vanclay, 2002; Wong, 2013) clustered under the following seven main categories as follows:

Health and socio-economic well-being impacts

- Annoyance, dust and noise;
- Security/Increase in crime;
- Increased risk of HIV and AIDS; and
- Personal safety, increased hazard exposure.

Quality of the living environment (Liveability) impacts

- Disruption of daily living activities; and
- Perceived quality of life.

Economic and material well-being impacts (positive)

- Increase in employment opportunities; and
- Increased opportunities for Small Medium And Micro Enterprises (SMME).

Economic and material well-being impacts (negative)

- Impacts on game farming income; and
- Loss of land for productive agriculture.

Institutional, legal, political and equity impacts

- Effect on existing infrastructure facilities and socio-economic services;
- Attitude formation towards project;
- Decreased level of community participation in decision making, loss of empowerment; and
- Compliance with municipal by-laws.

Gender relations impacts

- Cultural resistance towards women; and
- Division of labour.

These categories are not exclusive, nor fully inclusive of the project specific impacts, and at times tend to overlap as certain processes may have an impact within more than one category. For instance, changes to the division of labour, as discussed under the category gender relations, will also have an impact on the family and community. In much the same manner increased demand on existing infrastructure, facilities and social service, addressed under the category institutional, legal, political and equity, will have some bearing on the quality of the living environment.

With regard to similar infrastructure as the MCWAP-2A most socio-economic impacts are experienced during the construction phase, as this is when construction related activities, relating to the influx of

labour and the use of heavy machinery and explosives occurs. The various socio-economic impacts under the categories listed above are addressed below as they apply across the construction and operational phases of the project.

6.3.1 Health and socio-economic well-being

The health and socio-economic wellbeing impacts related to the project include:

- Annoyance, dust and noise;
- Security/Increase in crime;
- Increased risk of HIV and AIDS; and
- Personal safety, increased hazard exposure.

Annoyance: dust and noise

Annoyance through dust and noise will be more prominent during the construction phase of the project as construction activities will result in the generation of dust and noise due to the operation of construction vehicles and equipment. These impacts will be of a temporary nature. However, in this regard a number of I&APs have raised their concerns for instance at a public meeting on the 25 May, 2016 a landowner mentioned that:

" *…he has exotic game on his farm which will be adversely affected by dust, noise and light pollution during the construction period.*"

While another indicated on a reply form dated 24 June 2016 that:

"*Our business includes hunting (overseas clients) and breeding of exotic wildlife. Any air, light or noise pollution and dust have a direct impact on our business*."

In a letter sent on 10 April, 2018 regarding Buffelsvley it was also indicated:

"*Dust and noise caused by personnel, vehicles and equipment will have a definite effect on the overall stress levels of the animals*."

The generation of dust stems from construction phase activities such as earthworks, excavations, and vehicle movement. This situation will be worst during the dry season and during windy periods. Air borne particulates may pose a hazard to residents in the vicinity or downwind of the construction site. Mitigation through dust suppression methods will allow for this impact to be effectively managed.

During the construction, heavy equipment will be required for site clearance, excavations and backfilling. Noise generation will be unavoidable. The degree of noise, frequency of noise and individual perception are all important considerations when determining the impact on noise. Drilling; blasting and construction activities will also create noise pollution. Adequate warning of high noise events such as blasting should be communicated to the affected communities prior to carrying out the activities.

Annoyance through dust and noise during the operational phase of the project are likely to be minimal as it will be associated with sporadic maintenance and repair activity stretching over the lifespan of the project.

Security/Increase in crime

During construction there will be an influx of construction workers into the area and this may raise concerns amongst local communities who fear that crime levels will increase as a result of this influx of workers. In this regard the following concerns have been raised and comments made:

"*The impact during construction on all facets such as security, dust, noise, workers, disturbance to the environment and impact on all aspects of the project and surrounding environment as a whole*." (Letter dated 17 May, 2015).

At the public meeting, 26 May, 2016:

"[c]*oncerned about the security risks posed to landowners by the project*."

And the following comment was made:

"*How will the security of landowners be ensured during the operational phase of the project. Noted the various security problems experienced due to poor practices by Eskom. It is requested that the relevant members of the operational team also attend the Community Security Meetings.*"

In a reply form dated 10 April, 2018 a land owner pointed out that:

"*[t]his raises major concerns around our security – and the possibility of an increase in crime and poaching – Presently –zero problems experienced over the past 9 years.*"

Apart from this, there is a risk that actual crime levels may also rise due, not only to the influx of construction workers and job seekers, but also as a result of an increase in other informal enterprises attracted to the area by the opportunities and perceived opportunities generated through construction activities. Amongst the more legitimate activities certain illegitimate activities such as prostitution could arise. In this regard it has been well documented that construction activities attract prostitution (Meintjes, Bowen, & Root, 2007), particularly in areas with high poverty.

Mitigation measures include the project proponent/implementer, prior to construction, agreeing with farmers on appropriate access points to ensure the safety of the businesses, livestock and residents. A security policy must be drafted and strictly enforced by the contractors; this would include a requirement to obtain landowner permission prior to entering any property.

Increased risk of HIV and AIDS

There is an increased risk associated with the gathering of construction workers in a concentrated area and the availability of disposable income which may attract prostitution. In this regard the World Bank (Gender in Agriculture Sourcebook, 2009, pp. 367-368) indicates that there is a strong link between infrastructure projects and health as:

"Transport, mobility, and gender inequality increase the spread of HIV and AIDS, which along with other infectious diseases, follow transport and construction workers on transport networks and other infrastructure into rural areas, causing serious economic impacts."

Personal safety and hazard exposure

The use of heavy equipment and vehicles and an increase in vehicle traffic within the vicinity of all construction sites will result in and increased risk to the personal safety of people and animals. Of particular concern are increased hazards faced by pedestrians, cyclists and motorists with emphasis being placed on vulnerable groups such as children and the elderly. There will also be an increased risk of fires brought about due to construction workers lighting fires to cook and for warmth during cold periods. A large part of the project traverses areas that are covered with thick vegetation and that have game which increases the need to ensure that the lighting fires is strictly controlled and carefully monitored in an effort to reduce the risk of fire associated with the project.

During the operational phase of the project these risks are likely to be minimal although there may be some risk of fires associated with maintenance teams, particularly during the winter months.

As a result of the analysis above, Table 24, the following impact/mitigation table has been generated.

Table 24: Health and Socio-Economic Well Being Impact/Mitigation Table

Environmental Feature	Health and Socio-Economic Well Being
Project life-cycle	Construction Phase
Potential Impact	Proposed Management Objectives / Mitigation Measures
Annoyance: dust and noise	• Apply dust suppression reduction mitigation measures to vehicle movements, open areas and excavations.
	• Speed restrictions should be applied to unsurfaced roads.
	• Prior notice should be given to surrounding communities of blasting events.
	• Construction work should take place during working hours – defined as dawn until dusk on weekdays and dawn to 15:00 on Saturdays. Should overtime work be required, that will generate noise, consultation with the affected community or landowner should take place.
Security/Increase in crime	• Ensure that construction workers are clearly identifiable. All workers should carry identification cards and wear identifiable clothing.
	• Fence off all construction sites and control access to these sites.
	• Clearly mark any hazardous areas and regularly monitor these areas to ensure that they are avoided by people and animals.
	• Liaise with the South African Police Services (SAPS) and Community Policing Forums to ensure that construction sites are monitored.
	• Encourage local people to report any suspicious activity associated with the construction sites.
	• Prevent loitering within the vicinity of the construction camp as well as construction sites.
	• A security policy should be developed which amongst others requires that permission be obtained prior to entering any property and provisions controlling trespassing by contractor staff.

	• Only security staff should be allowed to reside at contractor camps.
Increased risk of HIV and AIDS	• Ensure that an onsite HIV and AIDS policy is in place and that construction workers have easy access to condoms.
Personal safety and increased hazard exposure	• Ensure all construction equipment and vehicles are properly maintained at all times.
	• Ensure that operators and drivers are properly trained and make them aware, through regular toolbox talks, of any risk they may pose to the community. Place specific emphasis on the vulnerable sector of the population such as children and the elderly.
	• Ensure that fires lit by construction staff are only ignited in designated areas and that safety precautions, such as not lighting fires in strong winds and completely extinguishing fires before leaving them unattended, are strictly adhered to.
	• Ensure all construction equipment and vehicles are properly maintained at all times.
	• Follow mitigation measures recommended in the appropriate specialist report/s
	• Put in place a monitoring system to monitor health risks throughout the life of the project
	• Ensure that there is broad based representation, capable of serving both community and company interests in respect of the monitoring facility referred to above

	Nature	Extent	Magnitude	Duration	Probability	Significance
Before Mitigation	Negative	Site	Moderate	Short term	High	2
After Mitigation	Negative	Site	Low	Short term	Medium	1
Significance of Impact and Preferred Alternatives	This impact is a significant concern for landowners, especially security during the construction phase. Mitigation measures are based upon control of the works on site and are effective when structures are in place to monitor contractor performance. This mitigation measure does not influence the choice of alternatives considered in the study.					

6.3.2 Quality of the Living Environment

The following quality of the living environment impacts are related to the project.

- Disruption of daily living activities; and
- Perceived quality of life.

The construction of the pipeline and water transfer infrastructure will result in some disruption in the vicinity of the construction sites, along the pipeline and in association with the borrow pits. In this regard there is likely to be disruption of daily living activities associated with construction, however, during the operational phase most activities can continue above the pipeline. For instance, farming activities can continue above the pipeline as long as they comply to certain requirements such as building restrictions and restrictions on crop types such as large trees.

The construction of the pipeline can reduce access to grazing lands, although in this case most of the route follows the edges of farm boundaries and don't generally bisect farm portions. Examples of such

construction phase reduced access include disruption of the access across the railway line. Whilst the pipeline is being constructed in the vicinity of underpasses or level crossings, the free movement of cattle or vehicles may be affected. This affect would only occur during the construction phase, with operational phase impacts only occurring if long sections of pipelines would have to be replaced.

In this regard, mitigation measures that allow for alternative access during construction and for restrictions on the duration of works in affected areas are recommended.

The above mitigations apply for properties where access to the property would be impacted by pipeline construction. This impact can be effectively managed to ensure continuous access throughout construction for all affected properties.

Once access to a property is granted, mitigation measures should be taken to ensure that any damage that is caused as a result of this access is made good. This includes damage to infrastructure such as fences, gates, electrical connections or roads and to crops.

Where there is a risk of damage occurring, the contractor is to document the condition prior to the start of work. If the condition has deteriorated after the completion of the work, any such damage should be made good. Landowner signed off that the damage has indeed been rectified satisfactorily should be obtained.

With the high level of construction activities occurring within the area the perception may emerge that the quality of life associated with a rural setting may be disturbed. This may be reinforced during the construction phase of the project if communities are inconvenienced in that their movement patterns and consequently their daily living environment are disrupted.

Over the operation phase of the project the impact of the pipeline will be low since the infrastructure will be out of sight, however, there is likely to be a visual impact in respect of certain of the project components such as the abstraction and gauging weirs, pumping stations, sedimentation works and balancing reservoir. However, this impact will only be perceived by people in the close vicinity of the Mooivallei area.

As a result of the analysis above, the following impact/mitigation table (Table 25) has been generated.

Table 25: Quality of the Living Environment Impact/Mitigation Table

Environmental Feature	Quality of the Living Environment
Project life-cycle	Construction Phase
Potential Impact	Proposed Management Objectives / Mitigation Measures
Disruption of daily living activities	• Ensure that, at all times, people have access to their properties as well as to social facilities such as schools, churches, transport, shops, etc..
	• Investigate and consult farmers and local communities on the need to provide suitable access points around the construction sites for people and animals.
	• An access survey should be carried out prior to working in a new section of the project and access arrangements should be discussed and agreed to by the landowner.

Damage to property once access is granted	• If a risk existing of damage taking place on a property as a result of construction, a condition survey should be undertaken prior to construction.
	• The contractor is to make good and acknowledge any damage that occurs on any property as a result of construction work.
	• The farmer should be suitably compensated for any loss of income experienced on the account of the contractor.

	Nature	Extent	Magnitude	Duration	Probability	Significance
Before Mitigation	Negative	Site	Moderate	Short term	High	2
After Mitigation	Negative	Site	Low	Short term	Medium	1
Significance of Impact and Preferred Alternatives	The impact on access to properties is a significant concern which can be managed through the recommended mitigation measures. This mitigation measure does not generally influence the choice of alternatives considered in the study and should be applied to all of the route options. In the northern section of the proposed project, Route Alternative D1 is the route that will result in the least disruption to daily living of the three route alternatives. In the southern section of the pipeline, route Alternative E may result in a lower impact on the project than the central route. Both Alternative E and the central route may be optimised during the tender design phase of the project to reduce the impacts as far as possible.					

6.3.3 Economic and material well-being (positive)

The positive economic and material well-being impacts associated with the project include:

- Provide a greater water supply to Lephalale, which will underpin economic growth;
- Influence on construction activity in the regional economy;
- Increase in employment opportunities; and
- Increased opportunities for SMMEs.

The project will create activity in the construction sector of the regional economy. The impact in Thabazimbi will be larger than that in Lephalale owing to Thabazimbi's smaller construction sector, which is currently at R302 million (2010, real pricing). Employee compensation in the construction sector in the regional economy, currently at R605 million will be impacted by the project. The project has the benefit of moving towards construction as the works at Medupi Power Station are winding down.

The project will result in the creation of directly related jobs during both the construction and operational phases. The regional study area's labour pool comprises approximately 45% of low skilled and informal sector workers, and there will be opportunity for employment uptake from this grouping. A further 46% of the regional labour force is semi-skilled, skills that could be deployed to the project.

It should be noted here that the impact of the project during construction, where its peak labour force will be 650 staff, is small compared to the size of the regional labour force and the population of the region.

The official youth unemployment rate in the region is higher than the general unemployment rate, at 27%. This project has the potential to impact positively on this rate should employment practises targeted at workers (male and female) under 35 years old be adopted.

The high proportion of impoverished and vulnerable households in the local study area proved an imperative for localisation of the construction phase. It is recommended that the appointed contractor use local SMME's and local labour as far as possible during the construction phase to enhance any local economic impact. In addition, this would increase the skills in the area after construction is completed.

