WEST RAND TAILINGS RETREATMENT PROJECT

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I, Elena Broughton as duly authorised representative of Urban-Econ Development Economists (Pty) Ltd., hereby confirm my independence (as well as that of Urban-Econ Development Economists (Pty) Ltd.) and declare that neither I nor Urban-Econ Development Economists (Pty) Ltd. have any interest, be it business, financial, personal or other, in any proposed activity, application or appeal in respect of Sibanye Gold Limited, other than fair remuneration for work performed, specifically in connection with the proposed West Rand Tailings Retreatment Project, to be located in the West Rand District Municipality Gauteng Province.

_____

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EXECUTIVE SUMMARY

Urban-Econ Development Economists (Urban-Econ) was appointed by Digby Wells Environmental (Digby Wells) to undertake an Economic Impact Assessment (EconIA) Study for the West Rand Tailings Retreatment Project (WRTRP) in the West Rand, Gauteng Province.

The EconIA forms part of the Environmental Impact Assessment process managed by Digby Wells. The EIA provides an assessment of the economic impacts associated with the development of the treatment facility and associated infrastructure to be developed as part of the initial implementation of the project. The EconIA documented in this report builds on the Economic Impact Assessment: Scoping Phase Inputs Report compiled as part of the Scoping Phase of the EIA process.

Economic impact refers to the effect on the level of economic activity and the welfare of households in a given area because of some form of external intervention in the economy. The intervention can be in the form of new investment in infrastructure (as in the case of the current assessment), new development, adoption of a new policy or service or expansion of the current operations. The types of economic impact stimulated by the intervention are generally positive and include creation of additional jobs, generation of business sales and value-added, improved quality of life, increase in disposable income, and growth of government revenue.

Any type of intervention does not only create direct benefits experienced by the investor, but has spill over effects on the other economic agents through a multiplier effect. Two types of multiplier effects can be distinguished, i.e. production induced impacts (generally referred to as indirect impacts) and consumption induced effects (generally referred to as induced impacts).

Economic impacts can also be viewed in terms of their duration, or the stage of the project's lifecycle that is being analysed. Generally, two phases are subjected to the economic impact assessment namely the construction phase and the operational phase. The construction phase economic impacts are of a temporary nature. On the other hand, the operational phase of the project usually takes place over a long-term, hence, the impacts during this stage are generally of a more sustainable nature.

An economic modelling exercise based on the Social Accounting Matrix (SAM) was used to assess the direct, indirect, and induced economic impacts of the construction and the operational phases on the local and regional economies of Gauteng.

The results of the impact assessment found that the construction and operation activities will result in various positive economic impacts, including:

- During construction, capital investment into the West Rand Tailings Retreatment Project will generate a total of R26 480 million of new business sales that will translate into R9 890 million in GDP-R, at 2015 prices. A total of 54 049 FTE man-years will be created. Of these, approximately three quarters will be created through production and

consumption induced impacts. Households will earn R4 252 million (2015 prices) in income over the initial implementation construction period.

- During operations that will span the period between 2018 and 2034, a total of 210 390 kilotons (kt) of ore will be reclaimed. This will generate sales to the value of R40 153 million at 2015 prices. Through the direct and multiplier effects and over the entire operational period, the project will stimulate the creation of new business sales to the value of R72 087 million that will translate into R36 769 million of value added in 2015 prices. On average, R6 456 million of production output, and associated R4 582 million of GDP-R will be created on an annual basis. This will in turn create 53 820 FTE jobs throughout the country over the entire period of operations, of which 7 683 FTE jobs will created and sustained at the mine itself. The total income earned by all households benefiting from the mine's operation, directly or through multiplier effects, will be approximately R7 330 million in 2015 prices. In addition, operations of the project will increase export earnings for South Africa and boost government revenue to the value of R5 038 million (2015 prices).

Considering that the mining sector in the local economy has been declining in the past few years, the proposed establishment of the WRTRP is expected to reverse this trend and offset the decline in the local economic base, importantly, it will re-establish sustainable employment opportunities that have been lost in the economy in the past.

The proposed project is also expected to create some negative environmental impacts that may result in negative economic effects in the immediate locality from the site. Among the negative impacts that are expected to ensue as a result of the project are the potential decline in property values and a possible loss of income derived by some of the properties from agricultural activities, for instance, Portion 11 of Cardoville 364 and Portion 6 of Wildebeestkuil 360. The value of these impacts is difficult to quantify, however, it is believed that proper mitigation measures may significantly reduce their probability and magnitude. Furthermore, if losses do occur, the potential negative economic effects will be a fraction of the positive impacts that will be created by the mine.

The proposed WRTRP will have a positive effect in terms of stimulation of domestic production, job creation, and government revenue. The project also falls within the government's objective to stimulate job creation and economic growth. Therefore, from an economic perspective, the project should be approved for development, under the condition that the proposed mitigations are implemented. Mitigations include employment of people from local communities and procurement of goods and services from local small business in order to maximise benefits to the local economy.

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LIST OF ACRONYMS

C4S	Cooke 4 South
CAPEX	Capital Expenditure
CPP	Central Processing Unit
CUP	Cooke Uranium Project
DM	District Municipality
EconIA	Economic Impact assessment
ESMP	Environmental and Social Management Plan
FTE	Full Time Equivalent
GDP-R	Gross Domestic Product per Region
GOS	Gross Operating Surplus
LED	Local Economic Development
LM	Local Municipality
Mt	Million tonnes
OPEX	Operating Expenditure
PFS	Pre-Feasibility Study
RTSF	Regional Tailings Storage Facility
SGL	Sibanye Gold Limited
SLP	Social and Labour Plan
SME	Small and Medium Enterprises
TSF	Tailings Storage Facility
WRTRP	West Rand Tailings Retreatment Project
WWP	West Wits Project

1 Introduction

Urban-Econ Development Economists (Urban-Econ) was appointed by Digby Wells Environmental (Digby Wells) to undertake an Economic Impact Assessment (EconIA) Study for the West Rand Tailings Retreatment Project (WRTRP) in the West Rand, Gauteng Province. The EIA forms part of the Environmental Impact Assessment process managed by Digby Wells. The EIA provides an assessment of the economic impacts associated with the development of project.

1.1 Project Background

There is a long history of gold and uranium mining in the broader West Rand area with an estimated 1.3 billion tonnes of tailings, containing in excess of 170 million pounds of uranium and 11 million ounces of gold. Sibanye Gold Limited (SGL) currently owns the majority of the tonnage and its gold and uranium content. SGL plans to ultimately exploit all these resources to develop a strong, long life and high yield surface business. Key to the successful execution of this development strategy is the West Rand Tailings Retreatment Project (WRTRP). The concept of the WRTRP is well understood with an eight-year history of extensive metallurgical test work, feasibility studies and design by a number of major mining houses. A pre-feasibility study (PFS) completed during 2013 for the WRTRP has confirmed that there is a significant opportunity to extract value from the SGL surface resources in a cost effective sequence. (Digby Wells Environmental, 2015).

The ultimate WRTRP involves the construction of a large-scale Central Processing Plant (CPP) for the recovery of gold, uranium and sulfur from the available resources. The CPP, centrally located to the West Rand resources, will be developed in phases to eventually treat up to 4mt/month of tailings inclusive of current arisings. The resultant tailings will be deposited on a modern tailings storage facility (TSF) called the regional TSF (RTSF). (Digby Wells Environmental, 2015).

1.2 Project Description

1.2.1 Ultimate Project

Simplistically, SGL's historical TSF holdings in the West Rand can be divided into three blocks; the Northern, Southern and Western Blocks. Each of these blocks contains a number of historical TSFs. Each of the blocks will be reclaimed in a phased approach. Initially the Driefontein 3 TSF together with the Cooke TSF will be reclaimed first. Following reclamation of Driefontein 3 TSF, Driefontein 5 TSF and Cooke 4 South (C4S) will be reclaimed.

- Kloof Mining Right Area: Kloof 1 TSF, Kloof 2 TSF, Leeudoorn TSF, Libanon TSF, Venterspost North and Venterspost South TSFs. Venterspost North and South TSFs will be processed with the concurrent construction of Module 2 float and gold plants. The remainder of the TSFs will be processed once Module 3 of the CPP has been constructed;

- Driefontein Mining Right Area: Driefontein 1, 2, 3, 4 and 5 TSF. Once the Driefontein 3 and 5 TSFs have been depleted the remainder of the Driefontein TSFs, namely Driefontein 1, 2 and 4 TSFs, will be processed through the CPP;
- Cooke Mining Right Area: Cooke TSF C4S TSF, and the Millsite Complex (38, 39 and 40/41 and Valley) TSFs. C4S will be processed subsequent to Driefontein 3 and 5 TSFs and in parallel with the Cooke TSF. Millsite Complex will be processed with the concurrent construction of Module 2 float and gold plants; and
- Ezulwini mining Right Area: during initial implementation no Ezulwini TSFs will be reclaimed. The Ezulwini uranium plant will however be used to treat 50 000 k/m of concentrated uranium slurry.

Once commissioned the project will initially reclaim and treat the TSFs at a rate of 1.4 Mt/m (1Mt/m from Driefontein 3 TSF, followed sequentially by Driefontein 5 and C4S TSFs, and 0.4Mt/m from Cooke TSF). Reclamation and processing capacity will ultimately ramp up to 4 Mt/m over an anticipated period of 8 years. At the 4Mt/m tailings retreatment capacity, each of the blocks will be reclaimed and processed simultaneously.

The tailings material will be centrally treated in a CPP. In addition to gold and uranium extraction, sulfur will be extracted to produce sulphuric acid, an important reagent required for uranium leaching.

To minimise the upfront capital required for the WRTRP, only essential infrastructure will be developed during initial implementation. Use of existing and available infrastructure may be used to process gold and uranium until the volumetric increase in tonnage necessitates the need to expand the CPP.

The authorisation, construction and operation of a new deposition site for the residue from the CPP will be located in an area that has been extensively studied as part of the original West Wits Project (WWP) and Cooke Uranium Project (CUP). The “deposition area” on which the project is focussing, has been termed the RTSF and is anticipated to accommodate the entire tonnage from the district. The RTSF if proved viable will be one large facility as opposed to the two independent deposition facilities proposed by the WWP and CUP respectively.

Table 1-1 provides a summary of the ultimate project, as it is currently understood.

Table 1-1: Summary of the ultimate project

Description		Kloof existing MR	Driefontein existing MR	Cooke existing MR	Ezulwini existing MR
Resources	**Ultimate project**	Kloof 1 and 2 TSFs, Leeuwdoorn TSF, Libanon TSF, Venterspost North & South	Driefontein 1, 2, 3 and 5 TSFs (4 operational)	Cooke TSF, Millsite TSF, C4S TSF	-
Resource LOM	**Existing underground (CPR-2014)**	11 years	11 years	11 years	9 years
	WRTRP (ultimate plan)	Indefinite (18 years mining)	23 years	26 years	11 years
Infrastructure	**Existing**	-	-	-	Ezulwini Uranium Plant
	New	▪ The CPP (3 Gold Plant Modules, 2 Uranium Plant Modules and a Roaster and Acid Module) ▪ The RTSF complex ▪ Pipelines, roads and pumps	▪ West Block Thickener (WBT) and bulk water storage ▪ Pipelines, roads and pumps	▪ Cooke Thickener ▪ Pipelines, roads and pumps	▪ Booster pump stationPipelines, roads and pumps

1.2.2 Initial implementation

Due to capital constraints in developing a project of this magnitude, it needs to be implemented over time. The initial investment and development will be focused on those assets that will put the project in a position to partially fund the remaining development.

This entails the design and construction of the CPP (gold module, floatation plant, uranium plant, acid plant and a roaster), to retreat up to 1.4Mt/m from the Driefontein 3 and 5 TSFs, C4S TSF and the Cooke TSF. Driefontein 3, 5 and C4S TSFs will be mined sequentially over 11 years, whilst the Cooke TSF will be mined concurrent to these for a period of 16 years. The resultant tailings will be deposited onto the new RTSF.

A high grade uranium concentrate, produced at the CPP, could be transported to Ezulwini (50k tonnes per month) for the extraction of uranium and gold. The tailings from this process could be deposited on the existing operational Ezulwini North TSF.

The CPP and RTSF are likely to be the two components of the project with the most significant potential impacts and will be developed as the project matures. The CPP will be developed over a period of approximately eight years, however the EIA process and impact assessments are applying for it to be authorised as an entirety. The decision to take this approach, as opposed to authorising it in stages over eight years, is to provide the regulators and the public with an impact assessment that takes the whole project into consideration. The same logic is applied to the RTSF. It will be developed in two phases over the life of the project however the entire footprint is assessed from an environmental impact perspective.

Table 1-2: Approximate phasing of implementation

Construction	2016	2018	2020
Operation	**2019**	**2021**	**2024**
Infrastructure required	▪ Gold Plant Module I ▪ Uranium Plant Module I ▪ Roaster Acid Module I ▪ West Block Thickener (WBT) and bulk water storage ▪ Ezulwini Booster Pump Station ▪ Cooke thickener ▪ Pipelines, roads and pumps	▪ Gold module II ▪ Pipelines, roads and pumps	▪ Gold Module III ▪ Uranium Plant Module II roaster ll ▪ Pipelines, roads and pumps

Note: Amendments to various MWPs and EMPs will be applied for in due course pending the inclusion of additional TSFs as the WRTRP grows to process 4 Mt/m. The RTSF and CPP will be assessed for the complete footprint to ensure suitability for all future deposition requirements.

The following primary activities of the WRTRP need to be assessed as part of the initial implementation:

Table 1-3: Primary activities of the WRTRP's initial implementation

Category	Activity
Kloof Mining Right area	
Infrastructure	Pipeline Routes (residual tailings).
	Central processing Plant (CPP) incorporating Module 1 float and gold plants and uranium, roaster and acid plants.
	The Regional Tailings Storage Facility (RTSF) Phase 1, RTSF Return Water Dam (RWD) Phase 1 and the Advanced Water Treatment Facility (AWTF) Phase 1. Collectively known as the RTSF complex.
Processes	Abstraction of water from K10 shaft - Pumping water from K10 to the BWSF located next to the WBT.
	Disposal of the residue from the AWTF to the RTSF.
	Gold, uranium and sulfur extraction at the CPP (tailings to RTSF)
	Water distribution at the AWTF for discharge.
Pumping	Pumping of up to 1.4 Mt/m of tailings to the RTSF.
	Pumping water from the RTSF return water dams to the AWTF.
	Discharging treated water to the Leeuspruit.
Electricity supply	Power supply from Kloof 1 substation to the CPP.
	Power supply from Kloof 4 substation to the RTSF and AWTF.
Driefontein Mining Right area	
Infrastructure	Pipeline Routes (water, slurry and thickened tailings).
	West block Thickener (WBT) and Bulk Water Storage Facility (BWSF) complex.
	Collection sumps and pump stations at the Driefontein 3 and 5 TSFs
Processes	Hydraulic reclamation of the Driefontein 3 and 5 TSFs.
Pumping	Pumping water from the BWSF to the Driefontein TSFs that will be reclaimed (Dri3 & 5 TSFs).
	Pumping slurry from the TSF sump to the WBT (for Driefontein 3 and 5 TSFs).
	Pumping the thickened slurry from the WBT to the CPP.
Electricity supply	Power supply from West Driefontein 6 substation to Driefontein 3 TSF.
	Power supply from West Driefontein Gold substation to Driefontein 5 TSF.
	Power supply from East Driefontein Shaft substation to WBT and BWSF.

Category	Activity
Cooke Mining Right area	
Infrastructure	Pipeline Routes (water, slurry and thickened tailings).
	Cooke thickener and BWSF.
	Collection sumps and pump stations at the Cooke and C4S TSFs.
Processes	Abstraction of water from Cooke 1/2 shaft.
	Hydraulic reclamation of the Cooke and C4S TSFs (which include temporary storage of the slurry in a sump).
Pumping	Pumping 400 kt/m of tailings from the Cooke TSF to the Cooke thickener.
	Pumping from the Cooke thickener to the CPP via Ezulwini.
Electricity supply	Power supply from the Cooke substation to the Cooke thickener.
	Power supply from the Cooke Plant to the Cooke TSF
Ezulwini Mining Right area	
Infrastructure	Pipeline Routes (water, slurry and thickened tailings).
Processes	Uranium extraction at Ezulwini (tailings to Ezulwini North Dump).
	Abstraction of water from Cooke shaft.
Pumping	Pumping water from Cooke 4 Shaft to the C4S TSF for reclamation.
	Pumping slurry from the TSF sump to the CPP.
	Boosting slurry from the CD at the Ezulwini plant to the CPP
Electricity supply	Power supply from Ezulwini plant to the C4S TSF

1.3 Terms of Reference

Digby Wells has appointed Urban-Econ Development Economists to undertake an Economic Impact Assessment Study, which forms part of the Environmental Impact Assessment (EIA) process for the project as described above. The Terms of Reference for the Economic Impact Assessment Report include:

- Delineation of the primary, secondary, and tertiary study area,
- Compilation of an economic profile of the study area,
- Development of an economic model on the basis of a Social Accounting Matrix for Gauteng,
- Collection of required data and the interpretation thereof, in economic variables required for the modelling exercise,

- Estimation of economic impacts associated with the proposed project using the economic models,
- Interpretation of the potential economic impacts in the context of the affected environment, be it local or regional economies,
- Comparison of the identified impacts against the status quo, i.e. a “no go” alternative to determine whether the project will produce a net benefit or net loss, and
- Provision of recommendations with respect to possible mitigation measures that could be implemented to reduce potential negative impacts and capitalise on the possible positive economic effects of the project.

2 Details of the Specialist

The Economic Impact Assessment of the project was prepared by Urban-Econ Development Economists. The details of the consultants responsible for the compilation of the report are as given below:

Elena Broughton is a senior professional at Urban-Econ and has an extensive knowledge in various fields of economic development, including impact assessments, investment strategy formulation, strategic decision analysis, and monitoring and evaluation. She is experienced in developing input-output and SAM-based models, as well as development and application of other econometric techniques. Elena has a special interest in project evaluation and decision-making framework, with the latter being the focus of her Master’s dissertation. Over the past few years, she was able to extend her experience in these fields by working on projects for both government and the private sector.

Memory Madondo is a professional at Urban-Econ who has gained experience over the past three years in several economic arenas such as collation and analytic processing of economic data, trend analysis, forecasting and economic development among others. She has also carried out a number of socio-economic impact assessments of varying magnitude and has in turn gained good skill in report writing and presentation. She continues to gain further knowledge as well as expertise in the economic field.

Mariette Steynberg completed her BCom degree in 2008 at the University of Johannesburg with a double major in Economics and Econometrics. She went on to complete a BCom Honours degree in 2009 majoring in International Trade and Development Economics. To further her capabilities in the field she successfully completed a Post Graduate Diploma in Financial Planning in 2013 while working as a trainee planner before relocating to Pretoria to pursue a career in Economics.

3 Aims and Objectives

The purpose of the EconIA is to determine the potential positive and negative effects of the proposed West Rand Tailings Retreatment Project (WRTRP) on the local and regional economies and to compare its effects with the “no go” alternative. The “no go” alternative

assumes that the WRTRP is not established at the proposed location, nor anywhere else in the country, thus retaining the current economic status quo. The study also aims to provide recommendations on how negative economic impacts, if identified, can be mitigated or eliminated altogether and advise on the potential actions that could be implemented to enhance positive impacts.

4 Methodology

4.1 Project Location and Delineation of Study Area

Study area delineation depends on the type of economic activity that is being analysed and the perceived spread of economic impacts that are expected to be generated from the project during its lifespan. Besides the WRTRP's strategic importance with respect to development of a sustainable surface business, it is expected to have both positive and negative impacts as has been identified in the Scoping Phase of the project. The former refers to the economic impacts stimulated as a result of increased operating activities, whilst the latter refers to effects on the local communities as a result of various environmental disturbances. The spatial distribution of economic impacts is expected to differ depending on the type and cause of the impacts.

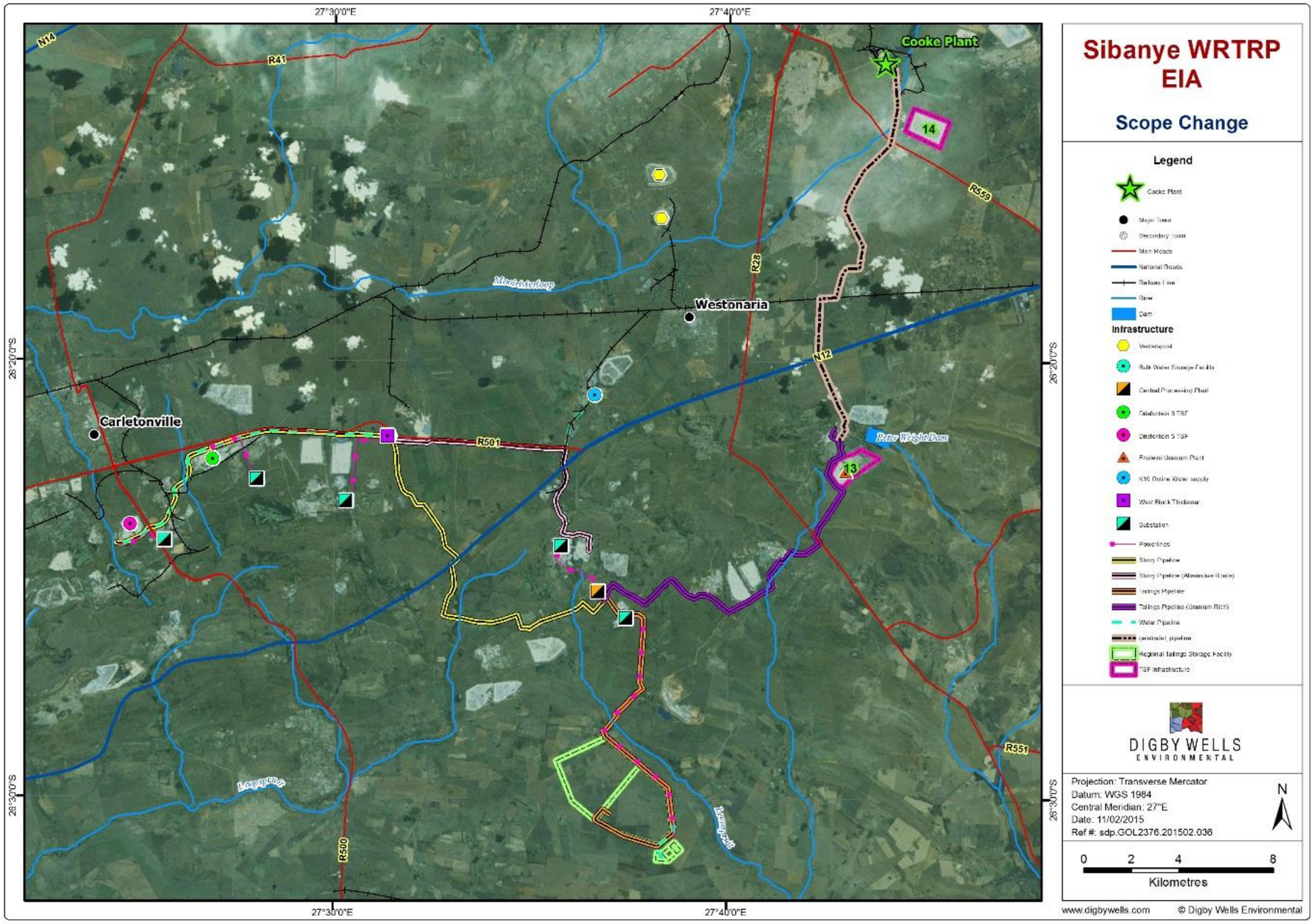
The proposed project is located in the mining areas of the Westonaria and Merafong City LMs, which form part of the West Rand District Municipality (DM) and extends into a small portion of the City of Johannesburg Metropolitan Municipality, where the Cooke Plant is located.

Considering that the two municipalities and the district in general have an established mining industry that goes back decades, it is likely that many of the skilled and highly skilled people required for the project could be sourced from the local economies.

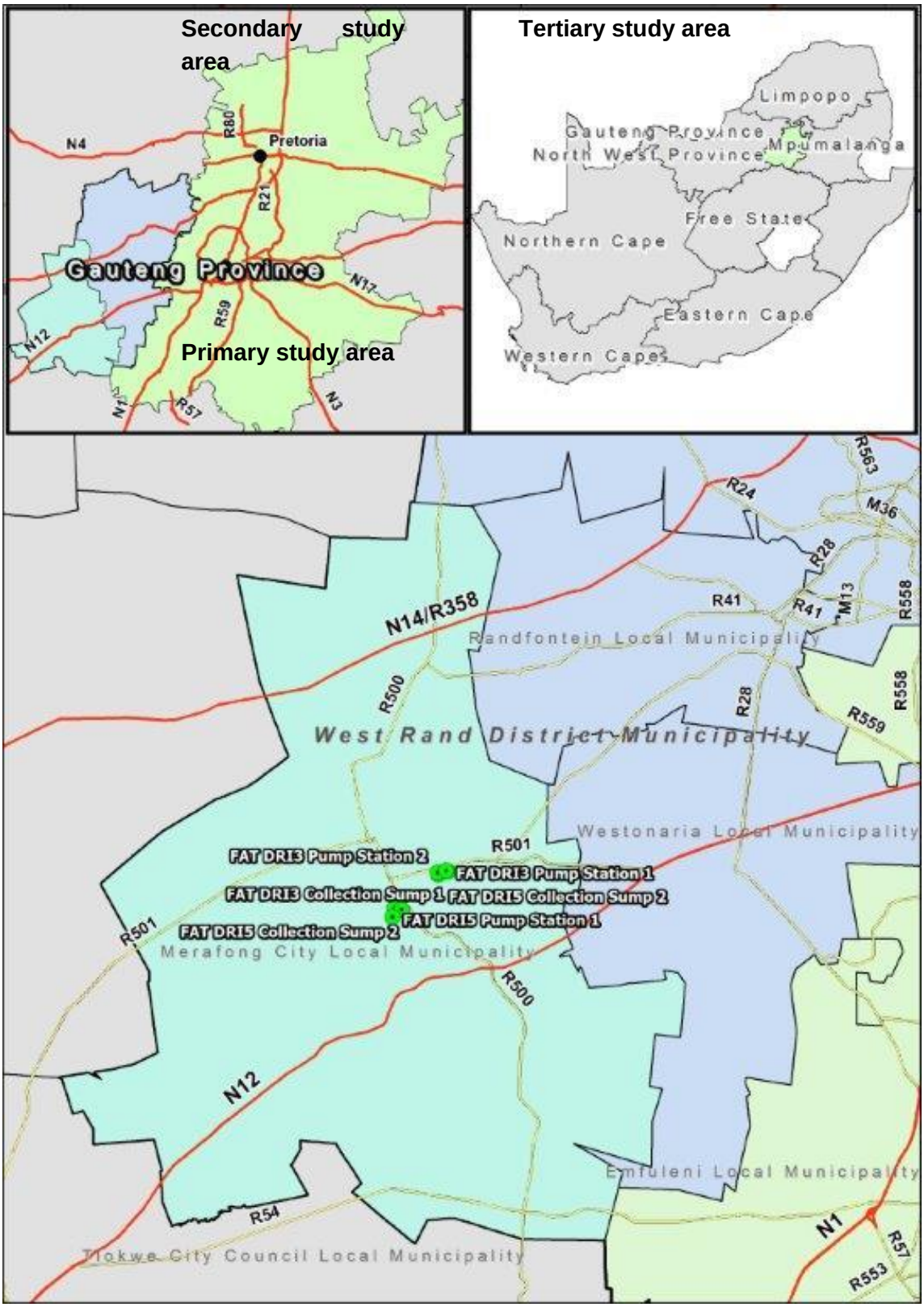
With respect to the procurement of equipment and machinery required for the establishment of the Central Processing Plant and other project components, the local economies and the district might not be sufficiently diversified. However, the project is to be located in the Gauteng economy, which is likely to host general and specialised equipment manufacturers and businesses that can service the project during construction and operations.

In the context of the above, the study area is delineated as follows as shown in Map 4-2:

- **Immediate zone of influence**, which includes the farms that form part of the entire project site and the adjacent farms, where certain environmental impacts can be extended to (to be identified by other specialists).
- **Primary study area** that includes nearby towns and the Westonaria LM, Merafong City LM, a portion of the City of Johannesburg Metropolitan Municipality; as well as the West Rand DM.
- **Secondary study area** that includes Gauteng.
- **Tertiary study area** that encompasses South Africa.



Map 4-1: Project Location (Digby Wells Environmental, 2015)



Map 4-2: Delineated study areas, locality map (Digby Wells Environmental, 2015)

4.2 Literature Review and Desktop Assessment

The policy review is done to provide an insight into government socio-economic objectives, plans, and applicable legislature. This assists in determining the importance and alignment of the project with regard to the developmental objectives of various government spheres. The policy analysis also attempts to identify potential developmental conflicts and economic impacts that the project might create.

Policies from all sectors of government within the specified delineated areas were examined to ensure alignment of the project with agendas of relevant government entities. These included:

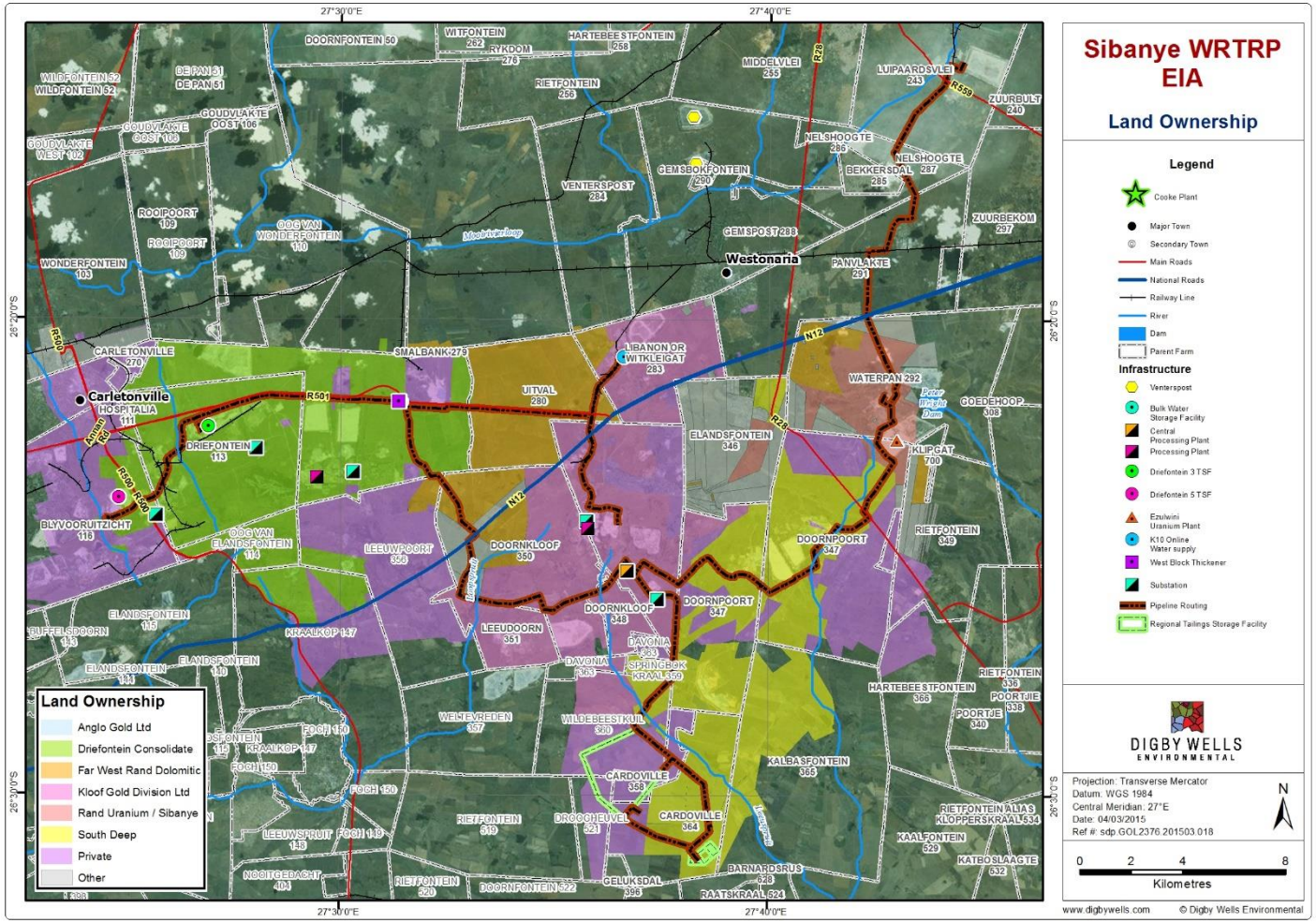
- The national level:
  - New Growth Path Framework
  - The National Development plan 2030
- Provincial level
  - Gauteng Employment Growth and Development Strategy
  - Gauteng Vision 2055
- The local government level:
  - West Rand DM's Integrated Development Plan (IDP) 2014/15
  - West Rand Regional Growth and Development Strategy
  - Westonaria Integrated Development Plan (IDP) 2012/13
  - Merafong City LM's Growth and Development Strategy, 2014

4.3 Fieldwork and Seasonal Influence

The proposed project is to be located in a predominantly mining area with scattered residential areas and some farming activities. From an economic perspective, any activity that is located within the potential zone of influence of the proposed project needs to be examined with the purpose of:

- Understanding the economic profile of the zone of influence,
- Determining whether the existing economic activity in the zone of influence may be impacted by the proposed project, and whether the impact will be of positive or negative nature, and
- Determining the extent to which the positive or negative impact will affect the economic viability of the existing economic activity.

The following map illustrates the zone of influence that was examined during the economic impact assessment study.



Map 4-3: Zone of influence

As can be seen the majority of land that is affected by various project components is owned by corporates or organisations and only certain portions are owned privately by farmers. A site visit was done on the 15th of May 2015. In addition, in order to obtain baseline information on the economic conditions characterising the potentially affected land parcels in terms of current and predicted future changes with and without the project, telephonic interviews were conducted on the 3rd and 4th of June 2015 and follow up interviews to address gaps were conducted on 20 July 2015.

Table 4-1 outlines the land parcels that were included in the zone of influence and summarises information about the interviews.

Table 4-1: Landowners' Contact Details

Farm	Registered Landowners	Contact Person	Data collection type
Geluksdal 396	Bernard Rabe	Bernard Rabe	Telephonic interview
Barnardrus 628	Bernard Rabe	Bernard Rabe	Telephonic interview
Cardonville 364-11	JCC Badenhorst	JCC Badenhorst	Telephonic interview
Wildebeestkuil 360-01	JF van Rensburg	JF van Rensburg	Telephonic interview
Cardoville 364-RE/6	Barry van Wyk	Barry van Wyk	Telephonic interview
Springbok Kraal 359	JF van Rensburg	JF van Rensburg	Telephonic interview
Wildebeestkuil 360-6	FRJ de Bruyn	FRJ de Bruyn	Telephonic interview

All interviews followed a semi-structured approach to ensure consistency and uniformity in the derived information. Information gathered during the interviews included, inter alia:

- The current land use of the land parcel,
- Type of economic activity taking place on the land parcel,
- Number of people employed and their status (permanent or temporary),
- Annual average revenue derived by economic activity on the land parcel and key revenue streams,
- Information about agricultural yields and livestock, if the land parcel is used for commercial agriculture, and
- Opinion and concerns, if any, of the land owners regarding the proposed project.

Other data collection methods took on the following forms:

- A desktop study of the sites and surrounding areas through the use of Google Earth
- Perusing the various locality maps generated through the project process, and
- Perusing existing project documentation, this included shape files and project descriptions received from the client.

4.4 Economic impacts explained

Prior to the introduction of the methodology employed in the study, it is important to explain the concept of an economic impact. Economic impact refers to the effect on the level of economic activity and the welfare of households in a given area as a result of some form of external intervention in the economy. The intervention can be in the form of new investment in infrastructure, new development, adoption of a new policy or service, expansion of the current operations, etc. The economic impacts stimulated by the intervention are generally positive and include creation of additional jobs, generation of business sales and value-added, improved quality of life, increase in disposable income, and growth of government revenue.

Any type of intervention does not only create direct benefits experienced by the investor, but has spill over effects on the other economic agents. As illustrated in Figure 4-1, three types of economic impacts are generally assessed:

- Direct effects are generated when a new business creates new jobs and purchases goods and services to operate the new facility. Direct impact results in an increase in job creation, production, business sales, and household income.
- Indirect effects occur when the suppliers of goods and services to the new businesses experience larger markets and potential to expand. Indirect impacts result in an increase in job creation, GDP, and household income.
- Induced effects represent further shifts in spending on food, clothing, shelter and other consumer goods and services as a consequence of the change in workers and payroll of directly and indirectly affected businesses. This leads to further business growth/decline throughout the local economy.

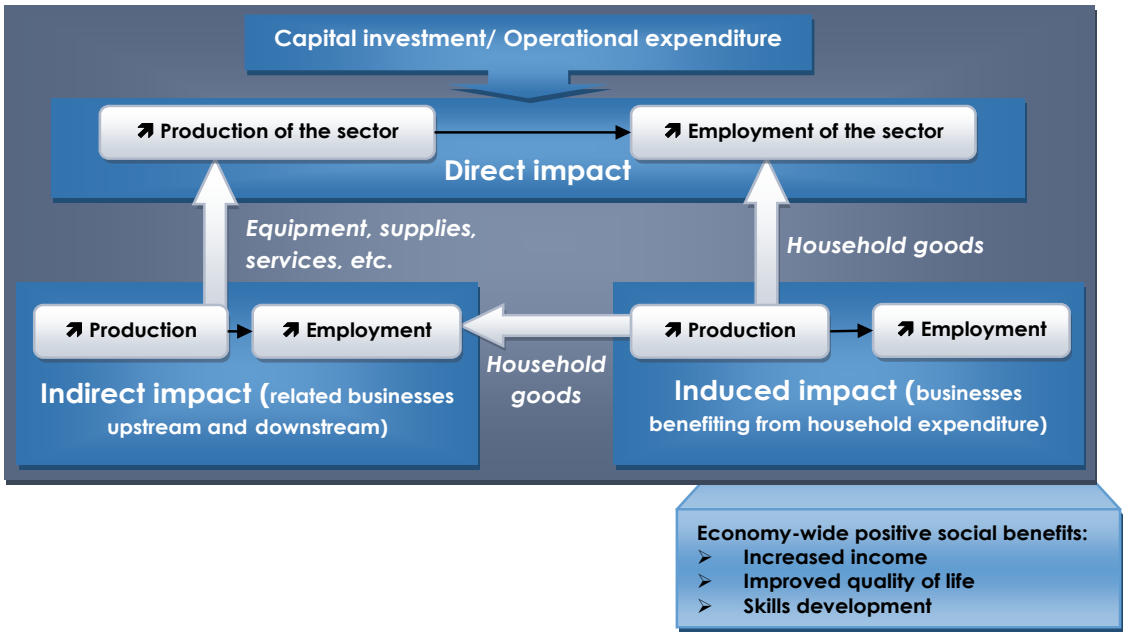


Figure 4-1: Impact of capital investment/operational expenditure

Economic impacts can also be viewed in terms of their duration, or the stage of the project's lifecycle that is being analysed. Generally, two phases are subjected to the economic modelling exercise and assessment, namely the construction phase and the operational phase. The construction phase economic impacts are of a temporary nature, they have, therefore, only a temporary effect. On the other hand, the operational phase of the project usually takes place over a long-term, hence, the impacts during this stage are of a sustainable nature.

5 Methodology

The methodology employed in conducting the study comprised of three main steps described below.

5.1 Step 1: Baseline profiling

Profiling involved the description of the study area in terms of selected economic variables. It included the analysis of parameters such as population size and household numbers, structure and growth of the economy, labour force, and employment situation. Profiling for the study was done making use of Quantec Research database and selected Stats SA statistics, such as Census 2011.

5.2 Step 2: Modelling

The modelling exercise made use of economic models developed on the basis of the Social Accounting Matrix (SAM) for Gauteng updated to 2015 prices. The SAM is a comprehensive, economy-wide database that contains information about the flow of resources that takes place between the different economic agents in this case in the provincial economy

The following assumptions were used with respect to the economic model and the modelling exercise:

- No structural changes in the economy are experienced during the analysed period (between 2004 and 2015).
- The model was closed with respect to households, which implies that households are regarded as an industry whose output is labour and whose inputs are various consumer goods and services. The closed economic model, compared to the open economic model, allows determination of induced impacts (i.e. impacts stimulated through household consumption) in addition to direct and indirect impacts predicted by the open economic model.
- When calculating the exogenous inputs, Gross Operating Surplus was excluded from the consumption induced effects thus assuming that all earnings will be retained and not paid out as dividends. Capital formation and interest payments were excluded from modelling, too.
- The model assumes that the economy is in equilibrium.

- The supply of each good and service is assumed to be perfectly elastic and absent of any capacity constraints. This means that industries and sectors can produce any quantities of goods and services and would not experience technological, budgetary, and/or human resource constraints.
- Employment is estimated in Full-Time Equivalent (FTE) person-years for one year. This, however, does not necessarily directly translate into new employment positions. In the short-term, an increase in FTE could be absorbed by currently employed through working overtime or it could translate into the support of currently employed people.

5.3 Step 3: Impact evaluation and recommendations

The impacts are assessed based on the impact's magnitude as well as the receiver's sensitivity, culminating in an impact significance which identifies the most important impacts that require management.

Based on international guidelines and South African legislation, the following criteria are taken into account when examining potentially significant impacts:

- Nature of impacts (direct/indirect, positive/ negative),
- Duration (short/medium/long-term, permanent(irreversible) / temporary (reversible), frequent/seldom),
- Extent (geographical area, size of affected population/habitat/species),
- Intensity (minimal, severe, replaceable/irreplaceable),
- Probability (high/medium/low probability), and
- Possibility to mitigate, avoid or offset significant adverse impacts.

Details of the impact assessment methodology used to determine the significance of physical, bio-physical and socio-economic impacts are provided below.

The significance rating process follows the established impact/risk assessment formula:

Significance = Consequence x Probability x Nature

Where

Consequence = Intensity + Extent + Duration

And

Probability = Likelihood of an impact occurring

And

Nature = Positive (+1) or negative (-1) impact

Note: In the formula for calculating consequence, the type of impact is multiplied by +1 for positive impacts and -1 for negative impacts

The matrix calculates the rating out of 147, whereby Intensity, Extent, Duration and Probability are each rated out of seven as indicated in Table 5-1. The weight assigned to the various parameters is then multiplied by +1 for positive and -1 for negative impacts.

Impacts are rated prior to mitigation and again after consideration of the mitigation measure proposed in this aquatic impact assessment report. The significance of an impact is then determined and categorised into one of eight categories, as indicated in Table 5-2, which is extracted from Table 5-1. The description of the significance ratings is discussed in Table 5-1.

It is important to note that the pre-mitigation rating takes into consideration the activity as proposed, i.e. there may already be certain types of mitigation measures included in the design (for example due to legal requirements). If the potential impact is still considered too high, additional mitigation measures are proposed.

Table 5-1: Impact Assessment Parameter Ratings

RATING	INTENSITY/REPLACABILITY		EXTENT	DURATION/REVERSIBILITY	PROBABILITY
	Negative impacts	Positive impacts			
7	Irreplaceable damage to highly valued items of great natural or social significance or complete breakdown of natural and / or social order.	Noticeable, on-going natural and / or social benefits which have improved the overall conditions of the baseline.	International The effect will occur across international borders.	Permanent: The impact is irreversible, even with management, and will remain after the life of the project.	Definite: There are sound scientific reasons to expect that the impact will definitely occur. >80% probability.
6	Irreplaceable damage to highly valued items of natural or social significance or breakdown of natural and / or social order.	Great improvement to the overall conditions of a large percentage of the baseline.	National Will affect the entire country.	Beyond project life: The impact will remain for some time after the life of the project and is potentially irreversible even with management.	Almost certain / Highly probable: It is most likely that the impact will occur. <80% probability.
5	Very serious widespread natural and / or social baseline changes. Irreparable damage to highly valued items.	On-going and widespread benefits to local communities and natural features of the landscape.	Province/ Region Will affect the entire province or region.	Project Life (>15 years): The impact will cease after the operational life span of the project and can be reversed with sufficient management.	Likely: The impact may occur. <65% probability.
4	On-going serious natural and / or social issues. Significant changes to structures / items of natural or social significance.	Average to intense natural and / or social benefits to some elements of the baseline.	Municipal Area Will affect the whole municipal area.	Long term: 6-15 years and impact can be reversed with management.	Probable: Has occurred here or elsewhere and could therefore occur. <50% probability.

RATING	INTENSITY/REPLACABILITY		EXTENT	DURATION/REVERSIBILITY	PROBABILITY
	Negative impacts	Positive impacts			
3	On-going natural and / or social issues. Discernible changes to natural or social baseline.	Average, on-going positive benefits, not widespread but felt by some elements of the baseline.	Local Local extending only as far as the development site area.	Medium term: 1-5 years and impact can be reversed with minimal management.	Unlikely: Has not happened yet but could happen once in the lifetime of the project, therefore there is a possibility that the impact will occur. <25% probability.
2	Minor natural and / or social impacts which are mostly replaceable. Very little change to the baseline.	Low positive impacts experience by a small percentage of the baseline.	Limited Limited to the site and its immediate surroundings.	Short term: Less than 1 year and is reversible.	Rare / improbable: Conceivable, but only in extreme circumstances. The possibility of the impact materialising is very low as a result of design, historic experience or implementation of adequate mitigation measures. <10% probability.
1	Minimal natural and / or social impacts, low-level replaceable damage with no change to the baseline.	Some low-level natural and / or social benefits felt by a very small percentage of the baseline.	Very limited Limited to specific isolated parts of the site.	Immediate: Less than 1 month and is completely reversible without management.	Highly unlikely / None: Expected never to happen. <1% probability.