In order to break the poverty cycle of the local study area additional skills are required within the workforce. It is therefore important that the project workers under-go skills development when during the construction phase.

Jobs created during the operational phase of the project will be limited when compared to the construction phase, but the indirect economic effects of the increased water supply to the region will have a positive influence of employment in the region.

Thus, that project will increase the number of economic opportunities available during both the construction and operational phases. Economic opportunities will range from the supply of labour and skills to the project, an increase in wholesale and retail trade in the regional economy and a positive impact on the construction activity in the economy.

To ensure that economic activity derived from the project is localised as far as possible, measures should be adopted to increase local procurement of the human resources and procurement.

As a result of the analysis above, the following construction phase impact/mitigation table (Table 26) has been generated.

Table 26: Construction Phase Economic Well Being (Positive) Impact/Mitigation Table

Environmental Feature	Economic and material well-being (positive)
Project life-cycle	Construction Phase
Potential Impact	Proposed Management Objectives / Mitigation Measures
SMME Development	• Local SMMEs should be given an opportunity to participate in the construction of the project through the supply of services, material or equipment.
	• A procurement policy promoting the use of local business where possible, should be put in place and applied throughout the construction and operational phases of the project.
Job Creation and Skills Development	• The main contractor should employ non-core labour local study area as far as possible during the construction phase.
	• The principles of Expanded Public Works Programme can be used for guiding construction phase local employment.

	• Women should be given equal employment opportunities and encouraged to apply for positions.					
	• A skills transfer plan should be put in place at an early stage and workers should be given the opportunity to develop skills which they can use to secure jobs elsewhere post-construction.					
Indirect Employment Impacts	• Spaza/informal trader shops may open next to the site as a consequence of construction. These should be controlled by the contractor to limit their footprint and to ensure that the local Municipalities – Informal Trading By-laws are complied with.					
	Nature	Extent	Magnitude	Duration	Probability	Significance
Before Mitigation	Positive	Regional	High	Long Term	Likely	3
After Mitigation	Positive	Regional	High	Long Term	Likely	3
Significance of Impact and Preferred Alternatives	Individuals who will benefit during the construction phase are limited to those who actively participate in the construction activity through employment, sub-contracting or other economic opportunities. This mitigation measure does not influence the choice of alternatives considered in the study.					

As a result of the analysis above, the following operational phase impact/mitigation table (Table 27) has been generated.

Table 27: Operational Phase Economic Well Being (Positive) Impact/Mitigation Table

Environmental Feature	Economic and material well-being (positive)					
Project life-cycle	Operational Phase					
Potential Impact	Proposed Management Objectives / Mitigation Measures					
Economic	• Increased water supply provides an economic input that supports economic growth;					
Social Benefits	• Positive Impact on air pollution through the reduction in air emissions at the Medupi and Matimba Power Station					
	Nature	Extent	Magnitude	Duration	Probability	Significance
Before Mitigation	Positive	Regional	High	Long Term	Likely	3
After Mitigation	Positive	Regional	High	Long Term	Likely	3
Significance of Impact and Preferred Alternatives	Mitigation is not necessary for this positive impact. This mitigation measure does not influence the choice of alternatives considered in the study.					

6.3.4 Economic and material well-being (negative)

There are indirect impacts from the project that may have economic impact. Impacts in this class for the project are:

- Loss of productive land as the direct result of construction. This includes the land on which the pumping station and desilting works will be constructed, the Break Pressure Reservoir, the Operational Reservoir, borrow pits and the pipeline's manholes and scours;
- Damage to Property once access is granted;
- An impact on land values; and
- A loss in business revenue owing to pipeline construction discouraging visitors.

Loss of productive land

The implementation of the proposed project will have an impact on landowners in that land would need to be acquired, and servitudes registered for the various project components. Landowners would have a marginally reduced land area to generate income and servitude conditions are likely to restrict the existing use of land.

The land where project components are proposed to be located will have a negative impact on agricultural productivity and will impact upon the value of the land. In these cases, compensation will be required for all affected landowners. Those landowners who will be directly affected should be compensated for the land, immovable assets and loss of business. Landowners who will be impacted upon by the project proponent acquiring a servitude over their land should be compensated for the servitude rights.

The project proponent is responsible for land and rights acquisition. It should ensure that this process is conducted in accordance with prevailing RSA legislation. This process should be undertaken following project authorisation but should be concluded prior to the start of construction. Similarly, servitudes would have to be negotiated with the landowner and settled in terms of the prevailing RSA legislation.

The Mooivallei area of the project, to the south where the principal project infrastructure is located, is the area where the highest direct economic impact of the project will be on landowners. This area is shown in the images in Figure 18 below.

Mooivallei Area

Figure 18: Area of High Direct Land Impact

Land Values

A number of concerns have been raised by various IAPs regarding the negative impact that the project may have on the value of their properties as well as on their income and livelihoods.

In this regard in a reply form dated 24 June, 2016 it was indicated by a land owner that:

"*It is thus our general feeling that the pumping station is going to negatively influence us and that we will lose income. In addition, our property value will depreciate.*"

Another land owner (14 June, 2016) listed a series of issues that he feels will negatively affect the value of his property. Amongst which are:

"*1. Pollution, noise and spoiling of the current view.*

2. Effect on the tourism industry.

3. Create permanent staff accommodation.

4. Farm boundary is approximately 300 m from the proposed site – effect of noise from construction and future activities. …

5. Loss of aesthetical value.

6. Theft of goods and wildlife by staff or their connections.

7. Thoroughfare.

8. Day visitors.

9. Increase in life risks.

10. Reduce the exclusivity of the farm and thus also the property value.

11. The value of our property is greatly dependent on its tourism value, which will be adversely affected by the above-mentioned issues and impact. The development potential of the farm portions nearest to the site where construction will take place can be negatively affected which could reduce the property value. Compensation through assisting with the construction of alternative structures and landscaping."

The routing of the pipeline provides an example of the conflict between the public good and private interests. Provisions in South African law allow the establishment of a servitude for the use of the project proponent, whilst still preserving the ownership of the land with the landowner. The proponent thus has rights over the land that exceeds those claimed by the landowner. This trade-off is negotiated between the proponent and the landowner and involves the payment to the landowner of a sum of money in compensation for the land rights. In the event that agreement cannot be reached, the state does have the right to acquire the land. This power exists to ensure that landowners who are in the path of proposed public utilities do not have the power to hold the project to unreasonable ransom and to ensure that the public good trumps individual rights.

The central question therefore is the value of the compensation that is to be paid to the landowner for the servitude rights. This value depends upon:

- the area of the servitude;
- the land uses which are permissible after the servitude has been registered; and

- the impacts that the servitude rights will have on the productive capacity of the land.

International research into the impact of oil and gas pipelines provide pointers as to the potential impacts of such projects on property values. In the following discussion it should be borne in mind that oil/gas pipelines convey odorous, flammable and potentially explosive fuels, therefore property value impacts may have a hazard and odour dimension that is not present with water pipelines. Thus, the impact on property value by water pipelines should have a lesser impact than oil/gas pipelines.

One recent study was carried out in the United States of America in 2016 by the Interstate Natural Gas Association of America (INGAA) Foundation. The INGAA Foundation is a trade group representing pipeline operators and the study was carried out by Integra Realty Resources, Inc. Integra Realty Resources advertises itself as the most comprehensive property valuation and consulting service in the United States. The study itself was carried out to the Uniform Standards of Professional Appraisal Practice (USPAP) promulgated by the Appraisal Standards Board and was carried out by a professional valuer. The study compared property values of suburban and small holding properties with pipeline servitudes registered over them, with similar properties with no such servitude. The study was carried out over six different geographic areas with varying pipeline sizes. The methodology compared the house prices of properties directly over a pipeline, with those nearby that were not directly over the pipeline.

The study revealed that the proximity to a natural gas pipeline had no measurable impact on the sales price of a property, nor did it have an impact upon the further housing development of any of the study areas. This conclusion indicates the impact of oil/gas pipelines in the United States of America and the study conclusions can be extended to apply to the current project.

This conclusion does not replace the function of the land valuer when valuing land for servitude requirements and other requirements, to obtain an objective basis for servitude acquisition.

With regards to land values and compensation for the use of a servitude, impacts and mitigation should consider the following categories of concern:

- maintenance access during operation;
- larger relative impacts on small properties than on large farms; and
- degree to which productive land is lost and consequent economic impact.

Recreational or Tourism Business Impacts

Eco-tourism and leisure impacts through the construction phase of the pipeline are generally limited to the impacts on game farms and associated accommodation and facilities. Game farming, when associated with tourism and leisure, derives its economic value from allowing the tourist to escape to nature, with a focus upon viewing or hunting game. This value proposition generally targets upper income earners, who place value on a rural sense of place and being in an environment that is as close to natural as possible. When this is not being offered, the value proposition decreases and the affected game farm would have to adjust it's offering to the market to remain competitive.

Pipelines can impact upon this rural idyll during construction, but since they are laid out of sight, the impact is limited to the construction phase.

There are other impactors, which have the same effect as that of pipeline construction, these include noise from major roads, the access arrangements onto each game farm and the facilities and amenities that the game farm offers. Each of these has the ability to reduce the rural and undeveloped sense of place.

A further consideration is the market niche that the game farm operates in. The game viewing or hunting experience can range from a basic package, where the accommodation, game viewing opportunities and experience fit the budget of the tourist, to a very up market package where high prices are charged for the perfect rural (and luxurious) experience. The sensibilities of the different type of tourist are affected differently depending upon the market offering by the game farm. It is suggested that the visual impacts and physical presence of pipeline construction will be felt at the higher end of the market.

Construction phase impacts include the loss of income or reputation when construction crews come into contact with tourists seeking an unspoilt natural environment. Impacts associated with construction crew actions, resulting in the loss of stock or equipment should also be considered.

Hence the route planning, but more importantly, the management of the construction process adjacent to sensitive receptors such as high-end game farms, should be carried out to have as little impact as possible on the tourism and leisure industries.

As a result of the analysis above, the following impact/mitigation table (Table 28) has been generated. It applies to the planning phase of the proposed project.

Table 28: Planning Phase Economic Well Being (Negative) Impact/Mitigation Table

Environmental Feature	Economic and material well-being (negative)
Project life-cycle	Planning Phase
Potential Impact	Proposed Management Objectives / Mitigation Measures
Loss of productive land or Business Value	• All negotiations and payments relating to compensating affected landowners should be conducted and concluded before construction begins.
	• The loss of productive land or of business value is handled in terms of prevailing RSA legislation. In this regard, please refer to Section 9.13: Land Acquisition of the environmental impact assessment
Acquisition of Servitude Rights	• All payments relating to the acquisition of servitude rights should be conducted and concluded before construction begins in terms of prevailing RSA legislation.

	Nature	Extent	Magnitude	Duration	Probability	Significance
Before Mitigation	Negative	Local	High	Medium Term	Moderate	2
After Mitigation	Negative	Local	Low	Short Term	Un-likely	1

Significance of Impact and Preferred Alternatives	This impact is significant if left un-addressed, and the impact can be successfully managed through programming of construction and management of pipe laying in areas adjacent to high risk areas. The costs for land acquisition and the number and length of servitudes that need to be acquired is considered a technical project aspect that does not fall within the scope of a socio-economic study.

As a further result of the analysis above, the following impact/mitigation table (Table 29) has been generated. This table applies to the planning phase of the proposed project.

Table 29: Construction Phase Economic Well Being (Negative) Impact/Mitigation Table

Environmental Feature	Economic and material well-being (negative)
Project life-cycle	Construction Phase
Potential Impact	Proposed Management Objectives / Mitigation Measures
Recreational or Tourism Business Impacts	• Agreement should be reached with each impacted landowner regarding the construction programme and impacts on the property during construction. Where possible in terms of the overall construction programme construction could be scheduled during low tourist season on affected game farms. Agreements made prior to construction with respect to property access, the duration of construction and the impacts on the land should be adhered to by both the landowner and the contractor.
	• For safety reasons, hunting should halt when pipeline construction is ongoing in relevant areas. As far as possible construction should be carried out along game farms during off-peak tourism periods.
	• Construction adjacent or alongside game farms should be restricted as to the lengths of open trench that is permitted. This length should be reduced to as short as practicable and cost effective.

	Nature	Extent	Magnitude	Duration	Probability	Significance
Before Mitigation	Negative	Local	High	Short-Term	Likely	2
After Mitigation	Negative	Local	Low	Short Term	Likely	1
Significance of Impact and Preferred Alternatives	This impact is significant if left un-addressed, and the impact can be successfully managed through the payment of compensation for the loss of land and land rights in terms of prevailing legislation. This impact can be reduced by choosing route alternatives which involve the lowest property impacts. In this regard, in the northern section, route D1 is preferred. This route follows the railway line for longer than the alternatives and impacts upon fewer houses than the alternatives. In the southern section of the pipeline, route Alternative E may result in a lower impact on the project than the central route. Both Alternative E and the central route may be optimised during the tender design phase of the project to reduce the impacts as far as possible. In the central section of the proposed pipeline the central route is preferred over route alternative C owing to its more direct path to the railway line and its impacting upon fewer houses along the adjacent road.					

	The study does not show any preference between route alternative A1, A2 and the central route in that area. The socio-economic impacts of each alternative are equal. The costs for land acquisition and the number and length of servitudes that need to be acquired is considered a technical project aspect that does not fall within the scope of a socio-economic study.

6.3.5 Cultural impacts

The pipeline transverses a number of farms and residential areas and it is quite possible that a number of heritage and burial site may be disturbed as a result of the project. This impact is likely to be most prevalent during the construction phase of the project.

The socio-economic consequences of this will need to be considered in accordance with the finding of the heritage study.

As a result of the analysis above, the following impact/mitigation table (Table 30) has been generated.

Table 30: Cultural Impacts Impact/Mitigation Table

Environmental Feature		Cultural Impacts				
Project life-cycle		Construction Phase				
Potential Impact		Proposed Management Objectives / Mitigation Measures				
Heritage		• Maintain a high level of awareness on site with regards the excavation or unearthing of heritage artefacts and of the possibility of burial sites.				
		• Training of the workforce in this regard should be conducted.				
		• Follow the mitigation measures suggested by the Heritage Specialist.				
	Nature	Extent	Magnitude	Duration	Probability	Significance
Before Mitigation	Negative	Site	Moderate	Long term	Unlikely	2
After Mitigation	Negative	Site	Low	Long term	Unlikely	1
Significance of Impact and Preferred Alternatives	The impact on local study area cultural practises is low and mitigation measures suggested by the heritage specialist consultants should be followed. The impact has no impact on alternative route selection.					