Table 5-2: Probability/Consequence Matrix

Significance

Probability																			
7	-147	-140	-133	-126	-119	-112	-105	-98	-91	-84	-77	-70	-63	-56	-49	-42	-35	-28	-21
6	-126	-120	-114	-108	-102	-96	-90	-84	-78	-72	-66	-60	-54	-48	-42	-36	-30	-24	-18
5	-105	-100	-95	-90	-85	-80	-75	-70	-65	-60	-55	-50	-45	-40	-35	-30	-25	-20	-15
4	-84	-80	-76	-72	-68	-64	-60	-56	-52	-48	-44	-40	-36	-32	-28	-24	-20	-16	-12
3	-63	-60	-57	-54	-51	-48	-45	-42	-39	-36	-33	-30	-27	-24	-21	-18	-15	-12	-9
2	-42	-40	-38	-36	-34	-32	-30	-28	-26	-24	-22	-20	-18	-16	-14	-12	-10	-8	-6
1	-21	-20	-19	-18	-17	-16	-15	-14	-13	-12	-11	-10	-9	-8	-7	-6	-5	-4	-3
Consequence	**-21**	**-20**	**-19**	**-18**	**-17**	**-16**	**-15**	**-14**	**-13**	**-12**	**-11**	**-10**	**-9**	**-8**	**-7**	**-6**	**-5**	**-4**	**-3**

Probability																			
7	21	28	35	42	49	56	63	70	77	84	91	98	105	112	119	126	133	140	147
6	18	24	30	36	42	48	54	60	66	72	78	84	90	96	102	108	114	120	126
5	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100	105
4	12	16	20	24	28	32	36	40	44	48	52	56	60	64	68	72	76	80	84
3	9	12	15	18	21	24	27	30	33	36	39	42	45	48	51	54	57	60	63
2	6	8	10	12	14	16	18	20	22	24	26	28	30	32	34	36	38	40	42
1	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
Consequence	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**

Table 5-3: Significance Rating Description

Score	Description	Rating
109 to 147	A very beneficial impact that may be sufficient by itself to justify implementation of the project. The impact may result in permanent positive change	Major (positive)
73 to 108	A beneficial impact which may help to justify the implementation of the project. These impacts would be considered by society as constituting a major and usually a long-term positive change to the (natural and / or social) environment	Moderate (positive)
36 to 72	An important positive impact. The impact is insufficient by itself to justify the implementation of the project. These impacts will usually result in positive medium to long-term effect on the natural and / or social environment	Minor (positive)
3 to 35	A small positive impact. The impact will result in medium to short term effects on the natural and / or social environment	Negligible (positive)
-3 to -35	An acceptable negative impact for which mitigation is desirable but not essential. The impact by itself is insufficient even in combination with other low impacts to prevent the development being approved. These impacts will result in negative medium to short term effects on the natural and / or social environment	Negligible (negative)
-36 to -72	An important negative impact which requires mitigation. The impact is insufficient by itself to prevent the implementation of the project but which in conjunction with other impacts may prevent its implementation. These impacts will usually result in negative medium to long-term effect on the natural and / or social environment	Minor (negative)
-73 to -108	A serious negative impact which may prevent the implementation of the project. These impacts would be considered by society as constituting a major and usually a long-term change to the (natural and / or social) environment and result in severe effects	Moderate (negative)
-109 to -147	A very serious negative impact which may be sufficient by itself to prevent implementation of the project. The impact may result in permanent change. Very often these impacts are immitigable and usually result in very severe effects. The impacts are likely to be irreversible and/or irreplaceable.	Major (negative)

6 Assumptions and Limitations

This chapter provides a brief description of the assumptions used to evaluate the potential economic impacts that may occur with the development of the CPP and subsequent recovery of gold and uranium resources. While the project-related assumptions are discussed in the sub-sections below, generally, the following assumptions and limitations apply:

- The report is based on available information obtained from the client and other relevant secondary sources.
- The project components assessed in this report are only the initial phases of a much bigger project that will last for decades.
- Although it was planned to interview several farmers, it was deemed necessary to focus on those who would be directly impacted by the new development. As such, efforts were made during the interviews to acquire information that would make it possible to give an accurate account of the potential economic impacts.

6.1 Proposed Project Related Assumptions

The initial implementation of the project consists of two components and will entail the reclaiming of the following tailings. The assumptions related to the construction phase and the extent of these activities are discussed in the sections below.

- Reclaiming of Driefontein 3, 5, and Cooke 4 South TSFs that mainly contain gold tailings with small amounts of uranium, and
- Reclaiming of Cooke TSF that mainly contains uranium.

6.1.1 Construction phase assumptions

Based on the project information as provided by the client, it is assumed that construction will commence in 2016 and will last for two years. The design and construction of the CPP will be undertaken during this phase.

It is estimated that the construction phase will require a capital investment of R4 336 million for the gold recovery component and R4 805 million for the uranium recovery component. This equates to a total capital investment of R9 141 million (2015 prices) which will all be spent in South Africa on the key items as shown in Table 6-1.

Table 6-1: Breakdown of capital expenditure (R'ml, 2015 prices)

Item	Driefontein		Cooke	
	R'ml	% of total	R'ml	% of total
Intermediate inputs	R2 404.5	55.5%	R2 664.5	55.5%
Labour costs	R1 536.4	35.4%	R1 702.5	35.4%
Gross operating surplus (GOS)	R395.3	9.1%	R438.1	9.1%
TOTAL	R4 336.3	100.0%	R4 805.1	100.0%

Source: (Sibanye Gold, 2015)

As per client's request, the uranium component percentage expenditure allocation is assumed to be the same as that of the gold component. Overall, 55.5%, or R2 404 million, and R2 664 million in 2015 prices of the gold and uranium component capital expenditure, respectively, will be spent on intermediate goods and services. Over a third of the total capital expenditure (CAPEX) will be spent on labour costs, while the remaining 9% is assumed to be Gross Operating Surplus (GOS).

In terms of cost allocation to economic sectors, it is envisaged that 86% of all CAPEX will be spent in the manufacturing sector, specifically on machinery and equipment (30.5%), fabricated metal products (19.3%), non-metallic mineral products (18.1%), and electrical machinery and apparatus (12.5%). About 12% will be spent on the finance, insurance, real estate and business services sectors.

Based on estimations made using the envisaged labour cost, it was estimated that 6 160 Full Time Equivalent (FTE) jobs will be created for construction activities of the gold component and a further 7 691 FTE jobs would be created for the uranium component construction activities.

The assessment of impacts during the construction phase will be presented separately for the two components.

6.1.2 Operational Phase Assumptions

Following the construction phase, extraction of gold and uranium from the tailings will commence. Gold will be the main resource extracted from the Driefontein TSF 3 and 5, as well as Cooke 4 South TSF; uranium will be extracted from the Cooke TSF.

Operations for the initial implementation of the project are scheduled to begin in 2018 and will last until 2034, however, other dumps and dams will be reclaimed after 2034, which are not part of this study. Production is envisaged to start later in 2018 with 4.5 million tonnes (Mt) expected be mined from the Driefontein TSF 3 that year; therefore, production will reach 12 Mt per annum. The Cooke TSF will be added in 2019 and will be mined at a rate of 5.4 Mt per annum, which will allow the total production to reach 17.4 Mt per annum. Reclaiming at Driefontein TSF 5 will begin in 2022, as production at Driefontein TSF 3 starts to decline to ensure that there is 12 Mt mined per annum. The operations at Cooke 4 South TSF will begin in 2025 which will increase annual tonnage mined to 19.7 Mt. After 2025, the tonnage mined will gradually decline as all TSFs except the Cooke TSF will be depleted. This is illustrated in Figure 6-1 below.

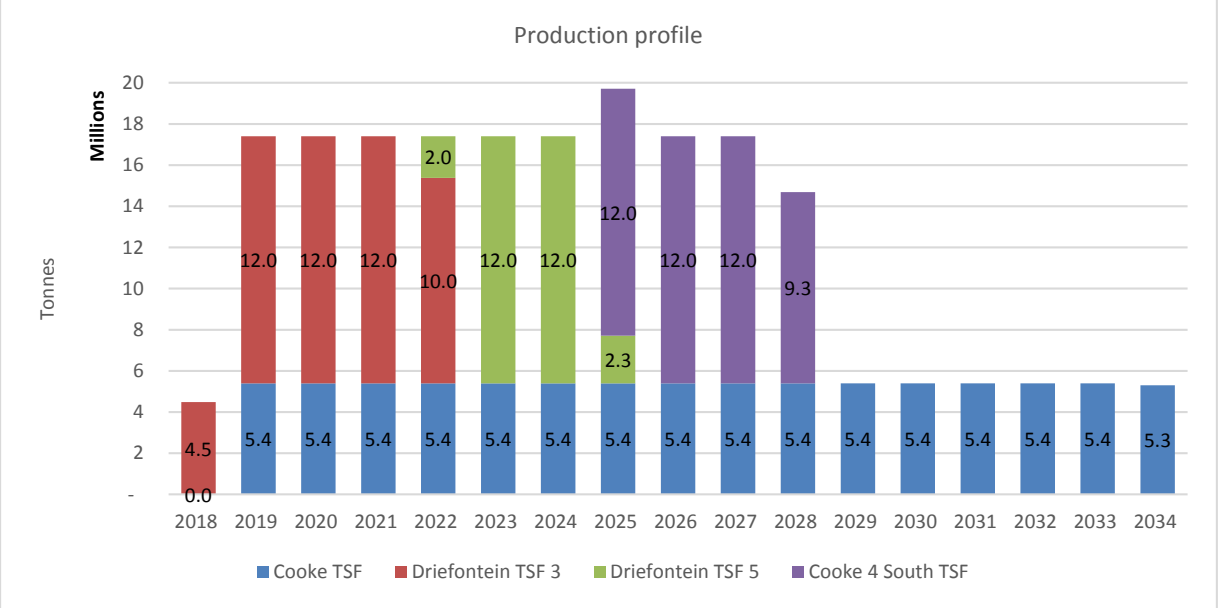


Figure 6-1: Production schedule (Sibanye Gold, 2015)

It is estimated that the recovery of gold and uranium from the four dumps will generate about R40 153 million worth of revenue in 2015 prices. Operating expenditure (OPEX) of the dumps will amount to R72 087 million (2015 prices). A separate OPEX model was created for each TSF based on amount spent to produce each tonne.

All intermediate inputs required to sustain operations at the dumps and labour costs will be sourced locally. It is expected that reclamation activities at the TSFs will provide an average of 524 employment opportunities at all skills levels until 2027, and will average 400 employment opportunities between 2028 and 2034.

Sectoral impact on production will be analysed for 2022 as an example of distribution f impact to be observed during the period.

6.1.3 Rehabilitation and Closure Phase Assumptions

The surface infrastructure in the area (excluding the RTSF itself) will be removed and the area rehabilitated. The rehabilitation process will be done to ensure that the land poses no environmental or health threats. The main objective is to free the land for other activities, which would assist in diversifying the economy. A number of post-closure land use options are available which include residential development and a solar farm. The associated expenses are unknown at this stage as they will differ depending on which post-closure land use option is chosen. There is no doubt, however, that that the rehabilitation of the dumps will require investments and thus will have a positive impact on the economy.

6.2 Assumptions regarding Affected Land Uses and Economic Activities

The land, on which the RTSF is to be constructed is currently used for commercial agricultural purposes. The establishment of the facility will result in the loss of the agricultural land. The areas that will be impacted by the retreatment of tailings of Driefontein TSF 3 and 5, and the Central Processing Plant are already demarcated for mining activity and therefore no economic activities will be disturbed.

Settlements located in close proximity to the project include Carletonville and Fochville, but these have developed in the back-drop of the surrounding mining activities, and it is expected that some of the labour will be sourced from these areas.

Table 6-2 below provides information on the privately owned land parcels that form part of the zone of influence (i.e. including directly affected land and adjacent farms), which includes their current uses and concerns raised by the land owners during telephonic interviews.

Table 6-2: Land Uses – Site and Adjacent Land

Farm	Economic activity	Raised concerns	Sensitivity
Geluksdal 396/ Barnardrus 628	Livestock - Poultry, cattle and wildlife, Crop - soya, corn, sunflower.	▪ Depreciation of land value ▪ Pollution	Located in proximity to the TSF footprint and may be impacted through environmental impacts
Cardoville 364-11	Livestock and crop farming	▪ Sterilisation of land, will be forced to move to smaller farm	Directly affected and will lose their land if the proposed project is approved
Wildebeestkuil 360-01/Springbok Kraal 359	No farming activities	▪ Will have to relocate as there is no suitable land in the immediate vicinity	
Cardoville 364-RE/6	Crop farming	▪ Will incur income losses of about 25% ▪ Water pollution	
Wildebeestkuil 360-6	Livestock and crop farming	▪ No concerns ▪ Willing to sell farm	

Source: (Urban-Econ, 2015)

The following paragraphs provide more detailed descriptions of business operations on the farms located on the land where the Regional Tailings Storage Facility is to be developed.

Portion 11 of Cardoville 364 Farm is privately owned and run by Mr. JCC Badenhorst who also owns a number of other farm portions in the vicinity of the RTSF. Currently, approximately 1 200 ha of the land is used for crop production with a yield of 5 tons per hectare. The main crops produced are corn and sunflower. In addition, livestock breeding takes place on the farm with a count of 900 livestock. It is estimated that these activities provide revenue to the value of R20 million. The farm also includes three houses, which are used for guest accommodation and earns the farmer additional income. The farm employs four permanent workers who reside in Bothaville. The farm's activities will be replaced by the mining activities, and the farm owner indicated that there is no land available for relocation in the immediate area. However, an option exists for the farmer to relocate to a smaller farm and continue current activities but at a smaller scale.

Portion 6 of Wildebeestkuil 360 is another farm that will be displaced by the facility's footprint. It is owned and run by Mr. FRJ de Bruyn. Currently, the farm is largely being used for crop farming, which earns the farmer about R3.5 million of annual revenue, and provides five permanent jobs for farm workers. The farm owner indicated that there is land available for relocation in the immediate area on which current farming practices can be continued, and he is willing to sell the property which is to be affected by the development of the facility.

Portion 1 of Wildebeestkuil 360 is owned by Mr JF van Rensburg. Currently, no economic activities take place on the farm, but the farm was previously used for cattle farming. The farm owner indicated that there is no land available for relocation in the immediate area and will possibly have to relocate.

Remainder of Portion 6 of Cardoville derives its revenue to the value of R1.2 million from cattle farming and crop production. The farm provides employment to 15 individuals on a permanent basis. The farm owner indicated that there is no land available for relocation in the immediate area, and is concerned that the he will incur about 25% of business loss if the proposed facility is established and this will in turn lead to job losses. Another concern is that the water might not be of good quality to the livestock.

6.3 Assumptions regarding Potential Environmental Impacts that may lead to Economic Impacts

Aside from positive economic impacts that any investment tends to create, a project can also be associated with a number of environmental impacts. These might impact economic activities situated in close proximity to the site and on the farms that will be affected by the footprint of the project and its various components.

To adequately assess potential negative impacts that can be exerted by the proposed project during various stages of its life cycle, other specialists' studies are reviewed. The Project Description Report (Digby Wells Environmental, 2015) highlights some of the potential environmental impacts of the project for which specialist studies will be required, these include:

- The impact on groundwater as a result of the reclamation,
- The potential impact on biodiversity in the area,
- The potential impact on surface water, and
- The potential impact on air quality, in the form of dust pollution, resulting from the retreatment process.

The spatial extent of these potential environmental effects that the proposed project will create needs to be examined and compared with the location of various economic activities in the delineated zone of influence.

7 Screening Assessment

According to the Integrated Environmental Management (IEM) Information Series, screening determines whether or not a development proposal requires environmental assessment, and if so, it also determines the appropriate level of assessment.

From an economic perspective, the proposed WRTRP will not likely have significant negative impacts on the economy in the future.

8 Baseline Environment

This chapter examines key socio-economic characteristics of the study area, as per delineation provided earlier in the report. It provides both qualitative and quantitative data related to the communities and economies under observation, creating a baseline against which the impacts can be assessed.

8.1 Review of Strategic Developmental Priorities

The integration of the policy objectives from a national to local entity is fundamental when developing a sustainable and positive socio-economic approach to the proposed development. From an economic perspective, the proposed WRTRP aligns with national policies and strategies based on the fact that the project is likely to contribute to job creation and economic growth, which are the key economic goals of the key national developmental policies:

- The **New Growth Path** cites employment creation as one of the primary tools to stimulate and grow the national economy, the policy lists one of its key “job drivers” as the mining industry. According to the NGP, it was estimated by the Industrial Development Corporation that the mining sector could create 200 000 additional job opportunities by 2030 by increasing the exploitation of mineral reserves. No known adjustments to this estimate have been made.
- The **National Development Plan (NDP) 2030** is informed by the New Growth Path and states that 11 million new employment opportunities must be created to improve the livelihoods of South Africans and grow the economy. It goes on to state that key

tools to achieve the desired growth is stimulation of private investment and involvement in labour intensive industries, as well as adequate beneficiation of the country's mineral resources.

At provincial level, the **Gauteng Employment Growth Development Strategy (GEGDS)** mimics the national government objectives, aiming to achieve an increased economic growth rate, decreased unemployment rate and decreased poverty rate. The provincial government vision in this respect is for "an inclusive and sustainable Gauteng City-Region that promotes a developmental and equitable society." One of the key initiatives is to create active industrial and sectoral strategies, which will support labour absorbing sectors and sectors in distress while encouraging exports as well as localisation. The WRTRP is seen as a key to revitalising the West Rand's mining sector and will create employment as well as business development opportunities within the province (Gauteng Department of Economic Development, 2009).

The **Gauteng Vision 2055** envisages a liveable, equitable, prosperous and united Gauteng City Region (GCR), and delivery of this vision demands that all sectors of society work in partnership with government to create inclusive, cohesive, integrated and connected spaces for people to live, work and play, thereby contributing toward equitable, sustainable development and economic growth of the GCR through collaborative, accountable and transparent governance practices (Gauteng Provincial Government, 2012). The WRTRP would result in a significant injection into the economy and will stimulate local economic growth.

In the context of the local government economic policies, the **West Rand DM's Integrated Development Plan (IDP) 2014/15** states that the development of the district can only take place through strategic, as well as spatial planning. Indicating that areas with economic potential should be developed in such a way that the economy, as well as the population can benefit. If no clear economic potential can be identified, the West Rand IDP calls for the development of human capital to encourage the future investment attractiveness of the specific area. It is envisaged that the proposed project will lead to a significant injection into an area of the DM, which experienced a negative economic growth rate in the past few years, as discussed later in the report, as well as lead to human capital development through employment of the people from the local labour force, enabling them to gain skills over the long-term.

The **Regional Growth and Development Strategy** (West Rand District Municipality, 2012) reinforces this point by highlighting the fact that the DM enjoys a comparative advantage in the mining sector when compared to the rest of Gauteng. A comparative advantage indicates a relatively more competitive production function for a product or service in a specific region than the aggregate economy. It therefore measures whether a specific economy produces a product or renders a service more efficiently than the other. Gold is the most important mineral mined in West Rand DM, with some of the largest unmined gold reserves in South Africa. The Regional Growth and Development Strategy states that this advantage should be used to stimulate growth in other sectors of the economy, especially through investment in forward and backward linkages. Implementation of the WRTRP would result in a significant injection into the economy at the construction phase and continuous use of the comparative advantage to stimulate the local economy throughout the project's operational phase. The Regional Growth and Development Strategy does, however, point out that due to the depletion of the region's natural resources and based on the economy's current high reliance on the mining sector, diversification from the mining sector is required.

In the same policy document, the district's spatial development framework is discussed, with an emphasis on the potential value of freeing up land currently occupied by mines or its operational legacy. In addition to stimulating economic growth, the proposed project will therefore, assist in freeing land for other economic activity, possibly leading to the development of alternate industry resulting in diversification of the economy over the long-term.

As mentioned previously, Phase 2 of the proposed project is located in the Westonaria and Merafong City LM's. In the **Westonaria Integrated Development Plan (IDP) 2012/13** (Westonaria Local Municipality, 2013), it is stated that the declining mining sector poses a threat to the economic development and growth of the LM. The proposed project will thus assist the municipality in taking advantage of one of the opportunities as stated in the IDP, i.e. revitalisation of the mining sector, which remains a vital component of the local economy with significant potential. Furthermore, it is stated that partnerships between government and private land-owners must be investigated with the aim to develop land and stimulate growth of the economy. Based on this, it can be concluded that freeing up of land currently occupied by tailings would assist the Westonaria LM in its bid to pursue infrastructure development in the LM.

Similarly, the **Merafong City LM's Growth and Development Strategy (2014)** states that although the mining sector has been declining, the LM enjoys a comparative advantage in this sector. It goes on to state that the beneficiation of mining by-products is perceived as an area of potential. Needless to say, the retreatment of tailings in the area is directly aligned with the LM's Growth and Development Strategy. The policy does, however, mention that, as is the case in the district, the municipality's economic growth is hampered by a lack of diversification of economic activity. If the proposed project is approved, this could lead to the freeing up of

land which could be used for other economic activities thereby creating opportunities for diversification of the economy.

The proposed project, as mentioned earlier, will also assist in reducing Acid Mine Drainage (AMD) potential. In response to the serious threat AMD poses in the Witwatersrand mining district and other parts of the country, the Department of Mineral Resources (DMR), the then Department of Water Affairs (DWA), the Department of Environmental Affairs (DEA), and the Department of Science and Technology (DST) formed an Inter-Ministerial Committee (IMC) in August 2010. The report, prepared under the coordination of the Council of Geoscience, submitted to the IMC in December 2010, titled the **Mine Water Management in the Witwatersrand Gold Fields** with special emphasis on AMD, acknowledges the fact that the problem is spread across the mine fields of South Africa, but that initial focus should be on the high priority problem areas such as the western, central, and eastern basins of the Witwatersrand mining area (Council of advisors - IMC, 2010).

The report concluded that the problem of flooded mine voids is not the only cause for concern, but that the tailings and other waste generated by mining in the area are also significant sources of AMD. Management of these sources of AMD is, however, complicated by the fact that there is no flow monitoring in the priority areas. As stated, the project includes treatment of currently impacted water, as well as removal of tailings eliminating the likelihood of future impact. Furthermore, the proposed project is set to begin operations in the western basin, thereby assisting with management of the AMD problem in one of the most critically affected areas.

To summarise, this phase of the proposed project will assist with much needed job creation and stimulation of the national economies, which have been identified as key economic development priorities for the country. It will also aid the efforts to provide a solution for AMD in the high risk western basin. At the same time, the anticipated investment into the mining sector is in line with the growth and development plans of the District and Local Municipalities. These regional policies all discuss the impact of the decreasing mining sector on development in the region and call for a renewed stimulation of the mining sector. However, the policies do guard against over-reliance on the mining sector, citing a lack of diversification of the region's economy as an obstacle to its growth and development. Considering the potential benefits of the project, it can be argued that through the release of land that will result from the retreatment of TSFs, the WRTRP will enable local government to pursue other land uses in the area and create opportunities for development of other industries. It therefore appears that the project is not in conflict with any of the key policies and strategies reviewed and that the proposed project is rather aligned with the key national and developmental economic priorities.

8.2 Study Area's Composition

8.2.1 Spatial Context and Regional Linkages

With a total land mass of 18 178km^2, 1.4% of the country's total land area, Gauteng is South Africa's smallest province. It is, however, the most populous province that also increased its contribution to the national population figure from 22.4% to 22.7% between 2011 and 2013 (Quantec Research, 2015). In contrast to its land size, the province is the country's largest economy, contributing 34.1% to the country's GDP (Quantec Research, 2015), and an estimated 10% to the GDP of the continent, in addition, it provides 28.9% of the country's total employment opportunities (Quantec Research, 2015). Johannesburg, the capital of the province, is home to the OR Tambo (ORT) International Airport, which is the gateway to South Africa, and also the main mode of transport between the provinces for locals. In addition to the ORT, the province hosts a further 35 airports, most noticeably Lanseria and Grand Central Airports (Department of Communications, 2014).

The West Rand DM encompasses 2 442km^2 of the province's land mass and is predominantly rural. The main economic hubs in the DM are Krugersdorp, Randfontein, and Westonaria, the dominant land uses in the region include mining, residential, and agriculture. Developments of residential settlements are concentrated towards the east of the district, and are reflective of current developmental dynamics and historical patterns and trends. As a result of the mining activities, and due to the dolomitic nature of the land in the district, land use patterns are often dispersed. This has meant that major economic centres in the district take on a fragmented form. In addition to the significant impact mining has had on the district, tourism and conservation opportunities exist to the north and north-east of the district, while agricultural holdings in the western side of the district represent possibility for development of the agricultural sector in the region.

The location of dolomite, slopes, red data species, mining activities, and nature reserves are aspects that require consideration when making planning and developmental decisions. The dispersed main economic centres are linked by various roads and rail routes, which also provide links to areas beyond the DM. The N14 and N12 form a strong south-east and north-west linkage, while the R500 provides road connection to the north via the linkage with the N14. The R512 is the access road to Lanseria airport, and the R559 links Soweto and Randfontein (Westrand District Municipality, 2014).

8.2.2 Towns, Resources and Land Capabilities

The **Westonaria LM** is bordered by the Randfontein LM, Johannesburg Metropolitan Municipality, Merafong City LM, Sedibeng DM, and Emfuleni LM. The LM's residential development is generally dispersed with the dominant townships including:

- Westonaria
- Bekkersdal
- Hillshaven

- Glenharvie
- Venterspost
- Simunye
- Mining towns such as Libanon and Waterpan

The only significant business node occurs within Westonaria town's Central Business District (CBD), the rest of the Westonaria LM is characterised by scattered residential areas and various mining developments. The main reason for the perceived low population density in the LM is due to the dolomitic conditions in the region. Westonaria town is linked to Johannesburg via the N12, this is a prominent entrance point into Johannesburg from Gauteng, and various developments are planned along this route to take advantage of its strategic positioning.

The only notable agricultural holdings areas in the LM are located to the north-eastern and central parts of the district. These areas offer limited room for additional development. The local government, based on the vision of a global city, or the Unicity, supports future development to the west of the LM. Development on this side of the LM would mean that the area's development follows the natural market forces, ensuring that commercial and industrial developments remain close to the current and future workforces. Moreover, development to the west of the Westonaria LM will contribute towards development of Soweto and Protea Glen, thus remaining accessible to the LM's population and strengthening the Unicity vision further.

The Westonaria LM's Spatial Development Framework makes mention of the fact that apart from the development potential to the west of the LM, as discussed above, the south of the LM has been demarcated for mining and conservation. In addition to mining, the northern regions of the LM have potential for the development of small-scale or subsistence farming opportunities (Westonaria Local Municipality, 2013).

Land uses in the **Merafong City LM** can be categorised in three main divisions, that is: agriculture, mining, and residential. Agriculture is the dominant land use in the LM, followed by mining and residential land uses, with the latter accounting for approximately 8% of the total land area of the LM. The municipality's human settlements are relatively scattered due to the mining activities taking place, the prominent settlements are:

- Fochville
- Carletonville
- Weverdiend
- Greenspark
- Wedela
- Blyplank
- Khutsong

- Kokosi

The municipality's Spatial Development Framework states that Fochville and Carletonville, as the LM's most prominent CBDs, have the most potential for public investment and development, while Greenspark, Wedela, and Blybank settlements are the most in need of social development initiatives.

Carletonville is located to the north of the LM, which is also where the majority of the municipality's high value agricultural land is located. The Carletonville-Khutsong-Welverdiend area is also the LM's most populous region. The townships of Kokosi and Greenspark, and the relatively wealthier Fochville are located to the south of the LM, with the central part of the LM being characterised by mining activities and the associated scattered housing developments. As with the rest of the Westrand mining belt, the LM's infrastructure development is hindered by the high occurrence of dolomite.

The economy of Merafong is dominated by the mining activities, which, as previously mentioned, has led to the development of dispersed human settlements leading to a loss of purchasing power across the region as central town functions are not well developed in the LM. Due to its location and relative state of underdevelopment, the LM has vast tracts of available land for development, about 9% of which is protected wetlands where natural processes still take place (Merafong City LM).

8.2.3 Land-Uses within the Affected Zone of Influence

Preliminary desktop investigation reveals that the area expected to be impacted by the retreatment of tailings of Driefontein 3 and 5 covers land demarcated for mining activity with some settlements being located in close proximity. The location of the proposed new Regional Tailings Storage Facility (RTSF) east of Fochville is to be in an area, where there is some form of agricultural activity taking place, be it crop production or livestock grazing.

The Central Processing Plant (CPP) is situated in an area demarcated for mining and industrial developments south of Glenharvie. The same applies to the area proposed for the West Block Thickener (WBT) and Bulk Water Storage Facility (BWSF), which are closer to the Blybank settlement situated in the Merafong City LM. Central to the existing tailings at Driefontein 3 and 5, the CPP, and WBT & BWST is the Goldfields West golf course.

The water supply is located close to Libanon mine, in an area with industrial build up surrounding it. West of the site there is crop production taking place, but it is unlikely to be impacted by the project.

The Cooke 4 South and Cooke TSFs are located to the north of the RTSF in the City of Johannesburg (CoJ) Metropolitan Municipality. Here, the economic base is more diversified, but is dominated by the tertiary services sector.

Considering the size of the CoJ Metropolitan Municipality and its economy, and the fact that the Cooke 4 South component will be located on only a small portion of this municipality, the

socio-economic baseline does not include the metropolitan's figures as this would skew the data.

8.3 Demographic Profile and Income Levels

The population of any geographical area is the cornerstone of the development process, as it affects the economic growth through the provision of labour and entrepreneurial skills, and determines the demand for the production output. Examining population dynamics is essential in gaining an accurate perspective of those who are likely to be affected by any prospective development or project.

Based on a combined population of 309 000 in 2011 (Digby Wells , 2015), the Westonaria and Merafong City LMs comprise 38% of the West Rand DM's total population, which was estimated at 821 000 in 2011 (Stats SA, 2015). The average household size in the DM is 2.8, which is only slightly higher than the province's average of 2.7, but much lower than that of the country where the average household size is 3.9. The majority of households (73%) within the DM reside in formal dwellings (Digby Wells , 2015). In South Africa, approximately 71% of households reside in formal residences (Stats SA, 2015). Traditionally, smaller household sizes are indicative of an increase in development, however, based on the relatively high number of households living in informal dwellings and considering the fact that the region is classed as a mining region it can be assumed that in this case the smaller household size is rather a result of migrant workers working or searching for opportunities, with the aim of sending money home to their families.

The male population of the West Rand DM exceeds the female population at 52%, versus the 48% females residing in the region (Stats SA, 2015). The fact that almost 80% of the DM's population is of working age (Digby Wells , 2015), i.e. between the ages of 15 and 65, could be seen as an additional indicator of the fact that the area attracts migrant workers. Moreover, in the two local municipalities within which the initial implementation of the WRTRP will be located an even higher number of individuals are of working age with 73% in the Westonaria LM, and 78% in the Merafong City LM (Digby Wells , 2015).

Within the Westonaria and Merafong City LM's, the proportion of the population aged 20 and older with no education is greater than in the district, with 6% and 6%, versus the 5.0% observed in the DM (Digby Wells , 2015). The average income within the Westonaria and Merafong City LMs was significantly lower than that of the other study areas at R5 597 and R6 625 per month (in 2011 in current prices), respectively (based on Stats SA, 2015). In the context of the analysed economies, the lower than national average income levels in the LMs could be an indication of two factors:

- High level of unemployment, particularly observed in the Westonaria area.
- The predominantly unskilled and low-skilled nature of employment created in the area, which is generally associated with low average monthly income levels and inherent to the mining industry.

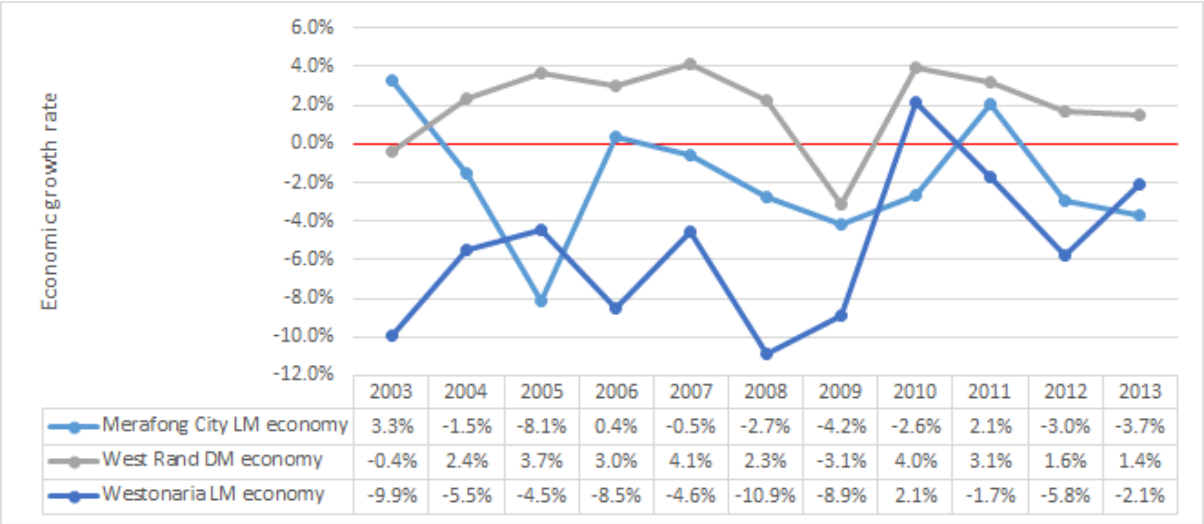
8.4 Economy and Sectoral Structure

The structure of the economy and the composition of its employment provide valuable insight into the dependency of an area on specific sectors and its sensitivity to fluctuations of global and regional markets. Knowledge of the structure and the size of each sector are also important for the economic impact results' interpretation, as it allows the assessment of the extent to which the proposed activity would change the economy, its structure, and trends of specific sectors.

In 2013, the economies of the Westonaria and Merafong City LM's represented 35.8% of the total GDP of the West Rand DM, which was valued at R61 466 million (2013 current prices). Between 2003 and 2013, the West Rand DM economy has been growing at a Compounded Annual Growth Rate (CAGR) of 1.1% per year, far below the provincial and national average rates of 3.8% and 3.4%, respectively. Moreover, during this time the economy of the Westonaria LM declined by 5.2% and the economy of the Merafong City LM decreased at a CAGR of 2.5%. The contraction of the LMs' economies was attributed to the dependency thereof on the mining sector and its sharp decline in both of the areas over the 10-year period between 2003 and 2013. For example:

- In constant 2005 prices, the mining sector accounted for 48.7% of the Westonaria economy in 2013, which decreased from 76.6% observed in 2003. Overall, the mining sector in Westonaria declined at a CAGR of 9.4% between 2003 and 2013.
- In the Merafong City LM, the mining sector contributed 24.7% to the GDP-R in 2013 in constant 2005 prices. Its contribution in 2003, though, was valued at 57.1% in 2003. As a result, the mining sector in the Merafong City economy contracted at a CAGR of 10.3% between 2003 and 2013.

Figure 3-2 illustrates the economic growth rate of the West Rand DM and the two analysed LMs between 2003 and 2013. As can be seen, all of the analysed economies reacted to the global financial crisis and local electricity crisis in 2008, which impacted on South Africa's export earnings and domestic consumption. It was expected that the economy would recover after 2010, but the subsequent investment injections were not sufficient and the recession's impacts had reached further than anticipated, leading to the national and regional economies recovering slower than expected. Importantly, the negative economic trends observed in the West Rand and Merafong city economies was created far earlier than the recession period experienced in 2009. In both of the cases, the mining sector was the only industry that experienced negative economic trends during the period between 2004 and 2008, which subsequently impacted on the growth rates of these entire economies and jeopardised their sustainability. This illustrates that the contraction of the mining industries in these areas has been the case for the last decade.



	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Merafong City LM economy	3.3%	-1.5%	-8.1%	0.4%	-0.5%	-2.7%	-4.2%	-2.6%	2.1%	-3.0%	-3.7%
West Rand DM economy	-0.4%	2.4%	3.7%	3.0%	4.1%	2.3%	-3.1%	4.0%	3.1%	1.6%	1.4%
Westonaria LM economy	-9.9%	-5.5%	-4.5%	-8.5%	-4.6%	-10.9%	-8.9%	2.1%	-1.7%	-5.8%	-2.1%

Figure 8-1: Economic performance of the West Rand DM, Merafong City LM and Westonaria LM (Urban-Econ, 2015)

The West Rand economy is primarily based on the tertiary services with 66.7% of its GDP being generated by industries in this sector. Finance and personal services, as well as government services are the major contributors to the West Rand economy. Its dependency on mining though is also quite substantial as the mining sector contributed 11.2% of GDP in the district. It should be noted that manufacturing is also quite prominent in the West Rand economy with 15.7% contribution to its GDP.

The Westonaria and Merafong City economies though, are far more dependent on the mining industry than the district in general.

- It is estimated that 48.7% of the GDP of the Westonaria LM is being generated by the mining sector (Quantec Research, 2015). Therefore, the impact of the declining mining sector is especially evident in this economy. Secondary industries such as manufacturing, construction and utilities make up about 12.6% of the Westonaria's GDP, while the rest is created by the tertiary industries specifically government services, trade, and finance (Quantec Research, 2015).
- The composition of the Merafong City economy is slightly more diversified with the mining making up only a quarter of its GDP. Almost two thirds (64.6%) of its economy though, comprises of the tertiary services with finance and business services, government services, and trade being the most prominent industries (Quantec Research, 2015).

8.5 Labour Force and Employment Structure

Employment is the primary means by which individuals who are of working age may earn an income that will enable them to provide for their basic needs and improve their standard of living. As such, employment and unemployment rates are important indicators of socio-economic well-being.

In South Africa, the unemployment rate is defined as comprising of those individuals aged between 16 and 65 years old, actively looking for employment that are unable to find gainful opportunities, it therefore does not take into consideration discouraged job seekers. Based on Stats SA's Census 2011 data, the West Rand DM had 590 206 individuals of working age in 2011 with 3.3% of these individuals being discouraged job seekers. The situation was slightly worse in the Westonaria and Merafong City LMs, where 4.1% and 3.6% respectively of the working age population groups were discouraged job seekers, however, it was still better than at the national level where the figure was 5.5% (Stats SA, 2015).

Table 8-1: Labour force (2011)

Indicators	Description	West Rand	Merafong	Westonaria
Working age population	All persons aged 15–64 years.	590 206 (100%)	143 340 (100%)	81 966 (100%)
Non-economically active	Persons aged 15–64 years who are neither employed nor unemployed at the time of the survey, including discouraged job seekers.	191 149 (32.3%)	51 513 (56.3%)	24 409 (56.3%)
Discouraged job seekers	Persons not employed during the reference period, wanted to work, were available to work/start a business but did not take active steps to find work during the last four weeks, provided that the main reason given for not seeking work was any of the following: no jobs available in the area; unable to find work requiring his/her skills; lost hope of finding any kind of work.	19 719	5 133	3 325
Other not economically active	Other not economically active persons who are not discouraged job seekers.	171 430	46 380	21 084
Economically active (i.e. labour force)	Proportion of the working-age population that is either employed or unemployed.	399 057 (43.7%)	91 827 (43.7%)	51 557 (43.7%)
Unemployed	Persons are those (aged 15–64 years) who: a) Were not employed at the time of the survey, and b) Actively looked for work or tried to start a business in the four weeks preceding the survey interview, and c) Were available for work, i.e. would have been able to start work or a business at the time of the survey or, d) Had not actively looked for work in the past four weeks but had a job or business to start at a definite date in the future and were available.	104 590	24 861	16 917

Indicators	Description	West Rand	Merafong	Westonaria
Employed	Persons aged 15–64 years who, at the time of the survey, did any work for at least one hour, or had a job or business but were not at work (temporarily absent)	294 467	66 966	40 640
Unemployment rate	Proportion of the labour force that is unemployed.	26.2%	27.1%	29.4%
Labour force participation rate	Proportion of the working-age population that is either employed or unemployed.	67.6%	64.1%	67.6%

Source: (Stats SA, 2015)

Between 2003 and 2013, the economy of Westonaria, due to the share decline in its mining sector's production output, lost over 24 thousand employment opportunities. At the same time, the Merafong City economy managed to increase its employment by over five thousand people during the same period, despite experiencing negative economic growth rate. This means that the losses in the mining sector's employment due to the contraction of that industry in the Merafong City LM were possible to offset by the increased employment in other industries.

In South Africa, 70.3% of employees are working in the formal sector (Quantec Research, 2015). Closer to the project site the situation is slightly different. In the West Rand DM, 75.3% of jobs are formal employment opportunities, while in the LMs formal employment opportunities comprise even a greater percentage, i.e. 81.5% and 80.5% in the Westonaria and Merafong City LMs, respectively (Quantec Research, 2015). At the same time, it is estimated that 2.4% of those employed in the West Rand DM are working in private households.

It is estimated that just about two thirds of all employment opportunities within the DM are created by the tertiary sector, with trade and accommodation industries (24.4%), community services (16.5%), and business and financial services (17.4%) accounting for the bulk of provided opportunities in this economy. Mining provides 5.6% of employment opportunities in the West Rand DM.

Within the Westonaria LM the importance of the mining sector for job security is significantly greater than in the district, as it provides 36.7% of opportunities in the LM's economy. It again shows the economy's reliance on the mining sector. In 2003, though, the mining sector contributed 74.2% of all jobs created in Westonaria, at the same time, though, the total employment in the local area was 51 409. Considering that the employment in Westonaria dropped to 26 731 by 2013, this means that between 2003 and 2013 the local economy was hard hit by the sharp contraction of the mining industry leading not only to the contraction of its employment but the net loss of jobs in the entire economy.

In the Merafong City LM, the employment structure was largely skewed towards the tertiary and mining industries. The mining sector created 42.7% of all employment opportunities in this economy in 2013 with the tertiary industries accounting for 48.8%. Unlike the situation observed in the Westonaria LM, employment in mining has increased between 2003 and 2013

despite the sector experiencing decline in the post 2008 period. Losses in employment in agriculture, manufacturing, and finance and business service, though, offset some of the employment gained during that period in mining and other industries.

8.6 Synthesis

The West Rand DM, where the proposed activity is to take place, comprises of 821 000 people, of which 38% represents the combined population of the Westonaria and Merafong City LMs comprise.

Households residing within the Westonaria and Merafong City LMs earn an average income of R5 597 and R6 625 per month (in 2011 in current prices), respectively (based on Stats SA, 2015). At the same time, the numbers of households living with no income in the LMs are not significantly different from the other study areas, as all of the study areas show that between 6% and 7% of households live on no income, except for South Africa where it was recorded that 8.6% of households have no income (Stats SA, 2015).

The labour market in the West Rand DM comprises of 590 206 individuals of working age in 2011 with 3.3% of these individuals being discouraged job seekers 47 826 employed and 31 533 unemployed people. The unemployment rate in the West Rand DM was 26.2% in 2011. In the Westonaria LM, unemployment was recorded at 29.4%, while the Merafong City LM recorded an unemployment rate of 27.1% (Stats SA, 2015).

The economies of the Westonaria and Merafong City LMs represent 35.8% of the total GDP of the West Rand DM, which is valued at R61 466 million (2013 current prices). The West Rand DM economy has been growing at a Compounded Annual Growth Rate (CAGR) of 1.1% per year, far below the provincial and national average rates of 3.8% and 3.4%, respectively.

The Westonaria and Merafong City LMs' economies are dominated by the mining sector which contributes 48.7% and 24.7% to the economies' GDP respectively. Such a dependency on mining, however, is not ideal as any fluctuations in commodity prices, and demand for commodities, would have a notable impact on the local economy. The global recession in 2009 had exactly the same effect on the economy, when the value added of the mining sector dropped by 19%.

From the employment perspective, within the Westonaria LM, the importance of the mining sector for job security is significantly greater than in the district, as it provides 36.7% of opportunities in the LM's economy. It again shows the economy's reliance on the mining sector. In the Merafong City LM, the employment structure was largely skewed towards the tertiary and mining industries. The mining sector created 42.7% of all employment opportunities in this economy in 2013, with the tertiary industries accounting for 48.8%.

9 Sensitivity Analysis and No-Go Areas

From an economic point of view, the proposed project is in line with the development priorities set by both provincial and local governments as outlined in the respective strategic policies. However, it is encouraged that the mining activities should be carried out in a sustainable manner.

The West Rand DM Regional Growth and Development Strategy have commented on the fact that the DM is under strain as a result of the slowdown of growth in the mining sector in this region. This point is confirmed by the data analysis of economic growth in the DM and specifically the Westonaria LM, revealing a significant decrease in economic production (GDP) resulting from the closure of mines and decreased mining production output. The Regional Growth and Development Strategy, as well as the applicable LM economic development strategies confirm that investment in the mining sector is required to revitalise the local economy. The WRTRP will result in positive benefits which include job creation and much need investment into the West Rand economy. The project will most likely create business opportunities for Small, Medium and Micro Enterprises (SMMEs) in the area and sustainable post mining jobs for local communities.

The West Rand DM Spatial Development Framework highlights the need to utilise the district's mining potential along the southern mining belt (where the proposed project will be located) in a sustainable and well managed manner. The document stresses the importance of putting in place appropriate environmental management processes to ensure the continuous rehabilitation of mining land with a view of eventually restoring the agricultural land tourism value of the land once mining activity ceases. Although the land will not be restored to its agricultural value it will be rehabilitated to make it available for other activities, which will enhance the area's economic viability. This in turn will assist in achieving the region's long-term objective of diversification of economic activity to increase long-term sustainability. In addition, the framework highlights the need to carefully manage human settlements associated with mining activity to prevent the establishment of small, unsustainable human settlements with no secondary economic base to support it once the mine closes down.