6.3.6 Family and community impacts

The workforce will be recruited from the regional study area, consequently the influx of construction workers is limited both in terms of numbers and duration, and any disruption to family structures and social networks is most likely to be limited.

During the operational phase of the project there will be no significant influx of workers at any of the sites.

6.3.7 Institutional, legal, political and equity

The institutional, legal political and equity impacts associated with the project include:

- Effect on existing infrastructure facilities and socio-economic services;
- Attitude formation towards the project;
- Decreased level of community participation in decision making, loss of empowerment; and
- Compliance with municipal by-laws.

Effect on existing infrastructure facilities and socio-economic services

The pipeline construction passes along rail, road and powerline servitudes. This raises the risk that the project may damage this infrastructure during construction. This would impact road, rail and power users in the region.

Consequently, it is important that the project proponent identifies all existing infrastructure associated with the project and implements a plan to reduce any risk of damage to this infrastructure and to ensure that any damage that may occur to existing infrastructure is swiftly repaired. This will need to be done in association with the appropriate authorities who are the custodians of the infrastructure concerned.

Decreased level of community participation in decision making, loss of empowerment

Although there does not seem to be any significant attitude forming towards the project it is still important for the project proponent to ensure that a communication channel is created between the project proponent and the general public. Any reasonable public concerns will need to be addressed through a transparent and swift process. The Public Participation Process (PPP) provides a channel through which stakeholder can engage with the project proponents and environmental and social compliance consultants to ensure that they have input in respect of decisions affecting them and needs to be carefully and thoroughly planned.

Compliance with municipal by-laws

It is important that the applicable municipal by-laws are understood and complied with to ensure that the environment and the public remain safe and secure. This is particularly important with regard to construction sites that are in close proximity to populated areas and in respect of:

- Control of public nuisances;
- Disaster management;
- Emergency services;
- Environmental;
- Fencing and fences;
- Planning;
- Municipal roads;
- Noise pollution; and
- Refuse removal, refuse dumps and solid waste disposal.

As a result of the analysis above, the following impact/mitigation table (Table 31) has been generated.

Table 31: Institutional, Legal, Political and Equity Impact/Mitigation Table

Environmental Feature	Institutional, Legal, Political and Equity
Project life-cycle	Construction Phase
Potential Impact	Proposed Management Objectives / Mitigation Measures
Effect on existing infrastructure facilities and social services	• Liaise with all relevant services providers such as the district and local municipalities, South African National Roads Agency Limited (SANRAL) and the water authorities in the area to ensure that any disruption to existing infrastructure is limited.
	• Liaise with property owners to ensure that existing infrastructure is recorded and any damage repaired satisfactorily or compensated for.
	• Provide a channel through which communities can route grievances or concerns regarding service disruption as a result of the project.
	• Swiftly address any grievance raised concerning service disruption as a result of the project in a transparent manner.
	• Regularly monitor the effect that the project has had on existing infrastructure facilities and social services within the host community.
Attitude formation towards project	• Promptly deal with any raised expectations amongst communities regarding perceived benefits associated with the project, through a process of communication and consultation.
	• Promptly address any concerns raised by the public in a transparent manner.
	• Where necessary always provide prompt and clear feedback to communities.
	• Include all relevant community members in decisions affecting them.
Compliance with municipal by-laws	• Ensure that all municipal by-laws are complied with.

	Nature	Extent	Magnitude	Duration	Probability	Significance
Before Mitigation	Negative	Site	Moderate	Short term	High	2
After Mitigation	Negative	Site	Low	Short term	High	1
Significance of Impact and Preferred Alternatives	The impact on project progress could be significant if grievances are not addressed. This can be effectively mitigated through the establishment of a grievance procedure and adherence to local by-laws The impact has no impact on alternative route selection.					

6.3.8 Gender relations

Gender refers to the characteristics attributed to males and females by society and is associated with available power and resources. These characteristics, together with the associated power and resources, vary widely between cultures and tend to change over time. The gender relationships associated with the project may include.

- Cultural resistance towards women; and
- Division of labour.

<u>Cultural resistance towards women</u>

Although equal access to employment across gender lines is a recognised right, the application of this right is often executed without careful consideration of the factors that may frustrate this right amongst women in the workplace. In this regard women are often subjected to cultural factors within the workforce from both peers on the job and from management who may resist both employing and promoting women, often based on cultural prejudices. Consequently, the International Labour Organisation points out that:

"Societies therefore have an obligation to create conducive socio-economic environment for all their citizens to be able to exercise their right to work, fully utilizing their human potential. Furthermore, evidence has shown that when women are employed and have their own income in their hands, there exist both direct and indirect socio-economic benefits for themselves and their households" (Otobe, 2014, p. 1).

With the employment of women during the construction and operational phases of the project it is important to ensure that cultural factors do not hinder the process of employing women and ensuring that they enjoy equal opportunities to men in the workforce.

Division of labour

Following on from the above, the division of labour is a critical aspect that will also lead to various impacts during both the construction and operational phases of the project. During the construction and operational phases of the project women will be integrated into the workforce, however, this will come with various challenges. Women and men work on different tasks, have different biological, sex, gender and health needs, and have different roles within the family, all of which need to be considered in order to create a workplace, without discrimination, that is accessible to both women and men on an equal basis (World Health Organization, 2006).

In introducing women into the workforce it must be noted that women are over-represented amongst the poorer sectors of society, particularly within the more rural communities, and under-represented, both vertically in terms of responsibility and seniority as well as horizontally in respect of certain functional areas and job categories (Otobe, 2014, p. 22). This is especially the case in the local project area where the proportion of women to men is higher than the provincial average. Thus, the potential labour force is dominated by women.

As a result of the analysis above, the following impact/mitigation table (Table 32) has been generated.

Table 32: Gender Relations Impact/Mitigation Table

Environmental Feature	Gender Relations
Project life-cycle	Construction Phase
Potential Impact	Proposed Management Objectives / Mitigation Measures
Cultural resistance towards women	• Sensitise staff in respect of gender sensitive issues that are pertinent to the workplace.
Division of labour	• Ensure gender inclusivity and equity with respect to all compensation.
	• Prioritise gender inclusivity and equity in access to resources, goods, services and decision making with the aim of empowering women.

	• Promote equal job opportunities for women and men during the construction and operational processes.
	• Prioritise and articulate gender inclusivity and equity in the project documents by including specific strategies and guidelines for implementation.
	• The project documents should also include clear mechanisms through which the actual implementation of the activities and the impact on the ground can be monitored and evaluated.
	• Develop a grievance procedure to specifically address gender matters.
	• Factors such as culture should be considered when planning for gender activities since they play a great role in influencing gender relations.

	Nature	Extent	Magnitude	Duration	Probability	Significance
Before Mitigation	Negative	Site	Moderate	Short term	High	2
After Mitigation	Negative	Site	Low	Short term	High	1
Significance of Impact and Preferred Alternatives	The impact on project equity promotion would be moderate if this impact were not addressed. This can be effectively mitigated through policy and implementation of policy. The impact has no impact on alternative route selection.					

6.4 Impacts during the Construction Phase

The construction activity will impact the socio-economic environment both positively and negatively. Given the nature of the project area, construction activity is likely to cause a number of social nuisances as well as possible economic implications on the communities and commercial activities.

Cumulative impacts can be both positive and negative. Cumulative impacts refer to the impacts that are incremental on the environment that results from the impacts of the proposed action when added to the existing and foreseeable future actions. These impacts can also be temporary in nature (by being restricted to the construction phase) and permanent (occurring in both the construction and operation phase).

6.4.1 Economic Opportunity

The high number of impoverished households shows that there are vulnerable communities in the study area. It is recommended that the appointed contractor use local SMME's and local unskilled labour as far as possible during the construction phase to enhance any local economic impact. In addition, this would increase the skills in the area after construction is completed.

In this way project revenue will stay in the area, raising economic activity and increasing welfare, resulting in induced economic opportunity. In South Africa, most employment is generated through small and medium business. Given the size of the proposed project, should contracts between local SMMEs be implemented, it is likely that there will be an increase in employment by SMMEs for the duration of the contracts.

In particular, the project has the potential to create a number of opportunities for existing and new local SMMEs. These opportunities range from site clearing, to fencing, parts of the construction scope and supply of materials. There are also opportunities for community members to provide labour, catering, accommodation and other services to the new workers.

Where possible, the project proponent should support and encourage the development of SMMEs and local or regional suppliers in line with government policy.

Education levels provide an indication of the level of skill in the community and the degree to which skills can be skilled. Rural and less developed areas are mostly defined by poverty, while poverty is associated with poor education outcomes.

Attempts to break the poverty cycle of the project areas will require more than secondary school education. Higher education or further skills training is required. It is therefore important that the community members under-go skills development. It is also recommended that the project proponent institute a skills development program during construction.

The project proponent should monitor the employment process. Employment audits should be conducted. It is important that women are also provided employment opportunities. Audits should pay attention to the employment process of women to ensure that exploitation does not take place.

6.4.2 Noise and Dust

During the construction phase communities may be exposed to increased dust, noise, visual and other nuisance disturbances.

The generation of dust stems from activities such as earthworks and as well as vehicle movement during the construction phase. This situation will be worst during the dry season and during windy seasons. Air borne particulates may pose a hazard to residents in the vicinity or downwind of the construction site that suffer from upper respiratory tract problems. Mitigation through dust suppression methods will allow for this impact to be effectively managed.

During the construction, heavy equipment will be required for the site clearance, foundation and trench excavations, pipe laying, backfill and rehabilitation. Noise generation will be unavoidable. The degree of noise, frequency of noise and individual perception are all important considerations when determining the impact on noise. Drilling; blasting and construction activities will also create noise pollution. Adequate warning of high noise events such as blasting should be communicated to the affected communities prior to carrying out such activities.

6.4.3 Worker Health and Safety

The impacts of construction can affect the health and safety of those working on the construction site; disturbance, health and income of the host communities; and disturbance to the environment and animals. These impacts can be mitigated in the Environmental Management Programme (EMPr) and through adherence to the Occupational Health and Safety Act 85 of 1993.

An influx of workers is often characterised by higher health risks, particularly if the influx is male dominated. These include a higher disease burden and rise in HIV/AIDS rates. There should also be awareness and education campaigns on health and socio-economic risks such as HIV/AIDS and crime prevention.

6.4.4 Security

There a safety concerns related to the construction activity. Landowners have expressed a number of security concerns including increased access to the farms and crime. Trespassing was cited as a concern as well of damage to property once access is granted.

Mitigation measures include the project proponent/implementer, prior to construction, agreeing with farmers on appropriate access points to ensure the safety of the businesses, livestock and residents. A security policy must be drafted and strictly enforced by the contractors; this would include a requirement to obtain landowner permission prior to entering any property.

6.4.5 Damage to Property Once Access is granted

Once access to a property is granted, mitigation measures should be taken to ensure that any damage that is caused as a result of this access is made good. This includes damage to infrastructure such as fences, gates, electrical connections or roads.

Property damage includes the destruction of crops that may be required at the time of site clearance.

Where there is a risk of damage occurring, the contractor is to document the condition prior to the start of work. If the condition has deteriorated after the completion of the work, any such damage should be made good. Landowner sign off that the damage has indeed been rectified satisfactorily should be obtained.

6.4.6 Local Road Condition and Traffic Impacts

Local road access will be used during the project, and as a result these roads may be subject to damage. The project is to maintain the local roads for the duration of the contract and should leave them in a state the same or better than they were prior to the start of the construction phase.

Heavy duty trucks and construction vehicles will cause damage to the current road conditions as well as contribute to congestion on the roads.

The greater the number of trucks on the road, the greater the risk of road accidents occurring. It is important that the contractors are sensitive to the road conditions and ensure that throughout the construction process that these roads are maintained and suitable for small vehicles.

As a result of the analysis above, the following impact/mitigation table (Table 33) has been generated.

Table 33: Construction Phase Impact/Mitigation Table

Environmental Feature		Economic opportunities arising from the construction phase				
Project life-cycle		Construction phase				
Potential Impact		Proposed Management Objectives / Mitigation Measures				
SMME Creation		• Local SMMEs should be given an opportunity to participate in the construction of the project through the supply of services, material or equipment.				
Job Creation and Skills Development		• The main contractor should employ non-core labour from the Main places as far as possible during the construction phase. • The principles of Expanded Public Works Programme can be used for guiding the construction.				
Indirect Employment Impacts		• Spaza/informal trader shops may open next to the site as a consequence of construction. These should be controlled by the contractor to limit their footprint and to ensure that the local Municipalities – Informal Trading By-laws are complied with.				
	Nature	Extent	Magnitude	Duration	Probability	Significance
Before Mitigation	Positive	Local	Medium	Short Term	Likely	1
After Mitigation	Positive	Local	Low	Short Term	Likely	3

Environmental Feature	Economic opportunities arising from the construction phase
Project life-cycle	Construction phase
Potential Impact	Proposed Management Objectives / Mitigation Measures
Significance of Impact and Preferred Alternatives	Individuals who will benefit during the construction are limited to those who actively participate in the construction activity through employment, sub-contracting or other economic opportunities. Active participation should be encouraged. The benefits on such a construction will take place irrespective of which routing alternative is preferred.

Environmental Feature	Disturbance arising from the construction phase
Project life-cycle	Construction phase
Potential Impact	Proposed Management Objectives / Mitigation Measures
Traffic	• Ensure that the necessary signage and traffic measures are implemented for safe and convenient access to the site; • Additional creation of routes and access roads must be implemented to reduce heavy traffic flow; • The EMPr must include restrictions on the Contractor and its sub-contractors related to minimising impacts on the safety of road users; Restrictions should include appropriate speed limitations, restricting travel times to daylight hours, communication measures and the establishment of haul routes.; • Measures must be put in place to prevent construction vehicles from entraining dirt onto public roads; • Traffic control personnel must be assigned where deemed necessary, this will be to control the movement of construction vehicles in relation to local vehicles to ensure maximum safety and coherence.
Local Road Condition	• A continuous condition survey of the local roads to be used during the construction phase should be made prior to construction; • Delivery routes should be defined and adhered to during the construction phase; • Maintenance of local roads should take place during the construction phase, ensuring that the local roads used by the contractor are left in the same or better condition than they were prior to the start of construction.
Increase in Dust	• Dust and disturbance can be mitigated through the use of appropriate dust suppression mechanisms; • Adherence to road signage can be added as an advantage and a measure to manage the increase in dust levels; • Mitigation measures management should be adhered to according to the relevant specialist studies.
Influx of workers	• All employment of locally sourced labour should be controlled on a contractual basis. If possible, and if the relevant Ward Councillors deem it necessary, the employment process should include the affected Ward Councillors.

Environmental Feature	Disturbance arising from the construction phase
Project life-cycle	Construction phase
Potential Impact	Proposed Management Objectives / Mitigation Measures
	• People in search of work may move into the area, however, the project will create a limited number of job opportunities. Locally based people should be given opportunities and preferences over others; • No staff accommodation should be allowed on site; • Influx of workers could may lead to increased diseases and HIV/AIDSs & STI as well as STD infections, therefore awareness programmes should be implemented through the local educational institutions and for the workers as well.
Worker Health and Safety	• The provisions of the OHS Act 85 of 1993 and the Construction Regulations of 2014 should be implemented on all sites; • Account should be taken of the safety impacts on the local community when carrying out the longitudinal aspects of the project, such as the pipelines; • Contractors should establish HIV/AIDS awareness programmes at their site camps.
Security	• The camp sites for the project and the non-longitudinal construction sub-site components should be fenced for the duration of construction; • All contractors' staff should be easily identifiable through their respective uniforms; • A security policy should be developed which amongst others requires that permission be obtained prior to entering any property and provisions controlling trespassing by contractor staff; • Security staff should only be allowed to reside at contractor camps and no other employees; • Contractors should establish crime awareness programmes at their site camps.
Noise impacts	• Prior notice should be given to surrounding communities of drilling events; • Construction work should take place during working hours – defined as dawn to dusk on weekdays and dawn to 15:00 on Saturdays. Should overtime work be required, that will generate noise, consultation with the affected community or landowner should take place.
Damage to property	• If a risk existing of damage taking place on a property as a result of construction, a condition survey should be undertaken prior to construction; • The contractor is to make good and acknowledge any damage that occurs on any property as a result of construction work; • Where crops and agricultural machinery are damaged, compensation is to be paid to the farmer for the proven loss of these crops; • The farmer should be compensated for any loss of income experienced at the account of the contractor.

	Nature	Extent	Magnitude	Duration	Probability	Significance
Before Mitigation	Negative	Local	Medium	Short Term	Likely	2
After Mitigation	Negative	Local	Low	Short Term	Moderate	1
Significance of Impact and Preferred Alternatives	Disturbances and irritation during construction is to be expected. These can then be successfully mitigated through contractor specifications that are issued at a tender stage and through the continuous monitoring of contractor proceedings and performance during construction phase.					

Environmental Feature	Disturbance arising from the construction phase
Project life-cycle	Construction phase
Potential Impact	Proposed Management Objectives / Mitigation Measures
	Negative impacts owing to the construction will unfortunately be experienced irrespective of the site and routing alternative that is most preferred and chosen.

7 ANALYSIS OF ALTERNATIVES

Based on the impact assessment and the suggested mitigation measures, the following preferences with regards to the project can be described. These preferences are made from a socio-economic assessment perspective and do not consider other project criteria.

Having taken into consideration the project aims of water supply to Lephalale and its use in power generation, and considering the assessment above which does not indicate any fatal socio-economic flaws. The "No-go" option is not supported by this study.

The benefits from the project going ahead, from a socio-economic perspective, will be larger than the project not proceeding.

With regards to project alternatives, the Table 34 below describes the preferred alternatives and the reasons for their selection.

Table 34: Table illustrating Project Components and Alternatives

Component	Alternatives	Order of Preference (1: most preferred, 3: least preferred)	Comments
Go / No-go	To not carry out the proposed project	Not Supported	Subsequent water supply to Lephalale will be less and less secure that if the project did not go ahead. Sufficient water is a key input into an economy and the air pollution benefits derived from the water use at Medupi and subsequently Matimba will benefits all residents of the area.
Pipeline Route	Route alternative A1	No Preference	This route alternative does not significantly impact upon socio-economic infrastructure, not does it impose undue access or use restrictions. It is similar in nature to route alternative A2 and this portion of the Central route. Therefore, the study does not find any preference of this route over any of its alternatives.
	Route alternative A2	No Preference	This route alternative does not significantly impact upon socio-economic infrastructure, nor does it impose undue access or use restrictions.

Component	Alternatives	Order of Preference (1: most preferred, 3: least preferred)	Comments
			It is similar in nature to route alternative A1 and this portion of the Central route. Therefore, the study does not find any preference of this route over any of its alternatives.
	Route alternative D1	1	This route follows the railway line to its termination point for longer than the alternatives. The route alternative passes by three dwellings and impacts upon eight farm portions, lower than the alternative routes.
	Route alternative D2	2	This route cuts across previously undisturbed land towards its termination point. The route alternative passes by four dwellings and impacts upon twelve farm portions.
	Route alternative D3	3	This route follows existing roads along its route to a termination point just south of Steenbokpan. This route would require a parallel pipeline servitude to accommodate the pipeline and this would directly impact upon fourteen dwellings and other buildings. The route would impact upon eleven farm portions. The impact on the road during construction would be significant.
	Route alternative D4	1	This route branches off from route D1 and traverses grazing land. It does not impact any dwellings or buildings. The choice of this route be less than the impact of D1 since it would avoid two homesteads.
	Route alternative C	3	This route follows an existing road and takes a more northerly route to the railway line than the Central route in this area. It follows the railway line for less distance than the Central route alternative in this area. The impact upon dwellings along this road is greater than the comparable impact of the Central route in this area.

Component	Alternatives	Order of Preference (1: most preferred, 3: least preferred)	Comments
			As such this route is not preferred over its alternative, the Central route.
	Route alternative E	3	This route is more tortuous than the Central route alternative in this area. This route is more effective in avoiding impacts on dwellings, structures and irrigated lands than the central route. Thus, this route is preferred over the Central route. However, consideration must be given to the optimisation of the central route that is possible during the tender design phase. Both Alternative E and the central route may be optimised during the tender design phase of the project to reduce the impacts as far as possible. Additional modifications to the route near its commencement point could be made during detailed design stage to further reduce its socio-economic impact within technical constraints.

8 HARTBEESPOORT DAM SOCIO-ECONOMIC IMPACTS

The following socio-economic impacts assessment has been carried out for the operational phase of the project and the impact that this will have on the Hartbeespoort Dam.

8.1 Definition of the Study Area

The study area for the Hartbeespoort Dam has been defined as a regional study area which comprises the affected local municipality; and a local study which comprises the wards which surround and border on the dam itself.

This division allows a broader scale social and economic analysis to gain understanding of the socio-economic context of the area, whilst also allowing a detailed analysis of the local project area.

8.1.1 Regional Study area

The regional study area is the affected local municipality that of the Madibeng Local Municipality (NW372).

The municipality is located within the Bojanala Platinum District Municipality in the North West Province. The seat of the municipality is in Brits and has a diverse economy comprising manufacturing, mining, agriculture and tourism.

8.1.2 Local Study Area

The local study area is defined as the directly affected wards in which project infrastructure will be constructed.

Thus, the local study area is:

- Madibeng Local Municipality - Ward 29 – the eastern most ward, including Hartbeespoort, Ifafi and Meerhof areas;
- Madibeng Local Municipality - Ward 30 – the central ward, including most of the residential area Schoemansville;
- Madibeng Local Municipality - Ward 33, the western most ward. The ward includes all of the perimeter of the dam, including the residential area of Kosmos, Kosmos Ridge and the large residential estates of West Lake Country and Safari Estate, the Islands Estate, Pecanwood Estate, The Coves, Magalies Gold Estate, Estate d'Afrique.

These wards are shown in the Google Earth image below (Figure 19):

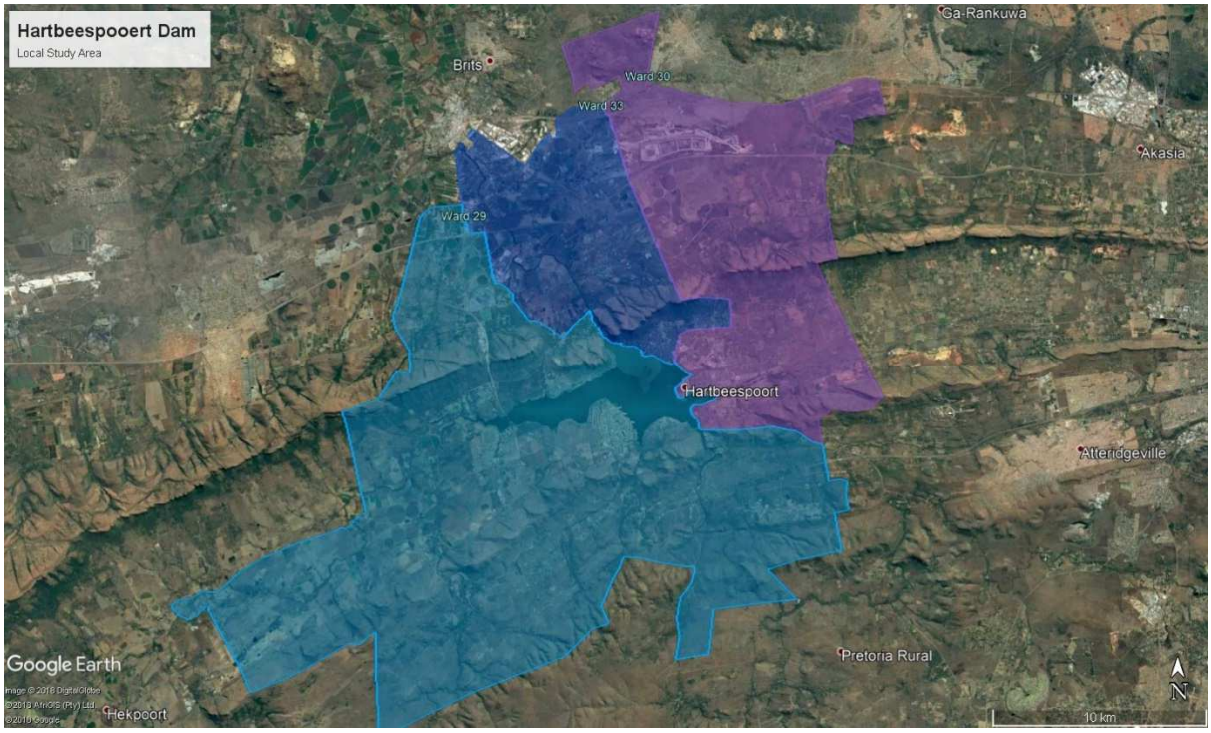

Figure 19: Hartbeespoort Dam Local Study Area

8.2 Regional Study Area Overview

The regional study area is the Madibeng Local Municipality. And the following overview data is drawn from the Community Survey, 2016, published by Statistics South Africa.

The Madibeng Local Municipality has a population of 536 110, people living within 193 364 households.

Data pertaining to education regional study area are illustrated in Table 35.

Table 35: Madibeng Local Municipality, Education Levels, Age 20 and above

Municipality	Education (age 20 +)			
	No Schooling	Primary School	Matric	Higher Education
Madibeng Local Municipality	11,5%	11,0%	72,8%	4,7%

Education levels are higher than the education levels shown in the two Limpopo Municipalities. This reflects the more urban character of the area.

8.2.1 Economy

The regional economy contributes a gross value added of R29 billion to the North West province's total of R180 billion. The Madibeng Local Municipality thus contributes some 16% of the province's economic activity. The municipality is located within the Bojanala Platinum District Municipality, which has an economy, measured as real gross value added, of R103,5 billion in 2017.

The structure of the regional economy is contained in Table 36 below.

Table 36: Madibeng Local Municipality Economic Sectors

Economic Sector	MLM GVA [2010, R' millions]	% of Total
Mining and quarrying	R10 121	34,40%
General government	R4 578	15,56%
Wholesale and retail trade	R3 491	11,86%
Business services	R2 938	9,99%
Transport and storage	R1 442	4,90%
Community, social and personal services	R1 337	4,54%
Finance and insurance	R973	3,31%
Construction	R948	3,22%
Metals, metal products, machinery and equipment	R597	2,03%
Agriculture, forestry and fishing	R573	1,95%
Food and Beverages	R515	1,75%
Electricity	R469	1,59%
Communication	R344	1,17%
Catering and accommodation services	R270	0,92%
Petroleum products, chemicals, rubber and plastic	R248	0,84%
Remaining Sectors	R579	1,97%
Grand Total	R29 426	100%

The regional economy rests on four pillars: metals mining, and metals mainly platinum; national and provincial government; wholesale and retail trade (of which retail trade is double that of wholesale trade); and professional business services. Important other sectors are transport and storage – the logistics to support mining and trade, along with financial and insurance, which supports mining, trade and government activities. Agriculture contributes some 1,8% of economic activity to the regional economy, whilst catering and accommodation contributes 0,92% of the regional economy. With respect to catering and accommodation, all of this gross value added can be ascribed to the hotel and restaurant trade.

When data for the value accruing to employees is analysed, Table 37 is produced. This table provides the value of compensation paid to employees within the municipality, in the various sectors at constant 2010 prices.

Table 37: Madibeng Local Municipality Employee Compensation

Economic Sector	Real Compensation of employees [2017, R' millions]	% of Total
Mining and quarrying	R4 436	29,76%
General government	R3 951	26,51%
Wholesale and retail trade	R1 385	9,29%
Business services	R1 108	7,43%
Community, social and personal services	R933	6,26%
Finance and insurance	R480	3,22%
Construction	R449	3,01%
Transport and storage	R430	2,88%
Metals, metal products, machinery and equipment	R420	2,82%
Food, beverages and tobacco	R245	1,64%
Agriculture, forestry and fishing	R158	1,06%
Transport equipment	R144	0,97%
Petroleum products, chemicals, rubber and plastic	R141	0,95%
Communication	R139	0,93%
Electricity, gas and water	R128	0,86%
Catering and accommodation services	R119	0,80%
Other Sectors	R239	1,6%
Grand Total	R14 905	100%

The values related to employee compensation are tied to the overall contribution of each sector to the economy. Noteworthy differences are the relatively high percentage paid to employees when compared to the total sector contribution to the economy of five economic sectors. These sectors, who are deemed more labour intensive than other sectors are: transport and storage, general government; business services; community and personal services and metals and metals products.