10 Impact Assessment

The following sections present the assessment of the expected economic impacts during different phases of the mine's life, i.e. construction, operation, and closure. All efforts are made to quantify each potential impact, whether positive or negative to provide for a more accurate assessment of the project's impact on the local and regional economies. Assessment of impacts follows the methodology outlined earlier in the report.

10.1 Construction Phase Impact Assessment Results

The following paragraphs describe the impact of the proposed West Rand Tailings Retreatment Project on the local and regional economies. It includes the assessment of both positive and potential negative economic impacts.

10.1.1 Impact on Production

Economic production is defined as any activity that uses inputs such as labour and capital to produce outputs in the form of services or goods. The construction phase of the mine will involve activities such as engineering and design, site and infrastructure development, installation of machinery and equipment, civil engineering works, and other business activities related to the construction of the proposed CPP and RTSF. This would create a positive impact on the local and regional economies, as the demand for products and services used in construction will generate new business sales.

Sibanye proposes to invest a total of R9 141 million in 2015 prices for construction activities of the gold and uranium recovery components. The duration of the construction phase will be two years commencing in 2016.

Of the total capital investment, R4 336.3 million (2015 prices) will be required for construction of the gold recovery component which will increase the production output of the national economy by R12 561.3 million (2015 prices). 34.5% of the total increase in business output resulting from the construction phase will be largely influenced by companies that will be directly involved in the construction of the mine, i.e. construction contractors and engineering firms. The rest will be generated through production and consumption induced effects as detailed in Table 10-1.

Table 10-1: Impact on production during construction (2016-2017) – Gold (R'ml) (2015 prices)

Sector	Direct	Indirect	Induced	Total	% total
Agriculture	-	R 1.4	R 28.3	R 29.7	0.2%
Mining and quarrying	-	R 32.2	R 13.2	R 45.4	0.4%
Manufacturing	-	R 3 189.2	R 1 120.6	R 4 309.8	34.3%
Electricity	-	R 42.0	R 71.1	R 113.1	0.9%
Water	-	R 0.8	R 30.2	R 30.9	0.2%
Building and construction	R 4 336.3	R 33.1	R 50.6	R 4 419.9	35.2%
Trade and accommodation	-	R 870.7	R 341.7	R 1 212.4	9.7%
Transport	-	R 284.2	R 247.3	R 531.5	4.2%
Finance	-	R 217.0	R 305.8	R 522.8	4.2%
Real estate and business services	-	R 572.1	R 422.1	R 994.2	7.9%
Government	-	R 98.8	R 160.5	R 259.3	2.1%
Other services	-	R 16.7	R 75.6	R 92.2	0.7%
TOTAL	**R 4 336.3**	**R 5 358.1**	**R 2 866.9**	**R 12 561.3**	**100.0%**

Source: (Urban-Econ, 2015)

Of the production output generated as a result of the construction activities for the gold recovery component, approximately R5 358.1 million (2015 prices), or 43%, will be stimulated through production-induced effects. This means that local businesses supplying goods and services for the construction activities at the proposed facility will experience an increase in business sales to the value of R5 358.1 million. The indirect effects during the construction period will be distributed throughout the country depending on the location of the suppliers. The biggest increase in business sales throughout the construction period will be experienced by the manufacturing industries, the trade sector and the real estate and business services sector.

The increase in production stimulated by the construction activities will create temporary employment opportunities through direct and indirect effects, which in turn will increase disposable income of the directly and indirectly affected households. This income, which will be spent on the purchase of household goods and services, will create another round of effects which are referred to as induced effects. The induced effect will stimulate the production of industries and sectors that manufacture consumer goods and provide services to households. It is estimated that R2 866.9 million (2015 prices) or 22.8% of the production output generated by the Driefontein component's construction activities will be as a result of consumption induced effects. Sectors and industries that are expected to benefit the most from this increased expenditure include trade, insurance, business activities, food, beverages and tobacco, chemical and chemical products, and transport services.

In addition, R4 805.1 million (2015 prices) will be required for construction of the uranium recovery component, which will increase the production output of the national economy by R13 919.2 million (2015 prices). About 35% of this production increase will be influenced by companies that will be directly involved in the construction activities on-site, that is, construction contractors and engineering companies.

Table 10-2: Impact on production during construction (2016-2017) - Uranium (R'ml) (2015 prices)

Sector	Direct	Indirect	Induced	Total	% total
Agriculture	-	R 1.6	R 31.4	R 32.9	0.2%
Mining and quarrying	-	R 35.7	R 14.6	R 50.3	0.4%
Manufacturing	-	R 3 534.0	R 1 241.7	R 4 775.7	34.3%
Electricity	-	R 46.6	R 78.7	R 125.3	0.9%
Water	-	R 0.9	R 33.4	R 34.3	0.2%
Building and construction	R 4 805.1	R 36.6	R 56.0	R 4 897.7	35.2%
Trade and accommodation	-	R 964.8	R 378.7	R 1 343.5	9.7%
Transport	-	R 315.0	R 274.1	R 589.0	4.2%
Finance	-	R 240.4	R 338.8	R 579.3	4.2%
Real estate and business services	-	R 633.9	R 467.7	R 1 101.6	7.9%
Government	-	R 109.5	R 177.9	R 287.4	2.1%
Other services	-	R 18.5	R 83.7	R 102.2	0.7%
TOTAL	**R 4 805.1**	**R 5 937.4**	**R 3 176.8**	**R 13 919.2**	**100.0%**

Source: (Urban-Econ, 2015)

As shown in Table 10-2, the indirect impact of the construction phase will be R5 937.4, contributing about 43% of the total production increase during this phase. The construction activities will require such inputs as cements, bricks, steel structures, and other material used in building. It will also create a demand for machinery and equipment used in construction. As such, companies involved in the manufacturing of metal and non-metal products as well as the trade sector will be the major beneficiaries of the construction of the uranium recovery component through indirect effects.

Finally, in addition to the direct and indirect impacts, the consumption induced impact of R3 176.8 million will represent about 13% of the total increase in production output. Sectors that will experience an increase in new business sales due to the increase in household income resulting from newly created employment opportunities include trade, insurance, business activities, food, beverages and tobacco, chemical and chemical products and transport services.

Temporary increase in production in the country during construction			
Dimension	**Rating**	**Motivation**	**Significance**
Impact Description: The impact takes place due to the investment on the project that will be spent in the country. Besides the direct impact, it involves the indirect and induced effects that are created when either suppliers of goods and services to the project experience an increase in demand or when businesses servicing households experience an increase in demand for their products.			
Prior to mitigation/ management			
Duration	Medium-term (3)	The construction phase will last two years	Moderate (positive) (+84)
Extent	Province (5)	Companies in the Gauteng City Region will be the main beneficiaries,	

Temporary increase in production in the country during construction			
Dimension	**Rating**	**Motivation**	**Significance**
Intensity x type of impact	High – positive (+6)	The economy's output will increase by R9.1 billion	
Probability	Highly probable (6)	It is most likely that there will be a temporary increase in production during construction.	
Mitigation/ Management actions			
The impact is positive, measures to maximise the stimulation of the local economy may include procurement of goods and services from local small business where feasible. This, however, will not change the significance of the rating.			
Post management			
Duration	Medium-term (3)	The construction phase will last two years	Moderate (positive) (+84)
Extent	Province (5)	Will benefit the Gauteng province the most	
Intensity x type of impact	High – positive (+6)	Output will increase by R9.2 billion	
Probability	Highly probable (6)	It is most likely that there will be a temporary increase in production during construction.	

10.1.2 Impact on GDP-R

A country's gross domestic product (GDP) is the total value of all "final" goods and services, which were produced within the borders of the country during a year. Most of the investment activities in the country are associated with a value-adding activity, which has a positive impact on the Gross Domestic Product per Region (GDP-R). The capital investment into the establishment of the proposed retreatment project of R9 141 million (2015 prices) will generate R9 890 million of value added. The value added is split between the two projects as described in the paragraphs below.

The R4 336 million (2015 prices) spending on the construction of the gold recovery component will generate R4 691.4 million (2015 prices) of Gross Domestic Product. Thus the total GDP-R multiplier for this component of the project is 1.08, which means that for every R1 invested in the construction of the gold recovery component, R1.08 of value added will be generated somewhere in South Africa's economy. It is most likely that a significant portion of this value-added will be created in Gauteng whilst the rest will be created in other parts of South Africa.

As indicated in Table 10-3, the majority of the value added will be created through direct and indirect effects. While the building and construction industry will be the direct beneficiary of the stimulated increase in value added, industries that will experience the largest temporary growth through indirect impacts will include the manufacturing, trade, and real estate and business services sectors.

As observed in the production impact, an increase in employment will lead to the increase of consumption expenditure, which in turn will result in the temporary growth of selected sectors and industries. It is expected that the temporary increase in employment opportunities during the construction period, will stimulate the country's GDP-R through the induced impact to the value of R1 163.7 million (2010 prices). In this case, sectors and industries that will experience the largest growth include manufacturing and tertiary sectors such as trade, finance, real estate and business activities.

Table 10-3: Impact on GDP during construction (2016-2017) – Gold (R million) (2015 prices)

Sector	Direct	Indirect	Induced	Total	% total
Agriculture	-	R 0.7	R 14.6	R 15.4	0.3%
Mining and quarrying	-	R 17.8	R 7.3	R 25.1	0.5%
Manufacturing	-	R 812.2	R 292.7	R1 104.9	23.6%
Electricity	-	R 22.6	R 38.1	R 60.7	1.3%
Water	-	R 0.3	R 10.4	R 10.7	0.2%
Building and construction	R1 593.6	R 8.4	R 13.2	R1 615.2	34.4%
Trade and accommodation	-	R 447.3	R 165.0	R 612.3	13.1%
Transport	-	R 120.9	R 104.5	R 225.5	4.8%
Finance	-	R 130.9	R 184.5	R 315.4	6.7%
Real estate and business services	-	R 307.9	R 210.3	R 518.2	11.0%
Government	-	R 54.6	R 79.1	R 133.7	2.8%
Other services	-	R 10.5	R 44.0	R 54.5	1.2%
TOTAL	**R1 593.6**	**R1 934.1**	**R1 163.7**	**R 4 691.4**	**100.0%**

Source: (Urban-Econ, 2015)

As indicated in Table 10-4, R4 805 million (2015 prices) spending on the construction of the Cooke project will generate R5 198.6 million (2015 prices) of Gross Domestic Product. Approximately 34% of this will be created through direct effects, while the rest of the value added will be created through indirect and consumption induced effects. Increase in business sales of the suppliers will generate R2 143.2 million of GDP-R. Through induced effects, an additional R1 289.5 million (2015 prices) will be generated. Besides the building and construction services industry, industries and sectors that will experience the largest temporary growth include manufacturing, trade, real estate, and business services.

Table 10-4: Impact on GDP during construction (2016-2017) - Uranium (R million) (2015 prices)

Sector	Direct	Indirect	Induced	Total	% total
Agriculture	-	R 0.8	R 16.2	R 17.0	0.3%
Mining and quarrying	-	R 19.7	R 8.1	R 27.8	0.5%
Manufacturing	-	R 900.0	R 324.3	R 1 224.3	23.6%
Electricity	-	R 25.0	R 42.2	R 67.2	1.3%
Water	-	R 0.3	R 11.5	R 11.8	0.2%
Building and construction	R 1 765.9	R 9.3	R 14.7	R 1 789.8	34.4%
Trade and accommodation	-	R 495.7	R 182.8	R 678.5	13.1%

Sector	Direct	Indirect	Induced	Total	% total
Transport	-	R 134.0	R 115.8	R 249.8	4.8%
Finance	-	R 145.1	R 204.5	R 349.5	6.7%
Real estate and business services	-	R 341.2	R 233.0	R 574.2	11.0%
Government	-	R 60.5	R 87.6	R 148.1	2.8%
Other services	-	R 11.6	R 48.8	R 60.4	1.2%
TOTAL	**R 1 765.9**	**R 2 143.2**	**R 1 289.5**	**R 5 198.6**	**100.0%**

Source: (Urban-Econ, 2015)

Temporary increase in the country's GDP-R during construction			
Dimension	**Rating**	**Motivation**	**Significance**
Impact Description: The impact is generated through capital expenditure that shocks the economy. It results in growth of sectors that include businesses supplying goods and services required for the establishment of the mine and businesses that benefit from the increased consumer expenditure.			
Prior to mitigation/ management			
Duration	Medium-term (3)	The construction phase will last two years	Moderate (positive) (+84)
Extent	Province (5)	Increase in GDP will affect mostly the Gauteng province	
Intensity x type of impact	High – positive (+6)	The national economy's GDP will increase by R9.8 billion	
Probability	Highly probable (6)	It is most likely that there will be a temporary increase in GDP during construction.	
Mitigation/ Management actions			
▪ Recruit local labour ▪ Sub-contract to local construction companies ▪ Use local suppliers where viable and arrange with the local Small and Medium Enterprises to provide transport, catering, and other services for the construction crew			
Post management: mitigation measures though will not increase the significance rating, but will assist with increasing the benefits felt by the local economy.			
Duration	Medium-term (3)	The construction phase will last two years	Moderate (positive) (+84)
Extent	Province (5)	Increase in GDP will affect mostly the Gauteng province	
Intensity x type of impact	High – positive (+6)	The national economy's GDP will increase by R9.8 billion	
Probability	Highly probable (6)	It is most likely that there will be a temporary increase in GDP during construction.	

10.1.3 Impact on Employment

Info Box: Full-Time Equivalent (FTE) man-year or FTE jobs

Employment impacts are calculated in terms of the Full-Time Equivalent (FTE) employment positions, which is the same as a FTE job or one man-year of work. This does not directly translate into the headcount of people employed or into new job opportunities. Generally, one FTE man-year is equal to one person working for 40 hours per week for about 50 weeks per year, however, it could vary depending on the industry.

A FTE man-year means that if one person worked only 20 hours per week for 50 weeks in a year, its FTE equivalent would be 0.5, if two people worked for 20 hours per week for 50 weeks in a year, the combined work load would be estimated as one FTE man-year or one FTE job. In the short-term, an increase in FTE employment positions could be absorbed by the existing workforce either by working overtime or if these labour resources are underutilised in the industry.

Investment on the construction of the retreatment project will create 13 606 direct full-time equivalent (FTE) employment opportunities. Of these, 5 916 FTE man-years will be created by the construction activities for the gold component, while 7 690 FTE man-years will be created for the construction of the uranium component.

In addition to the direct FTE man-years as mentioned above, the increase in production amongst businesses that will be supplying goods and services for construction will result in the creation of additional 11 108 full-time equivalent (FTE) jobs, whilst the induced impacts of the investment will result in the creation of an additional 8 076 jobs (FTE) during the construction period. Hence, the establishment of the gold component is expected to create a total of 25 100 FTE man-years. Besides the construction sector itself, industries that will have the largest opportunity to increase their staff during that period will include trade, business activities, finance, and manufacturing.

Table 10-5: Impact on employment during construction (2016-2017) - Gold (FTE-man years)

Sector	Direct	Indirect	Induced	Total	% total
Agriculture	-	9	188	198	0.8%
Mining and quarrying	-	29	12	41	0.2%
Manufacturing	-	1 851	548	2 399	9.6%
Electricity	-	25	42	67	0.3%
Water	-	0	18	18	0.1%
Building and construction	5 916	77	118	6 111	24.3%
Trade and accommodation	-	2 667	1 034	3 701	14.7%
Transport	-	363	268	631	2.5%
Finance	-	1 617	2 279	3 895	15.5%
Real estate and business services	-	4 263	3 145	7 408	29.5%
Government	-	177	287	464	1.8%
Other services	-	30	135	165	0.7%

Sector	Direct	Indirect	Induced	Total	% total
TOTAL	**5 916**	**11 108**	**8 076**	**25 100**	**100.0%**

Source: (Urban-Econ, 2015)

The uranium component is expected to create 28 989 jobs through direct, indirect, and induced effects during the construction period.

About 7 691 jobs will be created on site, of these, about 6 102 employment opportunities will be created for unskilled and semi-skilled workers such as engineers, technicians, machine operators, managers, artisans, etc. The rest of the construction workers will be skilled and highly skilled people. Further, about four in every ten FTE man-years, or 12309 FTE man-years, will be created through production induced impacts, while the remaining 8 949 FTE man years will be created through consumption induced effects.

Table 10-6: Impact on employment during construction (2016-2017) - Uranium (FTE-man years)

Sector	Direct	Indirect	Induced	Total	% total
Agriculture	-	10	209	219	0.8%
Mining and quarrying	-	32	13	46	0.2%
Manufacturing	-	2 051	608	2 659	9.2%
Electricity	-	28	47	75	0.3%
Water	-	1	20	20	0.1%
Building and construction	7 691	85	130	7 907	27.3%
Trade and accommodation	-	2 955	1 146	4 101	14.2%
Transport	-	402	297	700	2.4%
Finance	-	1 792	2 525	4 317	14.9%
Real estate and business services	-	4 724	3 485	8 209	28.4%
Government	-	196	318	514	1.8%
Other services	-	33	150	183	0.6%
TOTAL	**7 691**	**12 309**	**8 949**	**28 949**	**100.0%**

Source: (Urban-Econ, 2015)

Although it is difficult to ascertain the number of employment positions that will be possible to fill by worker from the local communities, supposing the 13 606 direct full-time equivalent (FTE) employment opportunities are provided to the local residents, i.e. people residing in the West Rand DM, the proposed project will significantly improve the local employment situation. In 2011, the West Rand DM 104 590 unemployed people, thus the creation of these new employment opportunities could potentially reduce the number of unemployed in the area by 13%. Unfortunately, however, these jobs are not sustainable and will expire once the construction is complete. It is also unlikely that all of these jobs will be created at the same time, thus, the actual impact would most probably be smaller too. Nevertheless, the above shows the potential of the project to improve the lives of the local population albeit temporarily.

Creation of employment opportunities during construction			
Dimension	**Rating**	**Motivation**	**Significance**
Impact Description: The impact is generated through capital expenditure that shocks the economy. It involves the creation of direct new job opportunities related to the construction of the proposed development and employment opportunities that will be indirectly created through the increased expenditure in sectors supplying goods and services to the construction activity and in sectors benefiting from the increase of consumer expenditure.			
Prior to mitigation/ management			
Duration	Medium-term (3)	The construction phase will last two years	Moderate (positive) (+84)
Extent	Regional (5)	Workers will be sourced from within Gauteng	
Intensity x type of impact	High (+6)	Could potentially reduce unemployed by 13%	
Probability	Highly probable (6)	It is most likely that there will be a temporary increase in employment during construction.	
Mitigation/ Management actions			
▪ Employ labour-intensive measures in construction ▪ Employ local residents ▪ Sub-contract to local construction companies ▪ Utilise local suppliers ▪ Set-up a skills desk at the local municipal office and in the nearby communities to identify skills available in the community and assist in recruiting local labour during both construction and operation			
Post management: mitigation measures could increase the impact on the local economy, but would not change the total impact. Therefore, the weights assigned for the impact before mitigations will not be affected.			
Duration	Medium-term (3)	The construction phase will last two years	Moderate (positive) (+84)
Extent	Regional (5)	Workers will be sourced from within Gauteng	
Intensity x type of impact	High (+6)	Could potentially reduce unemployed by 13%	
Probability	Highly probable (6)	It is most likely that there will be a temporary increase in employment during construction.	

10.1.4 Impact on Household Income

Jobs created during the construction of the gold recovery component will provide a temporary increase in income of R2 016.9 million (2015 prices) to the affected households. The workers directly involved in the construction of the proposed project will earn about R8 905 a month (2015 prices). This is a considerably larger amount compared to the average household incomes of the affected municipalities, that is, R5 597 in the Westonaria LM and R6 625 in the Merafong City LM. Thus, affected households will experience a considerable increase in

their household income during the construction period. An additional R876.6 million in 2015 prices of household income will be earned through indirect impacts while another R504.9 million in household income will be earned by local households due to an increase in household consumption induced through the creation of direct and indirect employment opportunities.

Table 10-7: Impact on household income during construction (2016-2017) – Gold (R'ml) (2015 prices)

Sector	Direct	Indirect	Induced	Total	% total
Agriculture	-	R 0.2	R 3.3	R 3.5	0.0%
Mining and quarrying	-	R 4.7	R 1.9	R 6.6	0.0%
Manufacturing	-	R 427.8	R 131.8	R 559.6	2.2%
Electricity	-	R 8.6	R 14.5	R 23.0	0.1%
Water	-	R 0.1	R 3.1	R 3.2	0.0%
Building and construction	R 635.4	R 4.1	R 6.4	R 645.9	2.6%
Trade and accommodation	-	R 208.8	R 76.6	R 285.4	1.1%
Transport	-	R 46.3	R 38.0	R 84.3	0.3%
Finance	-	R 57.1	R 80.4	R 137.5	0.5%
Real estate and business services	-	R 71.3	R 67.3	R 138.6	0.6%
Government	-	R 40.1	R 49.5	R 89.6	0.4%
Other services	-	R 7.7	R 32.0	R 39.7	0.2%
TOTAL	**R 635.4**	**R 876.6**	**R 504.9**	**R 2 016.9**	**8.0%**

Source: (Urban-Econ, 2015)

The creation of 28 949 FTE jobs during the construction of the uranium recovery component will increase income of the affected households by R2 235 million in 2015 prices. Of this, R704.1 million is created by workers directly involved in the construction activities. Furthermore, persons who obtain jobs as an indirect result of the construction activities will experience growth in their income levels and consequently more households in the province and other parts of the country will also benefit. An additional R1 530.9 million (2015 prices) in household income will be earned during the two-year construction period by households that will benefit from temporary jobs created as a result of multiplier effects.

Table 10-8: Impact on household income during construction- Uranium (R million) (2015 prices)

Sector	Direct	Indirect	Induced	Total	% total
Agriculture	-	R 0.2	R 3.7	R 3.9	0.0%
Mining and quarrying	-	R 5.2	R 2.1	R 7.3	0.0%
Manufacturing	-	R 474.0	R 146.1	R 620.1	2.1%
Electricity	-	R 9.5	R 16.0	R 25.5	0.1%
Water	-	R 0.1	R 3.5	R 3.6	0.0%
Building and construction	R 704.1	R 4.6	R 7.1	R 715.8	2.5%
Trade and accommodation	-	R 231.3	R 84.9	R 316.3	1.1%
Transport	-	R 51.3	R 42.1	R 93.4	0.3%
Finance	-	R 63.2	R 89.1	R 152.3	0.5%

Sector	Direct	Indirect	Induced	Total	% total
Real estate and business services	-	R 79.0	R 74.6	R 153.6	0.5%
Government	-	R 44.5	R 54.8	R 99.3	0.3%
Other services	-	R 8.5	R 35.4	R 44.0	0.2%
TOTAL	**R 704.1**	**R 971.4**	**R 559.5**	**R 2 235.0**	**7.7%**

Source: (Urban-Econ, 2015)

Temporary increase in household income and standard of living during construction			
Dimension	**Rating**	**Motivation**	**Significance**
Impact Description: The impact takes place during construction as a result of jobs created through direct, indirect and induced impacts			
Prior to mitigation/ management			
Duration	Medium-term (3)	The construction phase will last two years	Moderate (positive) (+84)
Extent	Province (5)	Increase in income will affect households of local workers, as well as workers benefitting through multiplier effect throughout the country	
Intensity x type of impact	Medium-high - positive (+5)	Household income will increase for those employed during this phase	
Probability	Highly probable (6)	It is most likely that there will be a temporary increase in income during construction.	
Mitigation/ Management actions			
▪ Recruit local labour as far as feasible to increase the benefits to the local households ▪ Employ labour-intensive methods in construction ▪ Sub-contract to local construction companies ▪ Use local suppliers where viable and arrange with the local Small and Medium Enterprises to provide transport, catering, and other services for the construction crew			
Post management: mitigation measures could increase the impact on the local economy but would not change the total impact. Therefore, the weights assigned for the impact before mitigations will not be affected.			
Duration	Medium-term (3)	The construction phase will last two years	Moderate (positive) (+84)
Extent	Province (5)	Increase in income will affect households of local workers	
Intensity x type of impact	Medium-high - positive (+5)	Household income will increase for those employed during this phase	
Probability	Highly probable (6)	It is most likely that there will be a temporary increase in income during construction.	