Conversely, agriculture and catering and accommodation are marked by lower employee compensation percentages than would otherwise be indicated by the sector contribution to the economy. This difference can be ascribed to high capital intensity, relatively low wages paid in the sector or a combination of the two.

Economic growth within the regional economy is an indicator of the vulnerability of residents to economic shocks. Table 38 below provides statistics for economic growth for the ten years between 2007 and 2017.

Table 38: Madibeng Local Municipality Economic Performance

Economic Sector	Gross Value Added [2007, R' millions]	Gross Value Added [2017, R' millions]	Compound Annual Growth Rate [%]
Mining and quarrying	R9 128	R10 121	1,04%
General government	R3 217	R4 578	3,59%
Finance, insurance, real estate and business services	R2 955	R3 911	2,84%
Wholesale and retail trade, catering and accommodation	R3 142	R3 760	1,81%
Manufacturing	R2 250	R1 940	-1,47%
Transport, storage and communication	R1 449	R1 786	2,11%
Community, social and personal services	R999	R1 337	2,96%
Construction	R737	R948	2,55%
Agriculture, forestry and fishing	R472	R573	1,96%
Electricity, gas and water	R531	R469	-1,23%
Grand Total	**R10 145**	**R14 903**	**1,69%**

The table shows that the overall average annual growth rate for the economy of the regional study area is 1,7% per year. Equivalent data for South Africa is 1,7% over the period with the data for the North West Province and the Bojanala Platinum District Municipality being 0,66% and 0,59% respectively. This data indicates that the economy is not coupled to the provincial and district economies which share rural and mining dominated economies, and that it is rather tied to the services and industrial drivers within the South African economy. This can be explained by its proximity to the City of Tshwane and the City of Johannesburg and the composition of the economy which is relatively diverse and relatively large when compared to the province and the district. The growth figure also indicates a degree of economic strength that is not shared by the province and the district.

These figures should be mirrored in trends in employee compensation between these years. The relevant figures are contained in Table 39 below

Table 39: Madibeng Local Municipality Employee Compensation Performance

Economic Sector	Real Compensation of employees [2007, R' millions]	Real Compensation of employees [2017, R' millions]	Compound Annual Growth Rate [%]
Mining and quarrying	R4 436	R2 357	6,53%
General government	R3 951	R2 644	4,10%

Economic Sector	Real Compensation of employees [2007, R' millions]	Real Compensation of employees [2017, R' millions]	Compound Annual Growth Rate [%]
Finance, insurance, real estate and business services	R1 588	R987	4,87%
Wholesale and retail trade, catering and accommodation	R1 504	R1 328	1,25%
Manufacturing	R1 188	R1 047	1,27%
Transport, storage and communication	R568	R396	3,43%
Community, social and personal services	R933	R666	3,67%
Construction	R449	R352	2,46%
Agriculture, forestry and fishing	R158	R124	2,45%
Electricity, gas and water	R128	R244	-6,25%
Grand Total	**R14 903**	**R10 145**	3,92%

The table shows that the overall average annual growth rate for real employee compensation was 3,9% per year between 2007 and 2017.

The growth in employee compensation should be compared to the inflation rate for the same period. The average of the consumer price index between these years was 6,6% (Statistics SA, 2018). These figures demonstrate the real employee compensation is eroding and does not keep pace with inflation.

Noteworthy compensation growths are recorded in the mining sector where growth was 6,5% per year when compared with a sector growth of 1% per annum. Similarly, high employee compensation growth rates when compared with sector growth rates are seen in wholesale and retail trade, manufacturing, finance and business services and the transport sector. The figures also show that employee compensation is rising at a meaningfully faster rate than economic growth, and unless employee productivity keeps pace with this faster growth rate, companies and institutions will not be able to sustain the compensation growth rate.

8.2.2 Labour Force

The labour force in the regional study area numbered some 173 000 people in 2017. The total population of the regional study area is approximately 536 000. The figure below, Figure 20, provides detail on the composition of the labour force.

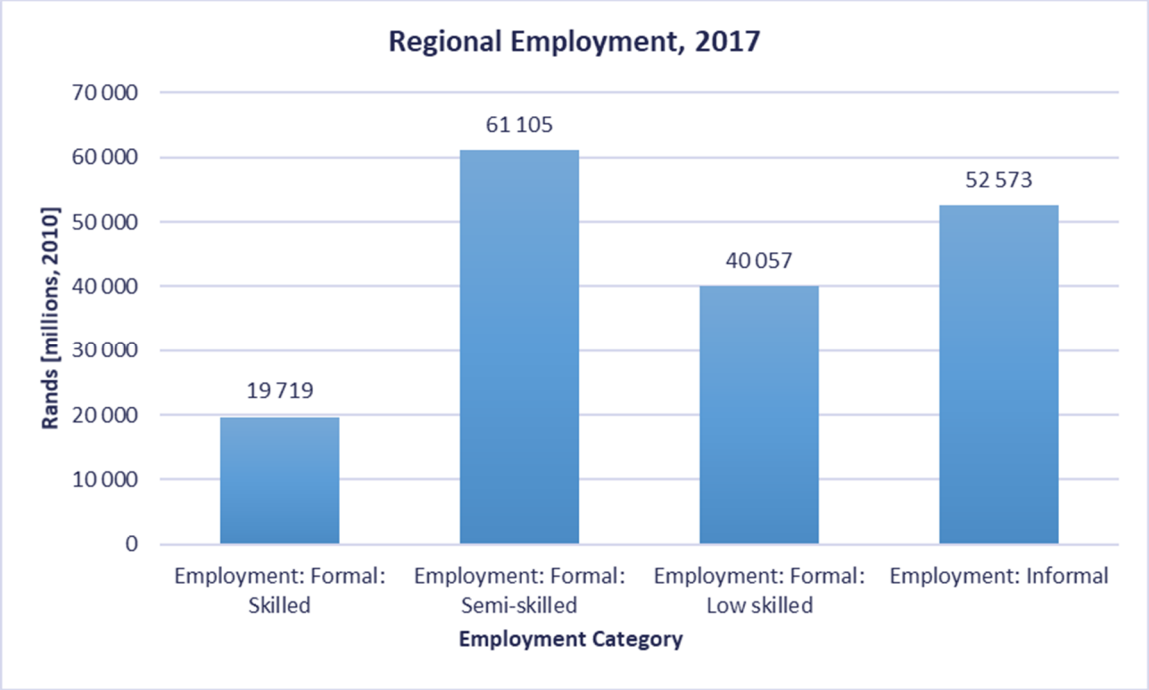

Figure 20: Madibeng Local Municipality Study Area Employment

Eleven percent of the regional labour force is in the formal skilled sector of the economy, a further 35% are suitable and capable of being employed in the formal semi-skilled sector. The remaining 23% of the labour force forms part of the low skilled members of the formal labour force, whilst a further 30% form part of the informal economy.

These figures mirror those on education, where less than five percent of the population has tertiary education.

Labour force compensation is detailed in the figure below (Figure 21). This includes compensation across all industries in 2017. The figure reveals that compensation received by skilled members of the workforce is relatively higher than that received by semi-skilled and unskilled workers.

Total real compensation, adjusted to 2010 values, is measured at R10 billion in 2017.

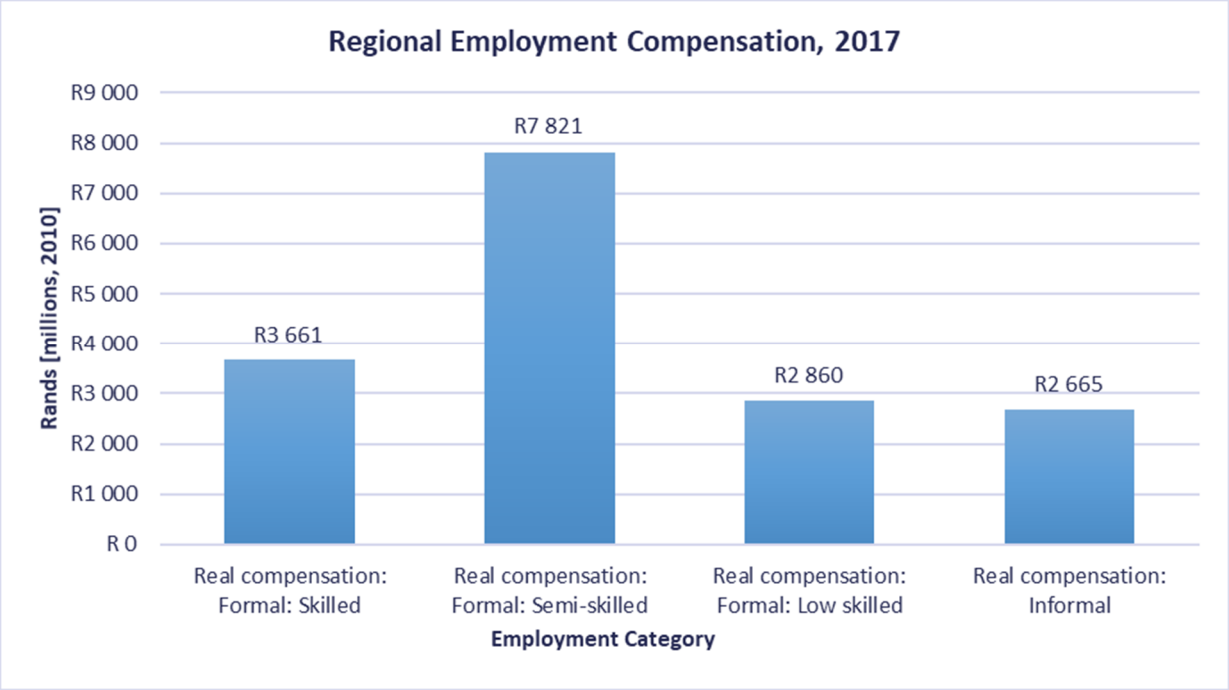

Figure 21: Madibeng Local Municipality Study Area Employment Compensation

Compensation of low-skilled and informal members of the formal economy is smaller than the numbers of workers would indicate. This gives credence to the hypothesis that wage competition at the lower levels of skill and employment formality is high, leading to downward pressure on these categories of wages.

There is no information in the dataset with regards to compensation in the catering and accommodation sector, a sector that is most relevant to the study. In the absence of such data, the gross valued added by the sector would have to form a proxy for labour force compensation.

8.3 Local Study Area Overview

The local study area comprises Ward 29, Ward 30 and Ward 33 of the Madibeng Local Municipality. The analysis below uses data drawn from Census 2011, published by Statistics South Africa.

Table 40 below provides an overview of the languages used in the area.

Table 40: Madibeng Local Municipality Wards Language

Language	Madibeng Local Municipality			Totals	% of Total
	Ward 29	Ward 30	Ward 33		
Setswana	2 884	1 968	1 415	6 267	11,9%
Sepedi	2 411	1 269	519	4 199	8,0%
Afrikaans	3 548	7 426	5 866	16 840	31,9%
Xitsonga	3 850	1 068	1 674	6 592	12,5%

Language	Madibeng Local Municipality			Totals	% of Total
	Ward 29	Ward 30	Ward 33		
English	3 033	1 686	1 223	5 942	11,3%
Other	2 238	1 556	709	4 503	8,5%
IsiZulu	735	453	413	1 601	3,0%
Sesotho	658	345	416	1 419	2,7%
Tshivenda	615	372	376	1 363	2,6%
IsiNdebele	461	221	252	934	1,8%
IsiXhosa	436	202	295	933	1,8%
SiSwati	200	128	83	411	0,8%
Not applicable	65	179	1442	1 686	3,2%
Sign Language	36	18	38	92	0,2%
Totals:	21 170	16 891	14 721	52 782	100,0%

Afrikaans is the dominant language spoken in the local study area, representing 32% of the population. Xitsonga, Setswana and English follow with 13%, 12% and 12% of the population respectively. A further 9% of the population speak another language, which are not one of the eleven official South African languages. Together these languages account for 76% of the population.

The high percentage of Xitsonga speakers in the population, is a further indication of the transient nature of the community. Native Xitsonga speakers hail from the north western border region of South Africa, the border between Mozambique and South Africa.

Figure 22 below, provides the gender balance in the local study area.

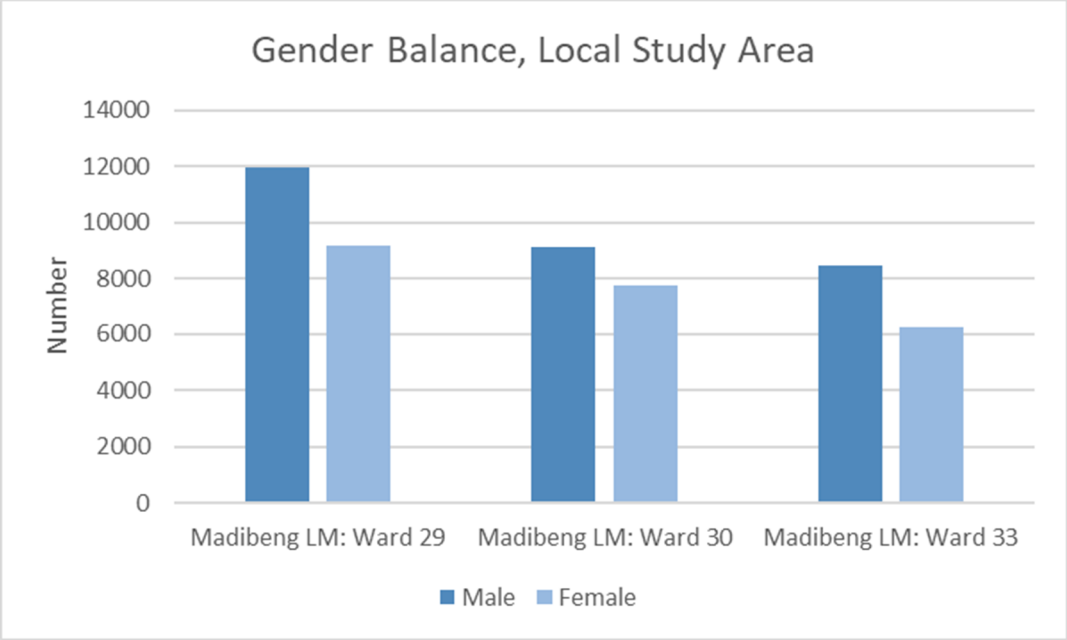

Figure 22: Madibeng Local Municipality Wards Gender

The study area has a 56:44 split between male and female. The ratio for the North West Province is 51:49. This demonstrates a preponderance of men in the population, which generally indicates an area that is attractive to economic migration.

8.3.1 Household Income

Annual household income is an indicator of the access to services and level of economy vulnerability that a house will face. Table 41 below provides data on the levels of annual household income I the local study area.

Table 41: Madibeng Local Municipality Wards Annual Household Income

Income Values	Madibeng Local Municipality [No. HH]			Totals	% of Totals
	Ward 29	Ward 30	Ward 33		
Very Low Income [R1 - R9 600 pa]	2 159	1 032	819	2 159	19,1%
Low Income [R9 601 to R38 200 pa]	3 908	1 891	2 134	3 908	37,7%
Middle Income [R38 201 to R614 400 pa]	2 882	2 638	2 154	2 882	36,5%
High Income [R614 60 and above pa]	567	548	285	567	6,7%
Totals :	9 516	6 109	5 392	9 516	100,0%
% of Totals :	45.3%	29.1%	25.7%	45.3%	

The table shows that fifty seven percent of the households in the local study area earned less than R38 200 per year, in 2011. Average household size across the Madibeng Local Municipality is 3.0,

which implies that individual annual income is very low. Thus, the degree of economic vulnerability to external shocks is high, with most households living a subsistence livelihood.

8.3.2 Education Level Attained

Table 42 below provides detail on the education levels attained by residents of the local study area.

Table 42: Madibeng Local Municipality Wards Education Levels

Education Level Attained	Madibeng Local Municipality			Total	% of Total
	Ward 29	Ward 30	Ward 33		
No Schooling	1 803	733	813	3 349	6,3%
Some Primary School	3 794	2 342	2 404	8 540	16,2%
Primary School	1 122	593	745	2 460	4,7%
Some High School	6 375	4 613	3 512	14 500	27,5%
Matriculated	4 197	4 578	3 320	12 095	22,9%
Secondary Education	1 256	1 717	1 039	4 012	7,6%
Higher Degrees	443	499	300	1 242	2,4%
Other and Not Applicable	2 182	1 815	2 590	6 587	12,5%
Totals:	21 172	16 890	14 723	52 785	100,0%
% of Total :	40.1%	32.0%	27.9%	100.0%	

Six percent of the residents have no schooling, whilst a further twenty percent have completed up to primary school, an additional 27% have completed some high school, but did not matriculate. The result is that 55% of the residents of the area have not completed matric. Ten percent of the population have gained an education level higher than matric. These figures compare favourably with the more rural areas of the MCWAP project and point towards a better educated population able to interact to a larger degree with the formal economy.

8.3.3 Dwelling Type

Dwelling type is a livelihood indicator that provides insight into the socio-economic conditions in the local study area. The characteristics of the dwellings in which households live and their access to various services and facilities provide an important indication of the well-being of household members. It is widely recognised that shelter satisfies a basic human need for physical security and comfort.

According to the Statistics South Africa household classification, the following definitions apply to formal and informal housing:

- **Formal dwelling**, refers to a structure built according to approved plans, i.e. house on a separate stand, flat or apartment, townhouse, room in backyard, rooms or flat let elsewhere. Contrasted with informal dwelling and traditional dwelling; and

- **Informal dwelling**, is a makeshift structure not erected according to approved architectural plans, for example shacks or shanties in informal settlements or in backyards.

Table 43 below provides data on the levels of annual household income I the local study area.

Table 43: Madibeng Local Municipality Wards Dwelling Type

Dwelling Type	Madibeng Local Municipality			Totals	% of Total
	Ward 29	Ward 30	Ward 33		
House, separate stand	3 861	3 434	2 800	10 095	48,0%
Traditional Dwelling	74	46	42	162	0,8%
Townhouses/Flats	294	343	227	864	4,1%
Backyard Dwelling or Flatlet	682	300	593	1 575	7,5%
Informal Dwelling	4 421	1 909	1 647	7 977	38,0%
Not Applicable, Other and Unspecified	184	77	83	344	1,6%

The analysis of dwelling type shows that forty-eight percent of the residents in the local study area live in brick houses located on separate stands. The next most common housing typology is an informal structure, which is home to 38% of residents. Seven percent of the population live in multi-dwelling buildings. The rest of the housing typologies, those of: Townhouses/Flats, Traditional Dwellings, Not Applicable, Other and Unspecified; can be ignored for the purposes of the analysis.

The high percentage of informal dwellings is an indicator of a transient population, which matches with the economic data which show a diverse and growing economy when compared to the surrounding areas.

8.4 Impact of MCWAP-2A on the Hartbeespoort Dam

8.4.1 Background

The Mokolo Crocodile River (West) Water Augmentation Project aims to meet increased water demands in the Lephalale area of the Limpopo Province. The source of the water is the Mokolo-Crocodile catchment and a major storage reservoir in the catchment is the Hartbeespoort Dam. Phase 2A of the project proposes to use the dam as a source of supply to meet water demands.

In this manner, the dam will supply an increasing demand for water, this implies that water will be released to meet demand requirements in the downstream catchment. The main proposed use of the water is to reduce the air quality impact of the Medupi, and subsequently, Matimba Power Stations, through Flue Gas De-sulpherisation (FGD) technology. Water releases to meet this and other demands in the Lephalale region will involve greater fluctuation in the level of the dam than has been the case in the recent past.

The dam is a government waterwork, which is defined by the National Water Act as a waterwork owned or controlled by the Minister and includes the land on which it is situated. Fluctuating water levels are a common occurrence on dams that are optimally utilised.

The sources of the following impact discussion are taken from the Specialist Opinion: Impact of MCWAP-2A on Hartbeespoort Dam, June 2018, conducted by Horizon Environmental.

The fluctuation in the dam level will vary with the seasons, with winter being the season where the dam level will be the lowest. The modelling indicates that the dam volume will be at an average of approximately 130 million m^3 during the winters. This translates to being 67% full when considering the full supply capacity of 195 million m^3. This implies that the dam level will decrease by between five and six meters in 50% of the winters. For the remaining winters, the fluctuation will either be greater or lesser depending upon a number of factors, including rainfall during the previous rainy season. During the summer seasons the modelling indicates that the dam will be full or nearly so. These results are based on a model that takes rainfall, water usage and other factors into account, and which has been run 1 000 times to obtain the probabilistic results mentioned above. The modelling programme was run as part of the feasibility stage of the project and the figures and graphs has to be interpolated in some cases to capture the results required by this study.

The impact of that fluctuation can be seen in Figure 23 below.

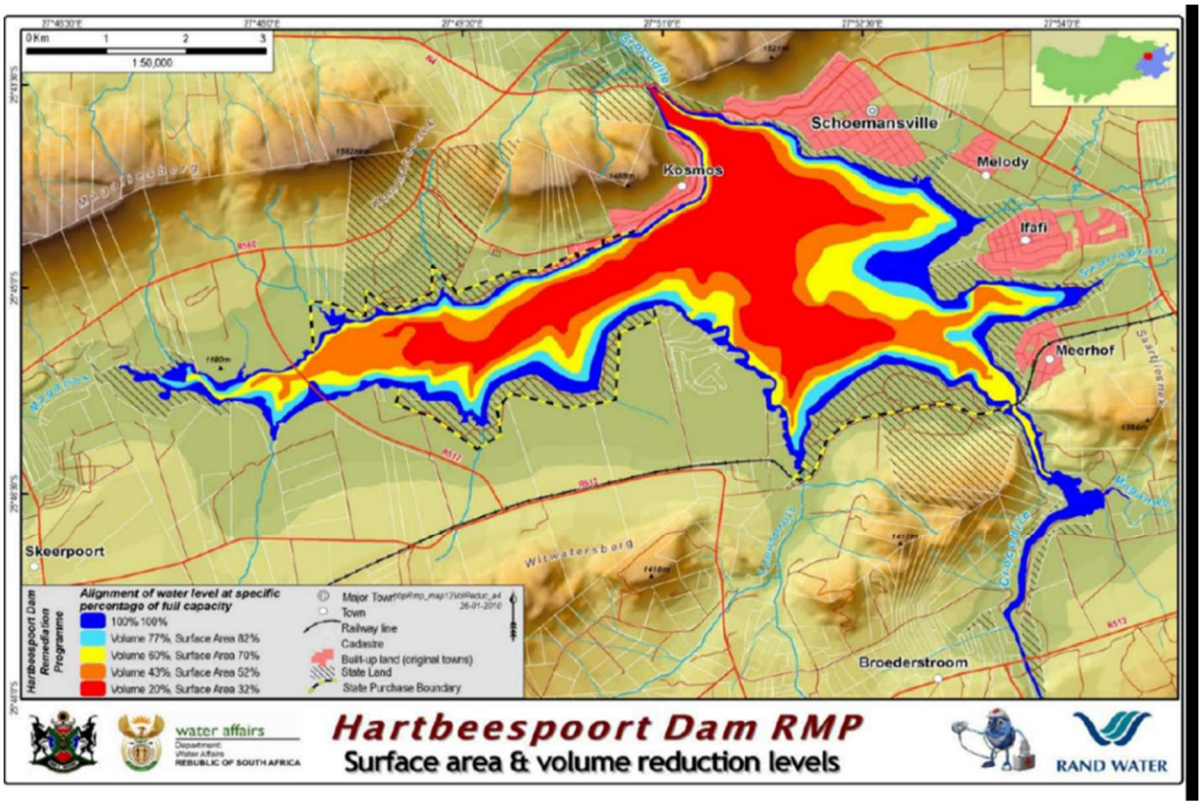

Figure 23: Surface Area and Volume Reduction levels in Hartbeespoort Dam

The figure demonstrates with that with the dam at 60% of capacity, water level will follow the yellow area in the map, with the dam at 70% full, the dam will follow the light blue area on the map. Based

on the 67% capacity figure, the predicted dam level during 50% of the winters will be between the yellow and the blue areas in the figure above.

8.4.2 Affected Areas

The areas of the dam that will be most impacted by the fluctuating levels are those properties that border the dam in the following areas:

- The eastern shore, including areas near Ifafi, Meerhof and Estate d'Afrique. There are areas of state land bordering the dam in this area, which are being used as camping grounds;
- Parts of the southern shore, including Club Nautique; the Islands Estate;
- Parts of the western shore, including West Lake and Country Estate, The Coves, Lakelands; and
- Parts of the northern shore, including Kshane Lake Lodge, Leloko Lifestyle Estate and Kosmos Ridge.

In addition, any marinas or areas that have direct access to the dam will be affected by the fluctuating water levels. This includes jetties, slipways, boat houses, moorings, fishing and picnic areas which will all be affected since the distance to the water will be increased as the dam level drops. This impact will be most felt during winter.

Based on this discussion, and without having the benefit of electronic mapping aids, a census of the direct impacts was carried out along the water's edge. These results are shown in Appendix 2 of the report.

The affected areas can be divided into two groups. Group one properties are in areas where the reservoir is shallow at the edges, and therefore a drop in the water level will result in the longest distance to the water's edge during winter. Group Two properties are those areas where the steep shoreline profile will result in a lesser increase in the distance to the water's edge during winter. The analysis has been done using the property's access points into the water as a basis for the decision. The groups have been listed in Table 44 below:

Table 44: Impact Groups for Surrounding Properties – Based on Distance to Water's Edge

Group 1 – High Impact	Group 2 – Medium Impact
Schoemansville Municipality Camping Ground	Transvaal Yacht Club
Liitle Venice	No 1 Waterfront
Eagles Waters Wildlife Resort	The Oewer Club
Club Nautique	Sunshine Cruises / Toro Ya Me
The Islands Estate	Eagles Landing
Lakeland Estate	Pecanwood
West Lake Country and Safari Estate	Key West
The Coves	Ifafi Aquatic Club
Magalies Golf Estate and River Club	The Oewer Club

Group 1 – High Impact	Group 2 – Medium Impact
Magalies Park Time Share Resort	Harties Party Boat
Leguaan Leap	Estate d'Afrique
Kshane Lake Lodge	Ile du Lac
Harties Boat Company and Water Freaks	Leloko Lifestyle Estate
	Kommando Nek / Gina's Picnic Spot
	Caribbean Beach Club
	Hartbeespoort Boat Club
	Montego Bay
	Boater's World, near Falconwood
	Kosmos Boat Club
	Mariners Village
	22nd Waterkloof / Kosmos Sea Scout Group

The group two properties all have boating access to the waterline. These properties have been given the designation of medium impact since the boat access facilities (jetties, boat houses, moorings etc.) would generally be above the water line during winter. The impact would therefore be the need to adjust the boating facilities to allow access during periods of low water levels. A prominent example of this is the case of the Hartbeespoort Boat Club: although the waterline would not be too distant from the accommodation, the jetties would be above the waterline during winter, and slipways would have to be used to reach the water during the periods of low water. Such would be the case for Montego Bay, Boaters World and others along the shoreline of the dam.

8.4.3 Identification of Activities and Aspects

Table 45 below presents an overview of the impacts associated with aspects during the operational phase of the project. Some impacts, including their mitigation measures, are thereafter discussed in detail while the remaining impacts are addressed in a separate limnology specialist study, as part of the EIA.

Table 45: HBD: Activity, Aspects and Impacts

Activity	Aspect	Potential Impact
Scheme Operations – Winter Season	Water Level Fluctuations	Existing boat mooring facilities to the water will be high and dry
		Reduced surface area of the dam for recreational use
		Increased beach area
		Impact of water hyacinth production

Activity	Aspect	Potential Impact
		Changes in the sense of place for residents of properties surrounding the dam
		Property value impacts
		Tourism revenue impacts

8.5 Impact and Mitigation Assessment

Taking these impacts into account and based on the project description as well as the applicable legislation and policy and planning issues, the following socio-economic impact variables are relevant to the Hartbeespoort Dam. These impacts are in accordance with Vanclay's list of socio-economic impact variables (Vanclay, 2002; Wong, 2013) clustered under the following seven main categories as follows;

Health and socio-economic well-being impacts

- Making existing boat and watercraft mooring facilities unusable during periods of low water;
- Security risk to estates through greater beach area during winter
- The creation of muddy plains leading to the water during periods of low water
- The impact of the water fluctuation on the Water Hyacinth infestation

Quality of the living environment (Liveability) impacts

- Changes in the sense of place for those living next to the water's edge
- Recreational use of the water surface
- Reduction in the air quality impact of the Medupi and Matimba Power Station

Economic and material well-being impacts (negative)

- Impacts on property values for properties close to the water's edge
- Loss in tourism revenue through reduced access to the water's edge during winter

Economic and material well-being impacts (positive)

- Increased water supply to the Lephalale area, which will enable economic growth

8.5.1 Health and socio-economic well-being

The health and socio-economic wellbeing impacts related to the project include the possible creation of muddy plains during periods of low water level.