10.1.5 Impact on Skills Development

The construction activities for the retreatment project will require general construction experience as well as expert knowledge. It is expected that where specialist training can be provided, candidates from local communities will be trained. People involved in the project will have opportunities to further perfect and develop the skills within their own fields of expertise or acquire new skills. This could particularly be relevant to the unskilled and semi-skilled people engaged in the construction.

The creation of jobs (FTE) through indirect and induced effects, although for a short-term, will create another opportunity for people to develop and acquire new skills. Given that the impact during construction will affect almost all sectors, although at different levels, it could be argued that the project will stimulate a creation of a comprehensive set of new skills in the country. Most importantly, unlike employment opportunities during construction, skills developed during that period will not expire once the phase is complete. Thus, the impact on skills development is much more sustainable and has a positive impact on the employability of the affected people. This means that although employment will be temporary, people benefiting from skills developed during that employment will have a far greater chance of finding permanent job than they had before the project.

Skills development during construction			
Dimension	**Rating**	**Motivation**	**Significance**
Impact Description: The impact takes place during the creation of new employment opportunities, and unlike the actual employment created is sustainable.			
Prior to mitigation/ management			
Duration	Permanent (7)	The impact on skills development is more sustainable than job creation during the construction phase	Minor (positive) (+64)
Extent	Province (5)	Skills will be transferred to workers sourced nationally	
Intensity x type of impact	Medium – positive (+4)	Average impact on local employees' skills	
Probability	Probable (4)	It is probable that there will be knowledge transfer during construction	
Mitigation/ Management actions			
▪ Contractors should provide learnerships and on-job training, ▪ Where specialist training can be provided, candidates from local communities should be prioritised for training, and ▪ Share knowledge with the sub-contracting companies during the construction period.			
Post management:			
Duration	Permanent (7)	The impact on skills development is more sustainable than job creation during the construction phase	Moderate (positive) (+105)
Extent	Province (5)	Skills will be transferred to workers sourced nationally	

Skills development during construction			
Dimension	**Rating**	**Motivation**	**Significance**
Intensity x type of impact	Medium – high positive (+5)	Average impact on local employees' skills	
Probability	Likely (5)	It is likely that there will be skills development and knowledge share during construction.	

10.1.6 Impact on Government Revenue

The construction period for the WRTRP will last for two years. During this period, the construction company and the workers will earn income and pay government taxes including income taxes and payroll taxes. Although the spending of this money by government is difficult to associate with a specific budget item, any revenue received by government is allocated towards certain budget items, provinces or local municipalities to support and assist with improvement of their service delivery. Thus, without doubt this revenue would be spent on improving socio-economic conditions of the population one way or another.

Increase in government revenue during construction			
Dimension	**Rating**	**Motivation**	**Significance**
Impact Description: The impact will take place as a result of local expenditure on construction and will be acquired by government through indirect and direct taxes on the project's activity.			
Prior to mitigation/ management			
Duration	Medium-term (3)	The construction phase will last two years	Moderate (positive) (+77)
Extent	Province (5)	Increase in employment will affect the regional government revenue	
Intensity x type of impact	Low – positive (+3)	Increase in revenue is not widespread but is felt by government	
Probability	Definite (7)	It is definite that tax will be paid	
Mitigation/ Management actions			
▪ No mitigation			
Post management:			
Duration	Medium-term (3)	The construction phase will last two years	Moderate (positive) (+77)
Extent	Province (5)	Increase in employment will affect the regional government revenue	
Intensity x type of impact	Low – positive (+3)	Increase in revenue is not widespread but is felt by government	
Probability	Definite (7)	It is definite that tax will be paid	

10.1.7 Negative Impact of Sterilisation of Agricultural Land

The footprint of the project considering the proposed layout will directly affect four farmers involved in crop production and livestock breeding. It is assumed that all agricultural activities currently underway at the proposed site will be halted once construction begins.

Although it is difficult to ascertain exactly how much of production will be lost given the farmers' reluctance to disclose income information it is estimated that annual loss of production directly related to the current activities will be R25 million. Considering the multiplier effects, the possible annual losses from sterilisation of land could be R50 million. In addition, about 66 FTE agricultural jobs could be lost.

In addition, the establishment of the facility could lead to the loss of workers at the adjacent farms. This is due to expectations that the pay received will be greater on the construction site as compared to the farm. This could also negatively impact on the agricultural and farming activities in the area as it could require the farm owners recruit new reliable and skilled farm workers who would be willing to work on the farms staff which could take time.

The impact on agricultural land is moderate due to the importance of farming on the affected land portions. The motivation behind this is that crop production and grazing activities will be halted during construction and this will continue over the operational period. Some farmers did report loss of revenues as a result. Even with mitigation, the impact of land sterilisation will remain of moderate significance, due to its permanent nature. As such, affected farmers should be adequately compensated for the loss of productivity.

Although the agricultural sector is important to the economy with respect to job creation, food security and sustainability, it cannot be ignored that the project's contribution to GDP, social empowerment and employment exceeds that of the agricultural activities which will be affected by a significant margin.

Loss of agricultural production as a result of land sterilisation			
Dimension	**Rating**	**Motivation**	**Significance**
Impact Description: The impact will take place as a result of replacement of farming activities			
Prior to mitigation/ management			
Duration	Permanent (7)	Land sterilisation will be permanent	Moderate (negative) (-91)
Extent	Local (3)	Will affect farms around the development site	
Intensity x type of impact	Low-moderate – negative (-3)	Could affect the agricultural activities	
Probability	Definite (7)	Without the sale of land the project will not go ahead	
Mitigation/ Management actions			
▪ Reasonable compensation must be negotiated with the affected farmers ▪ Should resettlement of farm workers be required, a Resettlement Action Plan must be developed and implemented ▪ Establishment of appropriate training and skills development at an early stage to allow farm workers to benefit from the mine employment opportunities			

Loss of agricultural production as a result of land sterilisation			
Dimension	**Rating**	**Motivation**	**Significance**
Post management:			
Duration	Permanent (7)	The impact will remain after the life of the project.	Moderate (negative) (-84)
Extent	Local (3)	Will affect farms around the development site	
Intensity x type of impact	Low – negative (-2)	Mitigation may reduce intensity of impact	
Probability	Definite (7)	It is definite impact will occur.	

10.1.8 Potential Negative Impact on Property Values

The establishment of the facility will affect the sense of place in the area and subsequently reduce the farm's marketability and diminish their land values. The changes in property values have a limited direct impact on local economies as far as development is concerned, they, however, affect the value of real estate and subsequently the loans that could be applied for by farmers, the revenue that could be derived from the sale of the property, and overall their future income security.

In general, any development associated with some negative environmental effects can influence property values in two ways:

- On the one hand, it can reduce the value of the land if the proposed development has a negative image associated with it. This could be related to real or perceived adverse effects of the proposed development on air quality, noise levels, aesthetics, traffic congestion, health, and crime levels in the area.
- On the other hand, the development could spike the demand for the surrounding properties and lead to the increase in property values in the area. This could occur in situations where nearby properties are found to carry valuable marketable natural resources or they offer improved accessibility of workers to the facility or other nearby developments.

The effects on property values are expected to present themselves during the construction phase, and even at the pre-construction phase when the knowledge about the proposed mining activity spreads. During this time, the decline in property values could be greater than expected due to the uncertainty in the market regarding the actual extent of environmental impacts that can ensue from the construction activity. The negative effects on property values during operation usually continue, however, the extent of that impact could change (i.e. reduced or increased) depending on the actual changes that the construction of the facility and its operation brought to the surrounding environment. In some cases, the negative impact could be reduced and more so for properties located further away from the site, and in some cases it could be increased if the perceived impacts were underestimated or new impacts occur.

Potential negative impact on property values			
Dimension	**Rating**	**Motivation**	**Significance**
Impact Description: The impact will take place as a result of various environmental effects that would ensue during construction activities, i.e. noise, visual, and dust pollution			
Prior to mitigation/ management			
Duration	Permanent (7)	The impact will remain after the life of the project.	Minor (negative) (-65)
Extent	Local (3)	Will affect farms around development site	
Intensity x type of impact	Moderate – negative (-3)	Moderate loss of sense of place	
Probability	Likely (5)	The impact may occur	
Mitigation/ Management actions			
▪ Mitigation measures proposed by other specialists should be strictly adhered to minimise the probability and intensity of noise, visual, and dust pollution in the area that affect the sense of place and as a result impact on property values			
Post management:			
Duration	Beyond project life (6)	Will remain for some time after the life of the project.	Minor (negative) (-55)
Extent	Local (3)	Will affect farms around development site	
Intensity x type of impact	Low – negative (-2)	Minor loss of sense of place	
Probability	Likely (5)	The impact may occur	

10.2 Operational Phase Impact Assessment Results

The following paragraphs describe the economic impact that is expected to take place during operation of the proposed treatment facility. The information provided in the tables show the impact that will take place during one year of full operations. These impacts will last as long as the operational phase continues. Since the phase under analysis will be in operation for 17 years, economic impacts stimulated by the project and observed during that time are considered to be sustainable. Sustainability is an integral component of the continuous growth and development of any economy, as it ensures retention and possibly even the growth of standard of living of affected people and their households.

10.2.1 Effects on Balance of Payment due to Production of Gold and Uranium

In 2013, the export of gold contributed almost R50 billion to South African exports. This means that gold exports accounted for 19.5% of the country's total exports during that year (Department of Mineral Resources, 2015). If the project exports the entire amount of gold and uranium produced, which is the most likely scenario given the current domestic market structure, they will contribute an estimated R0.6 billion and R3.5 billion per annum to South Africa's export earnings, which equates to an increase of gold and uranium exports observed in 2013 by between 1.2% and 7%.

Exports bring stability and growth to the country. They allow the country to earn foreign exchange, which in turn means that the nation has a greater purchasing capacity on the international market that can be used to acquire goods and services necessary for the development of other industries within the nation.

Over the last decade, South Africa's trade balance has been at a deficit. Between 2007 and 2014, the deficit fluctuated between 1.5% and 5.8% of the GDP (SARB, 2015). It reached the lowest level in 2010 (1.5% of GDP), which could be associated with the increase in demand for South Africa's goods and services due to the shift in global trade patterns following the global financial crises in 2009 and increase in travel receipts from South Africa hosting 2010 FIFA World Cup™. After 2010, though, while the merchandise exports and service receipts continued to grow, the volumes of imported goods and services also sharply increased leading to the widening of the trade deficit. In 2014, the balance on current account reached R206.6 billion, which equated to 5.4% of the national GDP. Although it was slightly smaller compared to 2013, it is still among the highest trade deficits observed after the global financial crisis. The export of the minerals produced will have a medium to long term positive effect on the balance of the current account, as it will increase the export component of the current account and lead to the decrease of the current account deficit.

Impact on balance of payment during operations			
Dimension	**Rating**	**Motivation**	**Significance**
Impact Description: The impact takes place during operation as a result of exporting the gold and uranium produced			
Prior to mitigation/ management			
Duration	Project life (5)	The project will cease after the operational life span of the project	Moderate (positive) (96)
Extent	National (7)	Exports will affect the balance of the national accounts	
Intensity x type of impact	Moderate – positive (+4)	Average on-going positive benefit	
Probability	Highly probable (6)	It is most likely that that the minerals produced will be exported	
Mitigation/ Management actions			
▪ None			
Post management:			
Duration	Project life (5)	The project will cease after the operational life span of the project	Moderate (positive) (96)
Extent	National (7)	Exports will affect the balance of the national accounts	
Intensity x type of impact	Moderate – positive (+4)	Average on-going positive benefit	
Probability	Highly probable (6)	It is most likely that that the minerals produced will be exported	

10.2.2 Impact on Production

The proposed retreatment project will generate R72 087 million of turnover during the total operational period. Figure 10-1 shows the annual production impact variations between a minimum of R950 million, and a maximum of R6 045 million in 2015 prices.

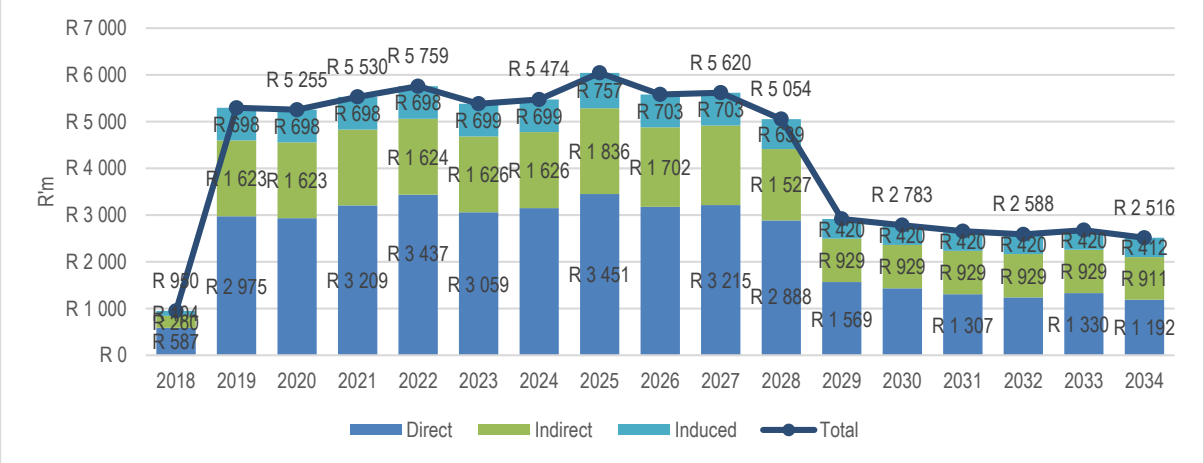


Figure 10-1: Annual impact on production (R'ml, 2015 prices) (Urban-Econ, 2015)

The annual impact on production during the 17-year operating period of the facility will vary year on year. It is estimated that the impact on new business sales will begin at a low of R950 million in 2015 prices, increasing to R5 296 million (2015 prices) and decreasing to R2 783 million in 2030. About 56% of the turnover to be generated by the project will be created directly by mining activities, while the rest will be stimulated through multiplier effects. If it is assumed that the production will be accounted in the same municipality where the project's output is generated, the proposed reclamation activities will significantly alter the structure of the local economies.

Due to the varying production volumes of the 17-year period, it is difficult to analyse the production impact per sector using an annual average. For illustration purpose, the year with the largest positive impact on the economy was used, i.e. 2022, to illustrate the envisaged distribution of benefits among economic sectors.

In 2022, retreatment operations will generate at total of R5 799 million (2015 prices) in new business sales. Of this, R3 473 million (2015 prices) will be created through direct impacts and an additional R2 321 million will be created through multiplier effects.

As indicated in Table 10-9, the sectors and industries that are expected to benefit the most from this will include the following:

- Through indirect effects
  - Electricity
  - Trade and accommodation
  - Transport

- Government services

- Through induced effects
  - Trade and accommodation
  - Finance
  - Real estate and business services

Table 10-9: Impact on production during operational phase in 2022 (R million) (2015 prices)

Sector	Direct	Indirect	Induced	Total	% total
Agriculture	-	R 1.0	R 7.1	R 8.1	0.1%
Mining and quarrying	R 3 437.3	R 58.0	R 3.2	R 3 498.6	63.8%
Manufacturing	-	R 708.1	R 274.3	R 982.4	15.0%
Electricity	-	R 188.0	R 17.4	R 205.4	5.4%
Water	-	R 0.9	R 7.4	R 8.3	0.1%
Building and construction	-	R 44.9	R 12.1	R 57.0	0.9%
Trade and accommodation	-	R 174.8	R 83.1	R 257.9	3.3%
Transport	-	R 93.8	R 60.9	R 154.6	2.4%
Finance	-	R 62.0	R 73.0	R 135.1	2.6%
Real estate and business services	-	R 192.4	R 102.4	R 294.8	4.8%
Government	-	R 93.1	R 39.1	R 132.1	1.1%
Other services	-	R 6.7	R 18.1	R 24.8	0.4%
TOTAL	**R 3 437.3**	**R 1 623.6**	**R 698.0**	**R 5 759.0**	**100.0%**

Source: (Urban-Econ, 2015)

Increase in production during operations			
Dimension	**Rating**	**Motivation**	**Significance**
Impact Description: The impact results from sustainable production of the mine, as well as procurement of goods and services required for its sustainable operations and creation of sustainable employment opportunities through direct and indirect effects.			
Prior to mitigation/ management			
Duration	Project life (5)	The impact will cease after project life span of 17 years	Moderate (positive) (96)
Extent	Regional (5)	Production increase will affect the entire province	
Intensity x type of impact	High – positive (+6)	The national economy's output will increase by between R1 billion and R5.8 billion per annum	
Probability	Highly probable (6)	It is most likely that there will be an increase in production during operational phase	
Mitigation/ Management actions			

Increase in production during operations			
Dimension	**Rating**	**Motivation**	**Significance**
The project should aim to benefit the local economy as far as possible and feasible by opting for procurement of locally procured goods and supplied services			
Post management			
Duration	Project life (5)	The impact will cease after project life span of 17 years	Moderate (positive) (96)
Extent	Regional (5)	Production increase will affect the entire province	
Intensity x type of impact	High – positive (+6)	The national economy's output will increase by between R1 billion and R5.8 billion per annum	
Probability	Highly probable (6)	It is most likely that there will be an increase in production during operational phase	

10.2.3 Impact on GDP-R

The business sales generated by the project over its lifespan through direct and spin-off effects will translate into R36 769 million (2015 prices) of Gross Domestic Product per region (GDP-R). During the steady state production between 2019 and 2028, the total impact on GDP-R will vary between R2 613 million and R3 168 million. Thereafter, the annual production will decline to 5.4 Mt per annum; therefore, the impact on the economy will be smaller than during the period between 2019 and 2028, but still positive.

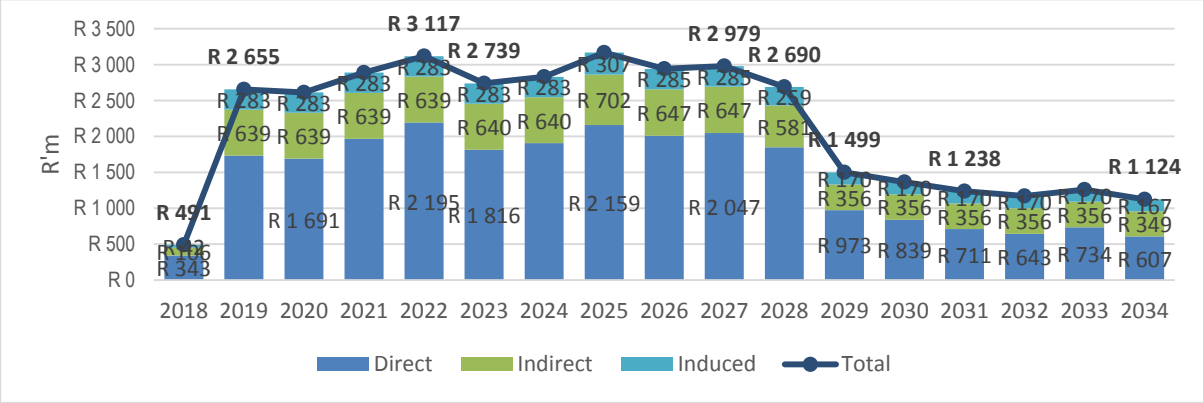


Figure 10-2: Annual impact on GDP-R (R'ml, 2015 prices) (Urban-Econ, 2015)

The new business sales generated by the operations in 2022 through direct and spin-off effects will translate into R3 117 million (2015 prices) of Gross Domestic Product per region. Since most of the production impacts are expected to be created within Gauteng, it could also be argued that the biggest portion of the value added created will be generated in Gauteng, too. Again, a significant portion of the GDP-R that is expected to be created by the proposed facility will be created through direct impact within the mining industry of the West Rand DM. This means that once the facility is operational, it will increase the West Rand DM's economy

by 5%. Table 10-10 shows the sectors which are likely to benefit from the increase in GDP-R during operations in 2022.

Table 10-10: Impact on GDP-R during operational phase in 2022 (R million) (2015 prices)

Sector	Direct	Indirect	Induced	Total	% total
Agriculture	-	R 0.5	R 3.7	R 4.2	0.1%
Mining and quarrying	R 2 195.2	R 32.1	R 1.8	R 2 229.0	71.5%
Manufacturing	-	R 178.5	R 71.7	R 250.2	8.0%
Electricity	-	R 100.9	R 9.3	R 110.2	3.5%
Water	-	R 0.3	R 2.5	R 2.9	0.1%
Building and construction	-	R 13.8	R 3.2	R 16.9	0.5%
Trade and accommodation	-	R 89.1	R 40.1	R 129.3	4.1%
Transport	-	R 39.8	R 25.7	R 65.6	2.1%
Finance	-	R 37.4	R 44.1	R 81.5	2.6%
Real estate and business services	-	R 96.9	R 51.0	R 147.9	4.7%
Government	-	R 45.8	R 19.2	R 65.0	2.1%
Other services	-	R 4.3	R 10.5	R 14.8	0.5%
TOTAL	**R 2 195.2**	**R 639.3**	**R 282.9**	**R 3 117.4**	**100.0%**

Source: (Urban-Econ, 2015)

Increase in the country's GDP-R during operations			
Dimension	**Rating**	**Motivation**	**Significance**
Impact Description: The impact is generated through continuous operations at the TSF. It stimulates economic activities of directly and indirectly affected businesses, which subsequently leads to the creation of new business sales and generation of value added. Through increased household expenditure, additional round of value adding is created.			
Prior to mitigation/ management			
Duration	Project life (5)	The impact will cease after project life span of 17 years	Moderate (positive) (90)
Extent	Regional (5)	A large portion of the value added created will be generated in Gauteng	
Intensity x type of impact	Medium high – positive (+5)	The national economy's value added will increase by R490 million and R3 117 million per annum	
Probability	Highly probable (6)	It is most likely that there will be an increase in GDP-R during operational phase	
Mitigation/ Management actions			

Increase in the country's GDP-R during operations			
Dimension	**Rating**	**Motivation**	**Significance**
▪ Investigate local procurement opportunities ▪ Procure from local suppliers should be encouraged if feasible to the viability of the mine. This will improve the benefit to the local economy but will not affect the impact rating.			
Post management: mitigation measures though, will not increase the significance rating but will assist with increasing the benefits felt by the local economy.			
Duration	Project life (5)	The impact will cease after project life span of 17 years	Moderate (positive) (90)
Extent	Regional (5)	A large portion of the value added created will be generated in Gauteng	
Intensity x type of impact	Medium high – positive (+5)	The national economy's value added will increase by R490 million and R3 117 million per annum	
Probability	Highly probable (6)	It is most likely that there will be an increase in GDP-R during operational phase	

10.2.4 Impact on Employment

During the operational period, the WRTRP will employ between 400 and 548 people on site on an annual basis, which over the entire period will add to 7 683 FTE man years or FTE jobs. It is expected that most of the jobs at the WRTRP will be created for the local community.