These plains would be created as the water retreats from the current full supply level. And would be muddy until the sun dries the affected area. During the muddy period, access to the water would be restricted. This impact was commented upon by F.J Botha: "*…the muddy plains (beach) that will be exposed when water level is at 60% for long periods of time"*.

During the winter period, when the dam level decline, greater beach area will be exposed. The largest increases in beach area will be amongst the Group 1 properties. The beach will initially be muddy, and as the ground dries, will become a hard surface. The water's edge will be at the bottom of the beach and the walking distance to the water's edge will be increased. This impact will decrease as the season moves towards spring and finally summer.

The impact will be to decrease access to the dam by water craft, increased walking distance for picnicker and fishermen and will impact upon the sense of place for residents of properties adjacent to the water's edge. With regards the sense of place, residents of properties not on the water front will be less affected than those along the water front. With regards access to the water by water craft, all those who use watercraft will be affected.

The increased beach length can be seen as a security risk to properties along the water front since it would allow pedestrian access to the front of the properties. A risk analysis of the security impact would have to be carried out by individual properties and this would consider the topography adjacent and next each property, as well as distances to roads and other public access points.

The impact of the water level fluctuation upon Water Hyacinth infestation is studied in the limnology specialist study. It was found that this impact would be negligible.

As a result of the analysis above, the following impact/mitigation table (Table 46) has been generated.

Table 46: HBD Health and Socio-Economic Well-Being Impact/Mitigation Table

Environmental Feature	Hartbeespoort Dam: Health and socio-economic well-being
Project life-cycle	Operational phase
Potential Impact	Proposed Management Objectives / Mitigation Measures
Making existing watercraft mooring facilities unusable during periods of low water	• Notifications to dam users of periods of low water, this would provide owners time to adjust their mooring facilities prior to these periods of low water • Safety awareness campaign prior to periods of low water to inform users with regards beach conditions
Greater beach area to water's edge during winter	• Notifications to dam users of periods of low water • Safety awareness campaign prior to periods of low water to inform users with regards beach conditions
Security Impact: Access to water facing properties	• Notifications to dam users of completion of the project to allow time for such properties to re-evaluate their security measures

	Nature	Extent	Magnitude	Duration	Probability	Significance
Before Mitigation	Negative	Local	Low	Seasonal	Certain	1
After Mitigation	Negative	Local	Low	Seasonal	Certain	1

Environmental Feature	Hartbeespoort Dam: Health and socio-economic well-being
Project life-cycle	Operational phase
Potential Impact	Proposed Management Objectives / Mitigation Measures
Significance of Impact and Preferred Alternatives	The impact would occur during winter, which is period of lower use recreational use of the dam than during summer. Individuals who are impacted will experience greater inconvenience in relation to access to the water's edge. The impact will occur regardless of the alternative adopted by the proposed project.

8.5.2 Quality of the living environment (Liveability) impacts

Physical changes to the nature of an area will impact upon the sense of place. Sense of place is a concept primarily used to describe the emotions experienced, or the association made, with a geographical location. Although it appears to be subjective, an exploration of various definitions can begin to narrow the concept sufficiently for analysis.

With this background two definitions are offered for sense of place, those of Stokes, Watson, and Mastran, (1997) and of Ryden (1993). Stokes et al believe sense of place is:

"Those things that add up to a feeling that a community is a special place, distinct from anywhere else."

Whilst Ryden is of the view that sense of place results from:

"... gradually and unconsciously … inhabiting a landscape over time, becoming familiar with its physical properties, accruing history within its confines."

From these definitions is it clear that sense of place covers the aspects of a place that have emotional meaning to the inhabitants. These may range from the physical environment, the climate, the layout of the streets, location of the commercial centres, a particular lifestyle, the friends and neighbours that develop over time and a sense of shared history. This shared history would develop through informal folklore and personal narrative, not through official histories.

As people have different experiences of the place, so the sense of place will differ. This variation in response to a place adds a level of complexity to an already difficult concept.

Residents who have weekend houses on the water's edge will experience a sense of place closely associated with the water, its tranquil nature and the sense of peace that it engenders. It will also be infused with an element of action owing to the widespread use of powered watercraft on the water. Residents in weekend properties further away from the water's edge will experience the sense of place slightly differently, with less emphasis being placed in the water and more upon the natural

environment: the vegetation, the mountains, the climate. In both cases surrounding people will impact highly upon the sense of place.

Residents of the broader community, who don't have properties in da-side properties and who live full time in the area will experience the sense of place differently again. There will be emphasis on the natural environment, including the presence of the Hartbeespoort dam, along with experience of their local living conditions, daily traffic impacts and their experience of the various commercial and retail offerings in the Hartbeespoort/Schoemansville area.

Income levels impact upon the sense of place, as do living conditions, and residents with lower income levels will experience the natural environment, the local delivery of services, public transport infrastructure as well as the various commercial and retails offerings of the Hartbeespoort/Schoemansville area.

In all cases, the sense of place is impacted upon by social facilities such as churches, schools, clubs and other social gatherings which contribute to interaction of the community and create a sense of belonging or familiarity.

The proposed project, with its fluctuating water levels, will impact most upon those who live along the water's edge, given that their sense of place will be partly defined in relation to the water. As distance from the water's edge increases, so the influence of the water on sense of place will decrease.

During winter, there will be less water surface area for recreational use. The scenario used for this study is that for a median of years, between 60% and 70% of the full surface area will be usable. This will have the effect of increasing the density of watercraft on the water, assuming that the same number of watercraft continue to use the water.

The final liveability impact will be the positive impact of better air quality in the Lephalale region as a result of the water being sourced from the Hartbeespoort dam. Coal fired power stations reduce the area quality of an area measurably, according to a report published in 2017 by the Centre for Environmental Rights, "Health-impacts-of-coal-fired-generation-in-South-Africa", authored by Dr Mike Holland. The report estimates that the Medupi Power Station will emit 61 200 ton/annum of nitrogen oxides and 448 000 ton/annum of sulphur oxides. He estimates that the annual costs of these emissions in disease, death and restricted activity is R4,5 billion/year (USD 368 million at R12,38/USD). Similar figures were provided for Matimba Power Station, its emissions are 67 592 ton/annum of nitrogen oxides and 309 262 ton/annum of sulphur oxides. The equivalent annual cost estimate for associated disease, death and restricted activity is R3,4 billion/year (USD 277 million at R12.38/USD). The water drawn from the Hartbeespoort Dam will contribute to a meaningful reduction in the sulphur oxides from the plant and will therefore reduce this cost incurred to the Lephalale region.

As a result of the analysis above, the following impact/mitigation table (Table 47) has been generated.

Table 47: HBD Quality of the Living Environment Impact/Mitigation Table

Environmental Feature		Hartbeespoort Dam: Quality of the living environment (Liveability) - negative				
Project life-cycle		Operational phase				
Potential Impact		Proposed Management Objectives / Mitigation Measures				
Changes to the sense of place		• This impact is only mitigatable through the influence of time and becoming accustomed to the rhythm of the water fluctuations				
Reduced surface area for recreation		• Information with regards water level fluctuations, particularly during winter, should be distributed to all affected watercraft users				
	Nature	Extent	Magnitude	Duration	Probability	Significance
Before Mitigation	Negative	Local	Low	Seasonal	Certain	3
After Mitigation	Negative	Local	Low	Seasonal	Certain	3
Significance of Impact and Preferred Alternatives	The fluctuating water levels will have the greatest impact upon sense of place to those living near or using the water's edge. These impacts would decrease as a person's distance from the dam increases. The impact would be greatest during winter. The impact will occur regardless of the alternative adopted by the proposed project.					

Environmental Feature		Hartbeespoort Dam: Quality of the living environment (Liveability)- positive				
Project life-cycle		Operational phase				
Potential Impact		Proposed Management Objectives / Mitigation Measures				
Impact on Air Quality in the Lephalale region		• Medupi clean air technology to be installed and used				
	Nature	Extent	Magnitude	Duration	Probability	Significance
Before Mitigation	Positive	Regional	High	Long Term	Certain	2
After Mitigation	N/A	N/A	N/A	N/A	N/A	N/A
Significance of Impact and Preferred Alternatives	The installation of clean air technology at the Medupi Power Station will measurably improve air quality and liveability in the region. The impact will occur regardless of the alternative adopted by the proposed project.					

8.5.3 Economic and material well-being impacts (negative)

The primary impact identified by IAPs in this regard is the potential impact upon property values for those properties that are water facing and the activities at the property are water focused. Comment in this regard were made by representatives of Pecanwood Estate and later by representatives of the Key West Estate: "*Impacts that immediately come to mind include: aquatic, avifauna, social (people living around the dam and business), socio-economic (private and business, directly or indirectly*

dependent on the dam, impact on property values, ability to sell property), groundwater, siltation effects, aesthetic (visual), impact on tourism and employment in the tourism industry or associated industry around the Dam".

The impact on tourism revenues was also commented upon by IAPs, viz Key West's comment: "*Has the cost to tourism, the main income stream for the area and big employer been assessed?".*

Numerous comments on these two economic impacts were made by IAPs for the project, including from The Coves, who are located west of the R512 bridge and therefore higher upstream in the dam, than other estates such as Pecanwood or The Islands Estate.

Property values are impacted upon by various factors, including property location, interest rates, the characteristics of the neighbourhood, the features of the property, state of the property, size of property and security considerations. Given this multiplexity, it is not within the scope of this study to apprise the value of properties and the impact of the proposed project upon their values.

Should the proposed project impact upon property values, a relevant question is: to whom does the responsibility for the value change lie; the project proponent; or to the property owner? It is commonly accepted that any additional value ascribed to the property through the more or less constant dam water levels over the years would accrue to the property owner, despite the fact that the owner of the dam is under no obligation to maintain water levels constant. The reverse would also be true, a fall in the additional value of the property created by the more or less constant water levels, would also fall to the property owner.

The impact upon the economy through direct losses related to tourism can be seen through the lens of the diversified structure of the local economy. The contribution of the economy of the catering and accommodation sector is 0,92% of the economy of the local municipality, data does not exist to determine the contribution of catering and accommodation related to direct access to the water's edge. However, it is likely to be a fraction of the total figure.

Water levels will be lowest in the winter months, with level returning to the full supply level during the spring months. Leisure tourism with a focus on the water surface has its peak seasons during spring and summer and the impact upon tourism is mitigated through this seasonal effect.

As a result of the analysis above, the following impact/mitigation table (Table 48) has been generated.

Table 48: HBD Economic and Material Well-Being Negative Impact/Mitigation Table

Environmental Feature	Hartbeespoort Dam: Economic and material well-being impacts (negative)
Project life-cycle	Operational phase
Potential Impact	Proposed Management Objectives / Mitigation Measures
Impact on property values	• Claims for loss of property value associated with fluctuating water levels should be addressed to the property developer who sold the properties
Impact on tourism	• Claims for loss of business value associated with fluctuating water levels should be addressed to the property developer who sold the properties • Managed by individual business owners

Environmental Feature		Hartbeespoort Dam: Economic and material well-being impacts (negative)				
Project life-cycle		Operational phase				
Potential Impact		Proposed Management Objectives / Mitigation Measures				
	Nature	Extent	Magnitude	Duration	Probability	Significance
Before Mitigation	Negative	Local	Low	Seasonal	Moderate	3
After Mitigation	Negative	Local	Low	Seasonal	Moderate	3
Significance of Impact and Preferred Alternatives	The fluctuating water levels will impact upon those living near or deriving a living from access to the water's edge. These impacts would decrease as the distance from the water's edge increases. The impact would be felt during winter in "normal" rainfall seasons. The impact will occur regardless of the alternative adopted by the proposed project.					

8.5.4 Economic and material well-being impacts (positive)

The increased provision of water to the Lephalale region has positive social-economic implications. Water is a fundamental enabler of economic growth and the increased supply of water to Lephalale will facilitate that growth.

As a result of the analysis above, the following impact/mitigation table (Table 49) has been generated.

Table 49: HBD Economic and Material Well-Being Positive Impact/Mitigation Table

Environmental Feature		Hartbeespoort Dam: Economic and material well-being impacts (positive)				
Project life-cycle		Operational phase				
Potential Impact		Proposed Management Objectives / Mitigation Measures				
Increased water supply to the Lephalale region		• Increased and stable water supply				
	Nature	Extent	Magnitude	Duration	Probability	Significance
Before Mitigation	Positive	Regional	High	Long Term	Certain	2
After Mitigation	N/A	N/A	N/A	N/A	N/A	N/A
Significance of Impact and Preferred Alternatives	The increased supply of water to the Lephalale region will have positive impacts on the local economy. The impact will occur regardless of the alternative adopted by the proposed project.					

9 CONCLUSION

The study assessed the social and potential economic impacts of the proposed project. As expected of any construction project, there were several positive and negative social as well as economic impacts identified.

The identified negative impacts can be successfully mitigated and the positive impacts will bring economic and socio-economic benefit to the area, they therefore do not require any mitigation.

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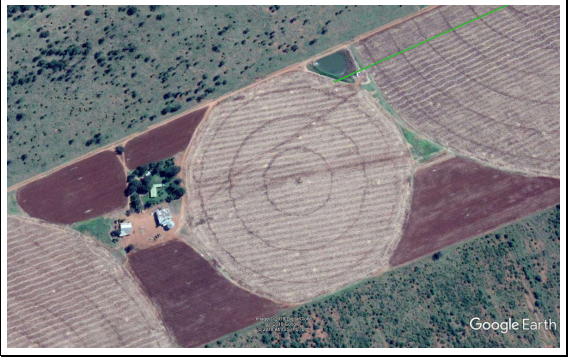
APPENDIX 1: CENSUS OF PROPOSED PROJECT IMPACTS

Table 1: Property Directly Impacted by the Project – Central Route

Name	Co-Ordinates	Route Option	Image
Farm Dwellings	S 24 37 29 E 27 18 44	Central Route	
Orchard	S 24 37 13 E 27 18 43	Central Route	
Farm Buildings	S 24 36 56 E 27 18 32	Central Route	
Farm Dwellings	S 24 36 36 E 27 18 06	Central Route	

Name	Co-Ordinates	Route Option	Image
Farm Buildings	S 24 36 32 E 27 17 58	Central Route	
Farm Buildings	S 24 36 24 E 27 17 50	Central Route	
Planted Fields	S 24 36 19 E 27 17 49	Central Route	
Farm Buildings	S 24 35 59 E 27 17 37	Central Route	
Irrigation Pivots x 3	S 24 35 37 E 27 17 53	Central Route	

Name	Co-Ordinates	Route Option	Image
Local Road Crossing	S 24 35 07 E 27 18 52	Central Route	
Dwelling and Soccer Pitch	S 24 34 26 E 27 18 26	Central Route	
Farm Dwelling	S 24 34 13 E 27 18 35	Central Route	
Farm Dwelling	S 24 30 38 E 27 16 57	Central Route	
Water Point	S 24 25 51 E 27 23 55	Central Route	

Name	Co-Ordinates	Route Option	Image
Major Road Crossing – R510	S 24 25 32 E 27 24 36	Central Route	
Farm Buildings	S 24 24 05 E 27 25 22	Central Route	
Farm Dwelling	S 24 23 15 E 27 26 29	Central Route	
Road over Rail Bridge	S 24 18 50 E 27 26 57	Central Route	
Major Road Crossing – R510	S 24 17 28 E 27 26 58	Central Route	

Name	Co-Ordinates	Route Option	Image
Cattle/Vehicle Crossing/Watering Area	S 24 16 45 E 27 26 59	Central Route	
Road over Rail Bridge	S 24 14 50 E 27 26 59	Central Route	
Cattle/Vehicle Crossing Area	S 24 14 02 E 27 27 00	Central Route	
Cattle/Vehicle Crossing Area	S 24 11 49 E 27 26 52	Central Route	
Local Road Crossing	S 24 10 51 E 27 26 36	Central Route	

Name	Co-Ordinates	Route Option	Image
Farm Buildings	S 24 10 30 E 27 26 25	Central Route	
Road over Rail Bridge	S 24 10 17 E 27 26 25	Central Route	
Road over Rail Bridge	S 24 09 24 E 27 26 10	Central Route	
Cattle/Vehicle Crossing Point	S 24 08 37 E 27 25 57	Central Route	
Cattle/Vehicle Crossing Point	S 24 08 11 E 27 25 50	Central Route	

Name	Co-Ordinates	Route Option	Image
Road over Rail Bridge	S 24 06 33 E 27 25 21	Central Route	
Road over Rail Bridge	S 24 06 13 E 27 25 13	Central Route	
Farm Buildings	S 24 05 47 E 27 25 19	Central Route	
Rail Level Crossing	S 24 04 44 E 27 24 55	Central Route	
Railway Station	S 24 03 31 E 27 24 39	Central Route	

Name	Co-Ordinates	Route Option	Image
Railway Station	S 24 02 44 E 27 24 32	Central Route	
Cattle/Vehicle Crossing Point	S 24 02 05 E 27 24 25	Central Route	
Powerline Crossing	S 24 01 05 E 27 24 14	Central Route	

Table 2: Property Directly Impacted by the Project –Route D1

Name	Co-Ordinates	Route Option	Image
Rail Level Crossing	S 23 50 06 E 27 25 04	Route D1	
Road over Rail Bridge Crossing	S 23 48 57 E 27 25 21	Route D1	
Rail Level Crossing	S 23 46 50 E 27 25 51	Route D1	
Powerline Crossing	S 23 46 41 E 27 25 51	Route D1	

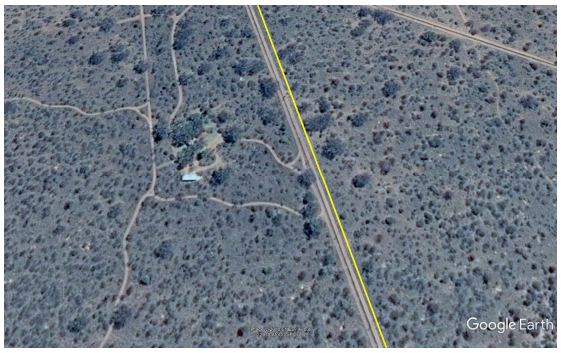
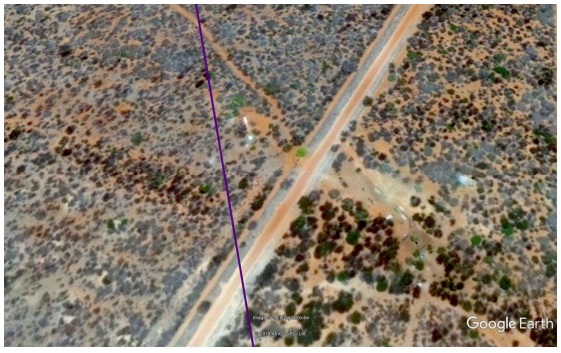
Name	Co-Ordinates	Route Option	Image
Powerline Crossing	S 23 46 19 E 27 25 35	Route D1	
Dwelling	S 23 43 58 E 27 24 34	Route D1	
Dwelling	S 23 43 35 E 27 24 16	Route D1	
Dwelling	S 23 43 25 E 27 24 14	Route D1	

Table 3: Property Directly Impacted by the Project – Route D2

Name	Co-Ordinates	Route Option	Image
Dwellings	S 23 51 26 E 27 23 59	Route D2	
Dwelling	S 23 51 10 E 27 23 53	Route D2	
Powerline Crossing	S 23 47 49 E 27 22 57	Route D2	
Cultivated Fields	S 23 46 37 E 27 22 39	Route D2	

Name	Co-Ordinates	Route Option	Image
Dwelling	S 23 51 10 E 27 23 53	Route D2	
Dwelling	S 23 45 22 E 27 22 01	Route D2	

Table 4: Property Directly Impacted by the Project – Route D3

Name	Co-Ordinates	Route Option	Image
Dwellings	S 23 52 23 E 27 23 36	Route D3	
Dwellings	S 23 50 56 E 27 21 32	Route D3	
Powerline Crossing	S 23 49 43 E 27 21 27	Route D3	
Dwelling	S 23 48 58 E 27 21 28	Route D3	

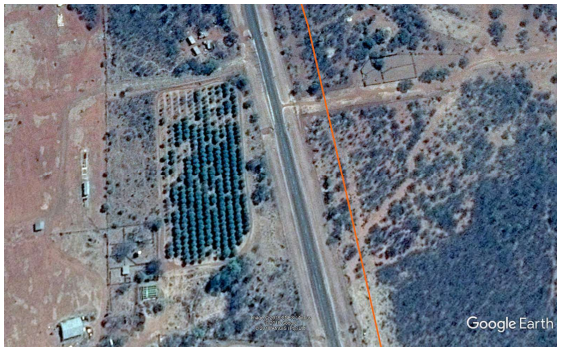
Name	Co-Ordinates	Route Option	Image
Dwelling	S 23 48 44 E 27 21 18	Route D3	
Dwelling	S 23 48 34 E 27 21 04	Route D3	
Dwelling	S 23 47 58 E 27 19 38	Route D3	
Dwelling	S 23 46 43 E 27 18 24	Route D3	
Farm Dwelling Complex	S 23 476 43 E 27 17 48	Route D3	

Name	Co-Ordinates	Route Option	Image
Farm Complex	S 23 46 16 E 27 17 35	Route D3	
Farm Complex	S 23 46 19 E 27 17 29	Route D3	
Dwelling	S 23 46 12 E 27 17 31	Route D3	
Dwelling	S 23 45 42 E 27 17 00	Route D3	
Dwelling	S 23 44 35 E 27 17 10	Route D3	

Name	Co-Ordinates	Route Option	Image
Dwellings – Sandbult/Steenbokpan	S 23 43 24 E 27 16 36	Route D3	

Table 5: Property Directly Impacted by the Project –Route C

Name	Co-Ordinates	Route Option	Image
Accommodation	S 24 23 12 E 27 23 53	Route C	
Dwellings	S 24 20 45 E 27 23 36	Route C	
Buildings	S 24 19 32 E 27 23 33	Route C	
Dwelling and Buildings	S 24 19 32 E 27 23 21	Route C	

Name	Co-Ordinates	Route Option	Image
Orchard	S 24 19 34 E 27 23 21	Route C	
Dwellings	S 24 19 20 E 27 23 20	Route C	
Dwellings	S 24 19 11 E 27 23 29	Route C	
Major Road Crossing – R510	S 24 19 11 E 27 23 29	Route C	
Dwellings	S 24 18 32 E 27 23 31	Route C	

Name	Co-Ordinates	Route Option	Image
Dwellings	S 24 18 13 E 27 24 32	Route C	

Table 6: Property Directly Impacted by the Project –Route A1

Name	Co-Ordinates	Route Option	Image
Powerline Crossing	S 24 31 12 E 27 16 36	Route A1	
Farm Dwelling	S 24 29 49 E 27 19 18	Route A1	

Table 7: Property Directly Impacted by the Project –Route A2

Name	Co-Ordinates	Route Option	Image
Farm Dwelling	S 24 28 53 E 27 16 19	Route A2	
Farm Dwelling	S 24 28 37 E 27 16 57	Route A2	

Table 8: Property Directly Impacted by the Project – Route Option E

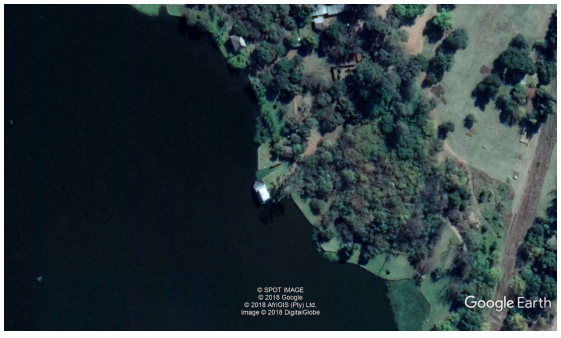
Name	Co-Ordinates	Route Option	Image
Farm Dwelling	S 24 37 29 E 27 18 44	Route E	
Irrigation Pivot	S 24 37 14 E 27 18 41	Route E	
Farm Buildings	S 24 36 56 E 27 18 32	Route E	
Farm Dwelling	S 24 36 36 E 27 18 06	Route E	

Name	Co-Ordinates	Route Option	Image
Farm Buildings	S 24 36 32 E 27 17 58	Route E	
Farm Buildings	S 24 36 24 E 27 17 50	Route E	
Planted Fields	S 24 36 19 E 27 17 49	Route E	
Farm Buildings	S 24 35 59 E 27 17 37	Route E	

APPENDIX 2: CENSUS OF HARTBEESPOORT DAM IMPACTS

Table 1: Property Directly Impacted by Dam Level Fluctuation

Name	Co-Ordinates	Area	Image
Transvaal Yacht Club	25°43'51.86" S 27°51'40.24" E	Hartbeespoort	
No 1 Waterfront	25°43'47.93" S 27°51'46.81" E	Hartbeespoort	
The Oewer Club	25°44'03.24" S 27°52'04.30" E	Schoemansville	
Sunshine Cruises / Toro Ya Me	25°44'04.80" S 27°52'09.88" E	Schoemansville	

Name	Co-Ordinates	Area	Image
Schoemansville Municipality Camping Ground	25°44'13.95" S 27°52'50.44" E	Schoemansville	
Liitle Venice	25°44’42.71” S 27°53’17.85” E	Ifafi	
Ifafi Aquatic Club	25°45'05.48" S 27°53'10.02" E	Ifafi	
The Oewer Club	25°45’37.32” S 27°53’30.67” E	Meerhof	
Harties Party Boat	25°45'44.76" S 27°53'36.92" E	Meerhof	

Name	Co-Ordinates	Area	Image
Estate d'Afrique	25°46'01.47" S 27°53'45.19" E	Pelindaba Road	
Ile du Lac	25°46'30.04" S 27°54'08.40" E	Pelindaba Road	
Eagles Waters Wildlife Resort	25°45'47.30" S 27°52'41.83" E	Pelindaba Road	
Eagles Landing	25°46'03.47" S 27°51'53.23" E		
Pecanwood	25°45'37.39" S 27°51'22.22" E		

Name	Co-Ordinates	Area	Image
Key West	25°45'18.48" S 27°51'07.66" E		
Club Nautique	25°45'17.70" S 27°51'00.00" E		
The Islands Estate	25°45'15.56" S 27°50'52.13" E		
Lakeland Estate	25°45'53.26" S 27°48'48.79" E		
West Lake Country and Safari Estate	25°45'50.60" S 27°48'19.90" E		

Name	Co-Ordinates	Area	Image
The Coves	25°45'50.49" S 27°47'50.49" E		
Magalies Golf Estate and River Club	25°45'36.03" S 27°46'58.94" E		
Magalies Park Time Share Resort	25°45'32.19" S 27°47'07.76" E		
Leguaan Leap	25°45'31.93" S 27°47'24.97" E		
Leloko Lifestyle Estate	25°45'25.42" S 27°47'42.41" E		

Name	Co-Ordinates	Area	Image
Kshane Lake Lodge	25°45'16.71" S 27°48'27.78" E		
Kommando Nek / Gina's Picnic Spot	25°45'09.06" S 27°48'57.15" E		
Caribbean Beach Club	25°44'54.55" S 27°49'44.15" E		
Harties Boat Company and Water Freaks	25°45'03.16" S 27°49'18.13" E		
Hartbeespoort Boat Club	25°44'52.04" S 27°50'13.23" E		

Name	Co-Ordinates	Area	Image
Montego Bay	25°44'46.49" S 27°50'23.47" E		
Boater's World, near Falconwood	25°44'41.75" S 27°50'36.97" E		
Kosmos Boat Club	25°44'35.33" S 27°50'51.45" E		
Mariners Village	25°44'21.78" S 27°51'15.16" E		
22nd Waterkloof / Kosmos Sea Scout Group	25°44'02.27" S 27°51'15.78" E