In addition to the direct jobs created, the project will support 46 138 FTE man years between 2018 and 2034. Of these, 28 718 will be created through of production induced effects and 17 420 will be as a result of consumption induced effects. Most of the employment opportunities will be created throughout the country, however, it is expected that a few jobs will be created and supported in the local economy.

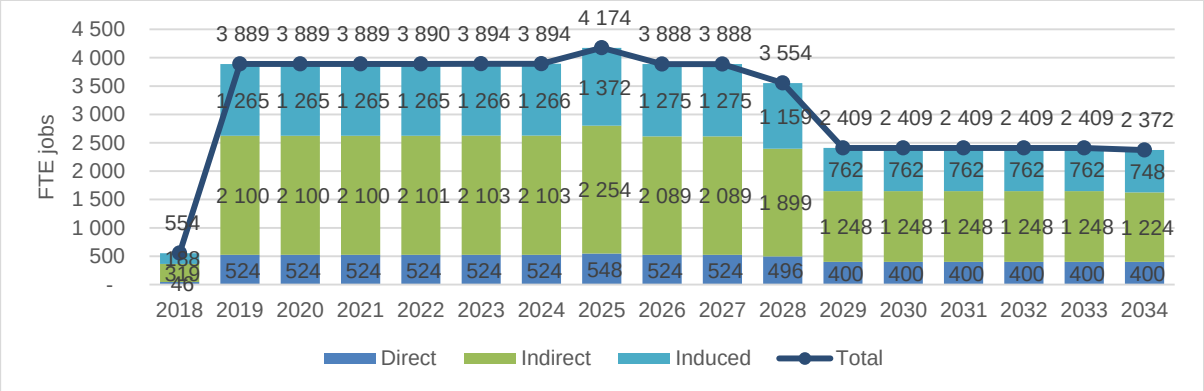


Figure 10-3: Annual impact on employment (FTE- man years/jobs) (Urban-Econ, 2015)

Taking 2022 for illustration purposes of the potential impact on employment during a period of one year, the WRTRP will support 3 890 jobs throughout the country. Of these, 524 of the employment opportunities will be created directly through operational activities at the TSFs. Through the indirect effects, an additional 2 101 jobs will be created along the supply chain. Lastly, factor spending will create and support 1 265 additional jobs.

The following table illustrates the expected distribution of created employment opportunities per economic sector in 2022. It is evident that aside from the mining sector itself, the economic sectors that are expected to experience the largest increase in employment as a result of the project's operation are real estate and business services, finance, and trade and accommodation. Most of the employment opportunities created through indirect and induced effects will be created in the Province and some in the rest of the country.

Table 10-11: Impact on employment during the operational phase in 2022 (FTE jobs)

Sector	Direct	Indirect	Induced	Total	% total
Agriculture	-	8	55	62	1.8%
Mining and quarrying	524	27	1	552	0.8%
Manufacturing	-	252	107	359	10.7%
Electricity	-	54	5	59	1.8%
Water	-	0	2	3	0.1%
Building and construction	-	42	11	53	1.6%
Trade and accommodation	-	375	178	553	16.4%
Transport	-	109	61	169	5.0%
Finance	-	289	341	630	18.7%
Real estate and business services	-	832	441	1,273	37.8%
Government	-	107	45	152	4.5%
Other services	-	6	18	24	0.7%
TOTAL	**524**	**2 101**	**1 265**	**3 890**	**100.0%**

Source: (Urban-Econ, 2015)

Creation of employment opportunities during operations			
Dimension	**Rating**	**Motivation**	**Significance**
Impact Description: The impact takes place throughout the operational phase and is translated into the creation of new employment opportunities at the mine and businesses that are affected through indirect and induced effects.			
Prior to mitigation/ management			
Duration	Project life (5)	The impact will cease after project life span of 17 years	Moderate (positive) (90)
Extent	Regional (5)	Increase in employment will affect the entire region	
Intensity x type of impact	Medium to high – positive (+5)	Could potentially reduce unemployment	

Creation of employment opportunities during operations			
Dimension	**Rating**	**Motivation**	**Significance**
Probability	Highly probable (6)	It is most likely that there will be an increase in employment during operations	
Mitigation/ Management actions			
▪ Where possible, the employment of local labour should be practiced to increase the benefit to the local community through prevention of leakage of buying power.			
Post management:			
Duration	Project life (5)	The impact will cease after project life span of 17 years	Moderate (positive) (90)
Extent	Regional (5)	Increase in employment will affect the entire region	
Intensity x type of impact	Medium to high – positive (+5)	Could potentially reduce unemployment	
Probability	Highly probable (6)	It is most likely that there will be an increase in employment during operations	

10.2.5 Impact on Household Income

During the operational period, the project will directly support between 400 and 548 households on an annual basis, whose monthly income will increase by an average of R19 675 per month. The other 1 972 to 3 626 households will experience an average increase in their income of about R9 963 per month either through indirect or induced effects. Overall, between 2018 and 2034 a total of R1 814 million will be paid in salaries and wages to households whose members are directly employed at the TSFs. Households benefiting from the project through indirect and induced effects will earn R3 829 million and R1 688 million in salaries and wages over the same period.

Increase in household income and standard of living during operation			
Dimension	**Rating**	**Motivation**	**Significance**
Impact Description: The impact takes place during operations as a result of jobs created through direct, indirect, and induced impacts, which in turn lead to income earned by households			
Prior to mitigation/ management			
Duration	Project life (5)	The impact will cease after project life span of 17 years	Moderate (positive) (90)
Extent	Regional (5)	Increase in income will affect households of those employed at the mine directly as well as indirectly	
Intensity x type of impact	Medium to high – positive (+5)	Household income will increase for those employed during this phase	
Probability	Highly probable (6)	It is most likely that there will be an increase in income during operations	
Mitigation/ Management actions			
▪ Recruit local labour as far as feasible to increase the benefits to the local households			

▪ Employ labour-intensive methods during operations			
Post management:			
Duration	Project life (5)	The impact will cease after project life span of 17 years	Moderate (positive) (90)
Extent	Regional (5)	Increase in income will affect households of those employed at the mine directly, as well as indirectly	
Intensity x type of impact	Medium to high – positive (+5)	Household income will increase for those employed during this phase	
Probability	Highly probable (6)	It is most likely that there will be an increase in income during operations	

10.2.6 Impact on Skills Development

The mine already has Social and Labour Plans (SLP) in place for each Mining Right Application Area. The SLPs which will be applicable to this phase of the project are the Driefontein Operations SLP, Randfontein Estates SLP and the Kloof Operations SLP.

10.2.6.1 Driefontein Operations SLP

As part of the Skills Development Plan (SDP) included in the SLP, the mine has set the following targets in terms training provision for its staff:

- Level 1 to 4 of Adult Basic Education and Training (ABET) to 1 100 workers on a full-time basis.
- Level 1 to 4 of Adult Basic Education and Training (ABET) to 650 workers on a part-time basis.
- Internal mining learnerships to 33 workers and 172 internal engineering learnerships.
- Core business training in various areas applicable to the mining industry to 3 021 workers.
- Potable skills training to 650 workers.

10.2.6.2 Kloof Operations SLP

As part of the Skills Development Plan (SDP) included in the SLP, the mine has set the following targets in terms training for its staff:

- Internal mining learnerships to 261 workers and 178 internal engineering learnerships.
- Core business training in various areas applicable to the mining industry to 44 017 workers.
- Potable skills training for 2 340 workers.

10.2.6.3 Randfontein Operations SLP

In the SLP, the mine committed to offer mine-operation related training to the value of R34 million for the period between 2007 and 2012. It should be noted that this version of the SLP is outdated and the reviewed SLP will only be available in 2016.

In addition to the above, mentorship programme, career progression plans, internships, and bursaries will also be offered to the employees to advance their skills and assist in their personal development. Importantly, bursaries will be offered not only to the employees of the company, but also to the individuals from the local communities that represent labour-sending areas.

Skills development during operations			
Dimension	**Rating**	**Motivation**	**Significance**
Impact Description: The impact results from the mine's investment in skills development during its operations			
Prior to mitigation/ management			
Duration	Permanent (7)	Skills will be retained beyond project's life	Moderate (positive) (+102)
Extent	Regional (5)	Skills will be transferred to workers locally and potentially beyond	
Intensity x type of impact	Medium – high positive (+5)	Average impact on local employees' skills	
Probability	Highly probable (6)	It is highly probable that the mine will implement the SLP	
Mitigation/ Management actions			
▪ The mine is required by law to adhere to the provisions detailed in the Social and Labour Plan – no mitigation measures required			
Post management:			
Duration	Permanent (7)	Skills will be retained beyond project's life	Moderate (positive) (+102)
Extent	Regional (5)	Skills will be transferred to workers locally and potentially beyond	
Intensity x type of impact	Medium – high positive (+5)	Average impact on local employees' skills	
Probability	Highly probable (6)	It is highly probable that the mine will implement the SLP	

10.2.7 Impact on Government Revenue

The operation of the proposed retreatment facility will generate additional revenue for government in the form of direct and indirect taxes. It is estimated that a total R5 038 million of various taxes would be paid by the facility during the operational phase (i.e. between 2018 and 2034), of which R1 518 million will represent royalties and the rest largely comprise of corporate and withholding taxes.

Increase in government revenue during operations			
Dimension	**Rating**	**Motivation**	**Significance**
Impact Description: The impact takes place mostly with payment of royalties and corporates taxes, as well as a result of payment of salaries and wages and declaration of dividends.			
Prior to mitigation/ management			
Duration	Project life (5)	The impact will cease after project life span of 17 years	Moderate (positive) (+84)
Extent	Regional (5)	Increase in employment will affect the provincial government	
Intensity x type of impact	Moderate – positive (+4)	Increase in revenue is not widespread but is felt by government	
Probability	Highly probable (6)	It is most likely that tax will be paid	
Mitigation/ Management actions			
▪ No mitigation			
Post management:			
Duration	Project life (5)	The impact will cease after project life span of 17 years	Moderate (positive) (+84)
Extent	Regional (5)	Increase in employment will affect the provincial government	
Intensity x type of impact	Moderate – positive (+4)	Increase in revenue is not widespread but is felt by government	
Probability	Highly probable (6)	It is most likely that tax will be paid	

10.2.8 Local Economic Development benefits derived through mine's SLP

The proposed project will contribute to the diversification of the local economy through investment into the development of local Small and Medium Enterprises (SME) as part of the Local Economic Development (LED) programme.

The Driefontein SLP (Sibanye Gold Limited, 2012) outlines five projects to the value of R17 million planned for implementation in the Merafong City LM, which will focus on the following aspects:

- Poverty alleviation and improvement of standard of living: Mphahlwa Village Community Development Project.
- Skills development and enterprise development: Enterprise Development Project.
- Poverty alleviation and biodiversity management: Eradication of alien invader tree species.
- Infrastructure development: Blybank Social Infrastructure Project.
- Poverty alleviation and environmental management: Waste Management Project.

It is envisaged that the projects will create between 127 and 250 jobs.

In addition, the Kloof SLP (Sibanye Gold Limited, 2012) outlines five projects to the value of R12.5 million which could potentially create between 575 and 1 150 jobs. The projects are planned for implementation in the Westonaria LM focusing on the following aspects:

- Tourism and poverty alleviation: Amampondo Tourism Project.
- Skills development and enterprise development: Enterprise Development Project.
- Poverty alleviation: Glenhave Agricultural Project.
- Infrastructure development: Simunye School Social Infrastructure Project.
- Poverty alleviation and biodiversity management: Alien Invader Beneficiation and Nursery Project.

Local economic development			
Dimension	**Rating**	**Motivation**	**Significance**
Impact Description: The impact results from the mine's investment in LED programme			
Prior to mitigation/ management			
Duration	Project life (5)	The impact will cease after project life span of 30 years	Moderate (positive) (+84)
Extent	Municipal area (4)	Development of the local economy	
Intensity x type of impact	Low – positive (+3)	Average impact on local economy	
Probability	Definite (7)	It is definite as this is required by law	
Mitigation/ Management actions			
▪ The mine is required by law to adhere to the provisions detailed in the Social and Labour Plan – no mitigation measures required			
Post management:			
Duration	Project life (5)	The impact will cease after project life span of 30 years	Moderate (positive) (+102)
Extent	Municipal area (4)	Development of the local economy	
Intensity x type of impact	Low – positive (+3)	Average impact on local economy	
Probability	Definite (7)	It is definite as this is required by law	

10.2.9 Potential losses of sustainable revenue by local farming activities due to various environmental impacts that affect the agricultural activities

The proposed activity is likely to create a number of environmental impacts that would have a negative impact on the sense of place. As mentioned earlier, the area where the proposed RTSF is to be established hosts farms that derive some form of income from livestock and crop farming activities.

One of the adjacent farm owners has raised a concern over the effect of pollution as a result the proposed project on the existing operations on the farm. A review of the sensitivity maps produced by other specialists would be necessary to ascertain the extent of the negative impacts on the farms adjacent to the facility

Negative impact on surrounding farming activities			
Dimension	**Rating**	**Motivation**	**Significance**
Impact Description: The impact will take place as a result of various environmental effects that would ensue during operational activities, i.e. noise, visual, and dust pollution			
Prior to mitigation/ management			
Duration	Permanent (7)	The impact will remain after the life of the project.	Negligible (negative) (-39)
Extent	Local (3)	Will affect farms around the development site	
Intensity x type of impact	Low – negative (-3)	Could affect agricultural activities	
Probability	Unlikely (3)	There is a possibility impact will occur.	
Mitigation/ Management actions			
▪ Implement mitigations proposed by other specialists on the team to reduce environmental impacts that affect agricultural activities adjacent to the RTSF			
Post management:			
Duration	Permanent (7)	The impact will remain after the life of the project.	Negligible (negative) (-39)
Extent	Local (3)	Will affect farms around the development site	
Intensity x type of impact	Low – negative (-3)	Could affect agricultural activities	
Probability	Unlikely (3)	There is a possibility impact will occur.	

10.3 Rehabilitation and Closure Phase Impact Assessment Results

Upon depletion of the TSFs, the historical tailings will be rehabilitated. The rehabilitation of the TSFs will require investment and will this have positive impact on production, employment, household income and government revenue.

11 Cumulative Impacts

Cumulative impacts are those resulting from the added impacts of other past, present or future developments. They consider how the impacts of one project may affect and be affected by

other projects and can be seen as the sum of the proposed action, plus past and present activity in the same area. Cumulative impacts usually relate to large-scale and more extensive rather than primary concentrated impacts and have a tendency to increase the intensity of impacts already predicted for the proposed Project.

The aim of this section is to present the cumulative economic impacts that are expected to occur as result of the combined effect of the proposed project and other current or planned mining operations in the area. Cumulative impacts identified include:

- **Job creation:** Nearby mining operations employ significant numbers of people, other mining activities planned for the area will also potentially add to the number of people employed in the mining sector. The contribution of mining related industries to job creation will therefore be enhanced through the proposed WRTRP.
- **Increased export income:** As indicated earlier, most of the gold produced in the country is for the export market. There are several mines in the West Rand already involved in gold mining and the proposed project will add to the country's gold export earnings.
- **Local economic development and skills development:** The proposed project through implementation of its Social Labour Plans will add to the existing positive effect of mining on local economic development and skills development.
- **Increase in government revenue:** The proposed project will add to the existing positive effect of mining on government revenue through the payment of royalties, company tax, secondary taxes, as well as personal income taxes through employees.
- **Increase in value added** in the affected LM's and consequently, the province.
- **Increased expectations of employment opportunities and community benefits:** If numerous mining projects take shape in the broader study area, local residents' expectations of employment opportunities and community benefits are likely to be fuelled. If, as in the past, these expectations are not met, the possibility of conflict between residents and the company, or between residents and "outsiders" could increase.
- **Dependency on mining to sustain the economy:** Given that the region is resource-rich, there is no doubt that mining activities will continue for the next 40 years. It is also understood that mining is not sustainable, but if rehabilitation processes are put in place and development of other industries is supported this will go a long way towards creating a sustainable and diverse economy. An example of an economy whose structure has changed dramatically from its mining beginnings is Johannesburg. Given the linkages between Johannesburg and the West Rand it is easy to see that a structural shift of the economy is possible.
- **Further undermining of agricultural potential in the area:** Cumulative mining impacts in the study area may over time, preclude any potential agricultural

development. In addition, cumulative pollution and water quality impacts could affect the agricultural activities on the farms.

12 Unplanned Events and Low Risks

Low risks can be monitored to gauge if the baseline changes, and mitigation is required. Unplanned events may happen on any project, and as responsible consultants, we need to provide the client with information on the potential impacts of those events and how to manage them, if they occur. Table 12-1 is how we will achieve this and also provides an example of how to complete the table.

Table 12-1: Unplanned events, low risks and their management measures

Unplanned event	Potential impact	Mitigation/ Management/ Monitoring
Gold price and foreign exchange fluctuations	▪ Impact on exports ▪ Impact on financial results and investor confidence	▪ Make business resilient to price changes ▪ Sound financial planning
Economic decline after closure of mine	"Ghost town" effect	▪ Well planned and managed closure process
Labour unrest	Decrease in production	▪ Engaging with organised labour ▪ Proactively address employees' concerns

13 Environmental Management Plan

The objective of an Environmental and Social Management Plan (ESMP) is to present mitigation to:

- manage undue or reasonably avoidable adverse impacts associated with the development of a project and
- enhance potential positives

Mitigation measures will sometimes be built into the base of a project and should be considered as part of the "pre-mitigation" scenario, additional mitigation must be recommended if the impact assessment indicates it is necessary.

13.1 Project Activities with Potentially Significant Impacts

The following table provides a list of potentially significant impacts as a result of construction and operational activities that require mitigation or management.

Table 13-1: Potentially significant impacts

Aspects	Potential Significant impacts	
Construction		
	Impact on production	Impact on skills development

Construction activities e.g. RTSF, CPP, pipelines,	Impact on GDP-R	Impact of land sterilisation
	Impact on employment	Impact on property values
	Impact on household income	
Operation		
Operations at the TSFs	Impact on balance of payment	Impact on household income
	Impact on production	Impact on skills development
	Impact on GDP-R	Local economic development
	Impact on employment	Loss of agricultural revenue

13.2 Summary of Mitigation and Management

The following tables provide a summary of the appropriate mitigation and management options for the economic impacts anticipated during the construction phase and operational phases. The tables also list the management objectives, relevant compliance standards and timing of proposed mitigations.

Table 13-2: Impacts

Activities	Phase	Aspects	Size and scale of disturbance	Mitigation/management Measures	Compliance with standards	Time period for implementation
Construction of RTSF, CPP and related infrastructure	Construction	Production	N/A	Procurement of goods and services from local small business where possible.	▪ Constitution of the Republic of South Africa, 1996 ▪ NEMA	Prior to construction with ongoing management and monitoring throughout the project life
	Construction	GDP-R	N/A	▪ Recruit local labour where skills exist. ▪ Sub-contract to local construction companies where appropriate. Use local suppliers where viable and arrange with the local Small and Medium Enterprises to provide transport, catering, and other services for the construction crew.	▪ Constitution of the Republic of South Africa, 1996 ▪ NEMA	Prior to construction with ongoing management and monitoring throughout the project life
	Construction	Employment	N/A	▪ Employ labour-intensive measures in construction. ▪ Employ local residents where possible.	▪ Constitution of the Republic of South Africa, 1996 ▪ NEMA	Prior to and during construction

Activities	Phase	Aspects	Size and scale of disturbance	Mitigation/management Measures	Compliance with standards	Time period for implementation
				▪ Sub-contract to local construction companies where appropriate. ▪ Utilise local suppliers where appropriate. Set-up a skills desk at the local municipal office and in the nearby communities to identify a local labour pool.		
	Construction	Household income	N/A	▪ Recruit local labour as far as is feasible to increase the benefits to the local households. ▪ Employ labour-intensive methods in construction where appropriate. ▪ Sub-contract to local construction companies where suitable. Use local suppliers where viable and arrange with the local Small and Medium Enterprises to provide transport, catering, and other	▪ Constitution of the Republic of South Africa, 1996 ▪ NEMA	During construction with ongoing management and monitoring throughout the project life

Activities	Phase	Aspects	Size and scale of disturbance	Mitigation/management Measures	Compliance with standards	Time period for implementation
				services for the construction crew.		
	Construction	Skills development	N/A	▪ Contractor should provide learnerships and on-job training. ▪ Where specialist training can be provided, candidates from local communities should be prioritised for training, and Share knowledge with the sub-contracting companies during the construction period.	▪ Constitution of the Republic of South Africa, 1996 ▪ NEMA	During construction with ongoing management and monitoring throughout the project life
	Construction	Land	N/A	▪ Reasonable compensation must be negotiated with the affected farmers. ▪ Should resettlement of farm workers be required, a Resettlement Action Plan must be developed and implemented. Establishment of appropriate training and skills development at an early stage	▪ Constitution of the Republic of South Africa, 1996 ▪ NEMA	During construction with ongoing management and monitoring throughout the project life

Activities	Phase	Aspects	Size and scale of disturbance	Mitigation/management Measures	Compliance with standards	Time period for implementation
				to allow farm workers to benefit from the mine employment opportunities.		
	Construction	Property values	N/A	Mitigation measures proposed by other specialists should be strictly adhered to minimise the probability and intensity of noise, visual, and dust pollution in the area.	▪ NEMA ▪ NEM: AQA ▪ ECA	During construction with ongoing management and monitoring throughout the project life
Operational activities including reclamation of TSFs	Operational	Production	N/A	Procurement of locally produced goods and services where possible.	▪ Constitution of the Republic of South Africa, 1996 ▪ NEMA	During operations
	Operational	GDP-R	N/A	▪ Investigate local procurement opportunities. Procure from local suppliers where appropriate.	▪ Constitution of the Republic of South Africa, 1996 ▪ NEMA	Prior to and during operations
	Operational	Employment	N/A	Employment of local labour where skills exist.	▪ Constitution of the Republic of South Africa, 1996 ▪ NEMA	During operations

Activities	Phase	Aspects	Size and scale of disturbance	Mitigation/management Measures	Compliance with standards	Time period for implementation
	Operational	Household income	N/A	▪ Recruit local labour, and Procure local goods and services where appropriate.	▪ Constitution of the Republic of South Africa, 1996 ▪ NEMA	During operations
	Operational	Skills development	N/A	Adhere to the SLP	▪ Constitution of the Republic of South Africa, 1996 ▪ NEMA	During operations
	Operational	Local economic development	N/A	Adhere to the SLP	▪ Constitution of the Republic of South Africa, 1996 ▪ NEMA	During operations
	Operational	Agricultural activities	Unknown	Implement mitigations proposed by other specialists on the team to reduce environmental impacts	▪ Constitution of the Republic of South Africa, 1996 ▪ NEMA	During operations

Table 13-3: Objectives and Outcomes of the EMP

Activities	Potential impacts	Aspects affected	Phase	Mitigation/management Measures	Standard to be achieved/objective
Construction of RTSF, CPP and related infrastructure	Temporary increase in production in the country during construction	Economic	Construction	Procurement of goods and services from local small business where appropriate.	To maximise the stimulation of the local economy
	Temporary increase in the country's GDP-R during construction		Construction	▪ Recruit local labour where skills exist. ▪ Sub-contract to local construction companies where appropriate. Use local suppliers where viable and arrange with the local Small and Medium Enterprises to provide transport, catering, and other services for the construction crew.	Increase the benefits felt by the local economy
	Creation of employment opportunities during construction		Construction	▪ Employ labour-intensive measures in construction where feasible.	Increase the impact on the local economy

Activities	Potential impacts	Aspects affected	Phase	Mitigation/management Measures	Standard to be achieved/objective
				▪ Employ local residents where skills are appropriate. ▪ Sub-contract to local construction companies where appropriate. ▪ Utilise local suppliers. Set-up a skills desk at the local municipal office and in the nearby communities to identify a local labour pool.	
	Temporary increase in household income and standard of living during construction		Construction	▪ Recruit local labour as far as is feasible to increase the benefits to the local households. ▪ Employ labour-intensive methods in construction where feasible. ▪ Sub-contract to local construction companies where appropriate. Use local suppliers where viable and arrange with the local Small and Medium Enterprises to provide	Increase the impact on the local economy

Activities	Potential impacts	Aspects affected	Phase	Mitigation/management Measures	Standard to be achieved/objective
				transport, catering, and other services for the construction crew.	
	Skills development during construction		Construction	▪ Contractor should provide learnerships and on-job training. ▪ Where specialist training can be provided, candidates from local communities should be prioritised for training, and Share knowledge with the sub-contracting companies during the construction period.	Upskilling of local labour force
	Impact of land sterilisation		Construction	▪ Reasonable compensation must be negotiated with the affected farmers. ▪ Should resettlement of farm workers be required, a Resettlement Action Plan must be developed and implemented. Establishment of appropriate training and skills development at an early stage to allow farm	To ensure that the quality of life of the displaced households is the same as or better than prior to displacement

Activities	Potential impacts	Aspects affected	Phase	Mitigation/management Measures	Standard to be achieved/objective
				workers to benefit from the mine employment opportunities.	
	Impact on property values		Construction	Mitigation measures proposed by other specialists should be strictly adhered to minimise the probability and intensity of noise, visual, and dust pollution in the area.	To maintain positive impact on sense of place
Operational activities including reclamation of TSFs	Increase in production during operations	Economic	Operational	Procurement of locally produced goods and services as far as possible.	To maximise benefits to the local economy
	Increase in GDP-R during operations		Operational	▪ Investigate local procurement opportunities. Procure from local suppliers where possible.	To increase benefits felt by the local economy
	Creation of employment opportunities during operations		Operational	Employment of local labour where skills exist.	Increase benefit to the local community through prevention of leakage of buying power
	Increase in household income during operations		Operational	▪ Recruit local labour, and Procure local goods and services where appropriate.	To improve standard of living of the local economy households

Activities	Potential impacts	Aspects affected	Phase	Mitigation/management Measures	Standard to be achieved/objective
	Development of skills during operations		Operational	Adhere to the SLP	To improve employability of local labour
	Local economic development		Operational	Adhere to the SLP	To diversify the local economy
	Negative impact on local agricultural activities during operations		Operational	Implement mitigations proposed by other specialists on the team to reduce environmental impacts	To minimise the negative environmental impacts of mining activities

Table 13-4: Mitigation

Activities	Potential impacts	Aspects affected	Mitigation type	Time period for implementation	Compliance with standards
Construction of RTSF, CPP and related infrastructure	Temporary increase in production in the country during construction	Economic	▪ Procurement of goods and services from local small business where appropriate.	Prior to construction with ongoing management and monitoring throughout the project life	▪ Constitution of the Republic of South Africa, 1996 ▪ NEMA
	Temporary increase in the country's GDP-R during construction		▪ Recruit local labour where skills exist. ▪ Sub-contract to local construction companies where appropriate.	Prior to construction with ongoing management and monitoring throughout the project life	▪ Constitution of the Republic of South Africa, 1996 ▪ NEMA

Activities	Potential impacts	Aspects affected	Mitigation type	Time period for implementation	Compliance with standards
			▪ Use local suppliers where viable and arrange with the local Small and Medium Enterprises to provide transport, catering, and other services for the construction crew.		
	Creation of employment opportunities during construction		▪ Employ labour-intensive measures in construction where viable. ▪ Employ local residents where skills exist. ▪ Sub-contract to local construction companies where appropriate. ▪ Utilise local suppliers where possible. ▪ Set-up a skills desk at the local municipal office and in the nearby communities to identify a local labour pool.	Prior to and during construction	▪ Constitution of the Republic of South Africa, 1996 ▪ NEMA
	Temporary increase in household income and standard of living during construction		▪ Recruit local labour as far as is feasible to increase the benefits to the local households. ▪ Employ labour-intensive methods in construction where viable.	During construction with ongoing management and monitoring throughout the project life	▪ Constitution of the Republic of South Africa, 1996 ▪ NEMA

Activities	Potential impacts	Aspects affected	Mitigation type	Time period for implementation	Compliance with standards
			▪ Sub-contract to local construction companies where viable. ▪ Use local suppliers where viable and arrange with the local Small and Medium Enterprises to provide transport, catering, and other services for the construction crew.		
	Skills development during construction		▪ Contractor should provide learnerships and on-job training. ▪ Where specialist training can be provided, candidates from local communities should be prioritised for training, and ▪ Share knowledge with the sub-contracting companies during the construction period.	During construction with ongoing management and monitoring throughout the project life	▪ Constitution of the Republic of South Africa, 1996 ▪ NEMA
	Impact of land sterilisation		▪ Reasonable compensation must be negotiated with the affected farmers. ▪ Should resettlement of farm workers be required, a Resettlement Action Plan must be developed and implemented.	During construction with ongoing management and monitoring throughout the project life	▪ Constitution of the Republic of South Africa, 1996 ▪ NEMA

Activities	Potential impacts	Aspects affected	Mitigation type	Time period for implementation	Compliance with standards
			▪ Establishment of appropriate training and skills development at an early stage to allow farm workers to benefit from the mine employment opportunities.		
	Impact on property values		▪ Mitigation measures proposed by other specialists should be strictly adhered to minimise the probability and intensity of noise, visual, and dust pollution in the area.	During construction with ongoing management and monitoring throughout the project life	▪ NEMA ▪ NEM: AQA ▪ ECA
Operational activities including reclamation of TSFs	Increase in production during operations	Economic	▪ Procurement of locally produced goods and services where appropriate.	During operations	▪ Constitution of the Republic of South Africa, 1996 ▪ NEMA
	Increase in GDP-R during operations		▪ Investigate local procurement opportunities. ▪ Procure from local suppliers.	Prior to and during operations	▪ Constitution of the Republic of South Africa, 1996 ▪ NEMA
	Creation of employment opportunities during operations		▪ Employment of local labour where skills exist.	During operations	▪ Constitution of the Republic of South Africa, 1996 ▪ NEMA

Activities	Potential impacts	Aspects affected	Mitigation type	Time period for implementation	Compliance with standards
	Increase in household income during operations		▪ Recruit local labour, and ▪ Procure local goods and services where appropriate.	During operations	▪ Constitution of the Republic of South Africa, 1996 ▪ NEMA
	Development of skills during operations		▪ Adhere to the SLP	During operations	▪ Constitution of the Republic of South Africa, 1996 ▪ NEMA
	Local economic development		▪ Adhere to the SLP	During operations	▪ Constitution of the Republic of South Africa, 1996 ▪ NEMA
	Negative impact on local agricultural activities during operations		▪ Implement mitigations proposed by other specialists on the team to reduce environmental impacts	During operations	▪ Constitution of the Republic of South Africa, 1996 ▪ NEMA

Table 13-5: Prescribed environmental management standards, practice, guideline, policy or law

Specialist field	Applicable standard, practice, guideline, policy or law
Social and Economics	▪ Environmental Management Policy ▪ EIA Regulations ▪ Integrated Environmental Management Information Series 22: Socio-Economic Impact Assessment

	▪ National Environmental Management Act (Act No 107 of 1998)

13.3 Monitoring Plan

The following indicators and activities are proposed to be considered for monitoring of the effects the proposed project will have on the local economy:

- Document the number of person-months created during construction and determine the percentage thereof that benefited the local communities.
- Document the value of procurement spent and determine the spatial distribution of the expenditure to identify the areas that benefited the most from capital expenditure with a specific focus on the benefits that are created in the local economy.
- Document skills development initiatives during construction and quantify the number of people who benefitted from these.
- Document the number of permanent employment opportunities created at the mine during operations.
- Document the goods and services procured by the mine during operations from the local economy and quantify the number of jobs that is being supported through these activities.
- Engage with the local property owners during both construction and operation of the mine and investigate the effects the mine had on the number of tourists visiting the game farms in the zone of influence.

14 Consultation Undertaken

As mentioned earlier, landowners located in the zone of influence were consulted during the study. In addition, the team also engaged with the local authority to determine the recent developmental trends in the area.

15 Comments and Responses

No additional comments were received from stakeholders, however, concerns raised by interviewed property owners have been taken into account and are included in the report.

16 Conclusion and Recommendation

The West Rand Tailings Retreatment Project (WRTRP) will begin operations in the western basin of the Witwatersrand mining region, which according to the IMC on AMD, is one of the high risk areas in the Witwatersrand mining region. In addition to providing assistance with a solution to this problem, the proposed project could create sustainable employment opportunities and make available land that can be used for the development of small-scale or subsistence farming initiatives as suggested by the Merafong City and Westonaria LMs' Spatial Development Frameworks. These opportunities though, would need to be explored further, importantly they would have to reflect the needs of the communities and take into account the outcomes of the other specialist studies.

The West Rand DM Regional Growth and Development Strategy has commented on the fact that the DM is under strain as a result of the slowdown of growth in the mining sector in this region. This point is confirmed by the data analysis of economic growth in the DM and specifically the Westonaria LM, revealing a significant decrease in economic production (GDP) resulting from the closure of mines, and decreased mining production output. The Regional Growth and Development Strategy, as well as the applicable LM economic development strategies, confirm that investment in the mining sector is required to revitalise the local economy. At the same time, the policies elaborate on the region's long-term strategy by stating that the economies of the Westonaria and Merafong City LM, and moreover, that of the district, require diversification of economic activity to increase long term sustainability.

A review of secondary economic data related to the district and local municipalities reveals that the Westonaria and Merafong City LMs' populations are low skilled when compared to the rest of the study areas. This indicates that there should be sufficient semi-skilled or unskilled labourers available for the operations. The presence of mining activities in both local municipalities also suggest that sourcing skilled and highly skilled individuals from the local communities would be challenging, this is particularly the case since the industry has seen a staggering job shedding trend in the Westonaria Lm in the past decade.

Considering the high reliance of the local economies on the mining sector and the fact that a reasonable portion of the labour could reasonably be procured from the local population, there is little doubt that the initial construction phase expenditure as well as ongoing operational expenditure, will generate a significant positive impact on the region's economy. Although the project may negatively impact some of the existing agricultural activities observed in the area, the losses associated with this are expected to be marginal compared to the economic benefits that are to be derived from the project.

Construction of the WRTRP will take two years and will cost R9.1 billion (2015 prices). It has been determined that during this period, the mine will stimulate new business sales in the country to the value of R12 561.3 million (2015 prices), and from the Driefontein and Cooke TSFs, generating R9 890 million of combined GDP-R and creating 54 049 FTE person-years. During the operational phase, which is estimated to last 17 years, the WRTRP will contribute to the creation of 53 866 FTE jobs in the country and generate R36 769 million of GDP-R (2015 prices) over its operational period. Considering that the mining sector in the local economy has been declining in the past few years, the proposed establishment of the mine is expected to reverse this trend and offset the decline in the local economic base, importantly, it will re-establish sustainable employment opportunities that have been lost in the economy in the past.

Among the negative impacts that are expected to ensue as a result of the project, are land sterilisation, potential decline in property values and a possible loss of income derived by some of the properties from crop and livestock farming. The value of these impacts is difficult to quantify, however, it is believed that proper mitigation measure may significantly reduce their probability and magnitude. Furthermore, if losses do occur, the potential negative economic effects will be a fraction of the positive impacts that will be created by the mine.

The table below summarises the results of the impact assessment.

Table 16-1: Summary of economic impact evaluation

Impact	Direct impact	Total impact	Nature of impact prior mitigation	Nature of impact after mitigation
Construction period (2016-2017)				
Production (R million)	R9 141.3 ml	R26 480.5 ml	Moderate (positive)	Moderate (positive)
GDP-R (R million)	R3 359.5 ml	R9 890.1 ml	Moderate (positive)	Moderate (positive)
Employment (FTE jobs)	13 607	54 050	Moderate (positive)	Moderate (positive)
Household income (R million)	R1 339.5 ml	R4 251.9 ml	Moderate (positive)	Moderate (positive)
Skills development	N/A	N/A	Minor (positive)	Moderate (positive)
Government revenue	Unknown	Unknown	Moderate (positive)	Moderate (positive)
Land sterilisation	N/A	N/A	Moderate (negative)	Moderate (negative)
Property values	N/A	N/A	Minor (negative)	Minor (negative)
Operations (2018-2034)				
Production (R million)	R40 153 ml	R72 087 ml	Moderate (positive)	Moderate (positive)
GDP-R (R million)	R24 224 ml	R36 769 ml	Moderate (positive)	Moderate (positive)
Employment (FTE jobs)	7 683	53 820	Moderate (positive)	Moderate (positive)
Household income (R million)	R1 814 ml	R7 330 ml	Moderate (positive)	Moderate (positive)
Skills development	N/A	N/A	Moderate (positive)	Moderate (positive)
Government revenue	N/A	R5 038 ml	Moderate (positive)	Moderate (positive)
Local economic development	N/A	N/A	Moderate (positive)	Moderate (positive)
Farming activities on adjacent farms	N/A	N/A	Negligible (negative)	Negligible (negative)

To conclude, from the economic perspective, the proposed project is beneficial. The proposed WRTRP will have a positive effect in terms of stimulation of domestic production, job creation, and government revenue. The project also falls within the government's objective to utilise mineral resources in a sustainable manner. Therefore, from an economic perspective, the

project should be approved for development, under the condition that the proposed mitigations are implemented.

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Appendix A: Consultant CVs

Elena Broughton

Date of Birth:	11 September 1980
Designation:	Unit Manager Sustainable Development
Profession:	Senior Development Economist
Specialisation:	Sustainable Development
Years within Firm:	10 Years
Nationality:	RSA
Years of Experience:	10 Years
HDI Status:	White Female

Education:			
2008-2011 – University of Pretoria		MSc in Technology Management	
2006 – 2007 – University of Pretoria		BSc (Hon) in Technology Management	
2004, Parkland College, USA		Computer Integrated Accounting	
2004, Parkland College, USA		Independent Business	
2003, Parkland College, USA		Intermediate Accounting	
2003, Parkland College, USA		Records Management	
2003, Parklands College, USA		Financial Accounting	
2003, Parklands College, USA		Managerial Accounting	
2002, Nizhny Novogorod University, Russia		BCom (Hon) in Economics	
Language Proficiency:	**Reading**	**Writing**	**Speaking**
English	Excellent	Excellent	Excellent
Russian	Excellent	Excellent	Excellent

Key Qualification

Elena Broughton completed her BCom (Hon) in Economics in Russia, at Nizhny Novgorod State University in 2002 specialising in regional economics. At the same time, she completed an additional degree as Translator/Interpreter in Professional Orientated Communication. After completion of her Honours degree in Economics, Elena has moved to the USA and stayed there for 1.5 years. During her stay in the USA, she completed a number of Accounting and Business courses at Parkland College, Illinois. In 2007, she obtained her BSc (Hon) in Technology Management (Cum Laude) at the University of Pretoria and later received her MSC in Technology Management (2011) from the same university.

Elena Broughton is a senior professional at Urban-Econ and has an extensive knowledge in various fields of economic development, including impact assessments, investment strategy formulation, strategic decision analysis, and monitoring and evaluation. She is experienced in developing input-output and SAM-based models, as well as development and application of other econometric techniques. Elena has a special interest in project evaluation and decision-making framework, with the latter being the focus of her Master's dissertation. Over the past few years, she was able to extend her experience in these fields working on projects for both government and the private sector.

Experience Record	
Economic and Socio-Economic Impact Assessment studies	✓ Thabametsi Coal Mine Sustainable Development Investigation and Economic Impact Assessment, Limpopo ✓ Mafube Nooitgedacht and Wildfontein EIA/EMP Sustainable Development Investigation Study, Mpumalanga ✓ Mooifontein Coal Mine Comparative Analysis, Mpumalanga ✓ Inyoni Colliery Mine, Mpumalanga ✓ Zandkopsdrift Rare Earth Elements (REE) Project Economic Impact Assessment ✓ Saldanha Bay Separation Plant Economic Impact Assessment ✓ Eskom CSP Macro-Economic Impact Assessment ✓ Proposed Exxaro IPP Coal-Powered Power Station near Lephalale ✓ Eskom Sere Wind (WEF1) Macro-Economic Impact Assessment ✓ Farm 198 PV Solar Energy Facility north of Kimberley in the Northern Cape (210 MW PV solar facility) ✓ Wag'nbiekiespan PV Solar Energy Facility near Boshof, the Free State Province (75 MW PV solar facility) ✓ Eskom Ariadne-Eros Power Lines Economic and Agricultural Impact Assessment ✓ Eskom Ingula Pumped Storage Scheme Regional Economic Impact Assessment ✓ N3 Highway Economic Impact Assessment ✓ The Mandela Bay Precinct Economic Impact Assessment ✓ Arriesfontein Solar Energy Park near Danielskuil in the Northern Cape (100 MW CSP-Tower facility and 225 MW PV solar facility) ✓ Humansrus Solar Energy Facility near Postmasburg in the Northern Cape (100 MW CSP-Tower facility) ✓ Rooipunt Solar Energy Park near Upington in the Northern Cape (100 MW CSP-Tower facility and 215 MW PV solar facility) ✓ Farm 198 PV Solar Energy Facility north of Kimberley in the Northern Cape (210 MW PV solar facility) ✓ Wag'nbiekiespan PV Solar Energy Facility near Boshof, the Free State Province (75 MW PV solar facility)

Experience Record	
Project:	The localisation potential of Photo Voltaics (PV) and a Strategy to support large scale roll-out in South Africa
Year:	June 2012 – March 2013
Location:	National
Client:	WWF SA
Project Features:	South African Photovoltaic Industry Association (SAPVIA) The Department of Trade and Industry, RSA ✓ Describing of the global PV industry and its trends ✓ Profiling of the local PV industry ✓ Analysing of the local PV value chain considering three markets segments, i.e. rooftop, commercial, and utilities ✓ Analysing of financial dynamics of the market and standardisation requirements ✓ Determining the potential for localisation in the country ✓ Developing a strategy for the future roll-out
Position held:	Elena Broughton - policy environment review, market segments analysis, demand analysis, value chain analysis, pricing of components, local content analysis, potential for localisation assessment, strategy formulation
Activities Performed:	The goal of the study was to describe the global and local PV industry trends and dynamics, and to develop localisation scenarios for the purposes of providing recommendations with respect to the future roll out of the industry.
Project:	Feasibility study into establishing CSP component manufacturing facilities in South Africa
Year:	November 2012 – February 2013
Location:	National
Client:	The Industrial Development Corporation, RSA
Project Features:	✓ The Identification of various CSP technologies and systems that are promoted internationally and the various designs and configuration of each technology. ✓ An overview of the international and local CSP market, the major materials and components of CSP with a view of establishing a local manufacturing base of CSP systems and components ✓ The identification of key technical and technology partner in the development of the manufacturing facility ✓ Engagement with the potential technical partner to determine whether the IDC can capacitate the supplier to manufacture components and systems locally ✓ Identification of a suitable location for the new facility or expansion of existing local CSP component manufacturing facilities in South Africa ✓ The amount of potential jobs that will be created from expansion or creation of a new facility, preliminary financial model and CAPEX budget.
Position held:	Elena Broughton – global CSP industry analysis, value chain analysis, local industrial capabilities assessment, demand analysis, job creation potential analysis
Activities Performed:	The Industrial Development Corporation (the IDC) has commissioned Urban-Econ Development Economists supported by EScience Associates to undertake a feasibility study to determine the viability of the establishment of a manufacturing facility of CSP modules and components in South Africa.

Experience Record	
Project:	Northern Cape Renewable Energy Strategy
Year:	November 2012 – June 2013
Location:	National
Client:	The Northern Cape Department of Economic Development and Tourism, RSA
Project Features:	✓ Description of the status and potential of the local renewable energy sector ✓ Investigation of the potential to establish clean and green sustainable development projects in the Province in line with the optimal mix identified. ✓ Identification of income generation opportunities for the purpose of revitalising rural communities ✓ Assessment of the institutional capacity and capability ✓ Strategy and implementation plan formulation
Position held:	Elena Broughton – policy environment analysis, renewable energy industry profiling, desired state of industry analysis, market segmentation and demand analysis, stakeholder analysis and institutional structures review, strategy formulation
Activities Performed:	The consortium comprising of Urban-Econ Development Economists, Escience, and the CRSES was appointed to formulate the Renewable Energy Strategy for the Northern Cape Province. The study involved undertaking a situational assessment of the Northern Cape economy to identify the opportunities and constraints with respect to renewable energy development, to formulate a plan to unlock the existing potential of the Province to harness renewable energy to the benefit of its communities and economy, to position the Province to attract a maximum share of investment under the IRP2010 Renewable Energy Target and beyond.
Project:	Wag'nbiekiespan Socio-Economic Impact Assessment
Year:	December 2011 – February 2012
Location:	National
Client:	Savannah Environmental
Project Features:	✓ Compilation of the socio-economic profile for the area ✓ Site visit and interview of the affected parties ✓ Compilation of the profile of the directly and indirectly affected communities/farms ✓ Economic modelling ✓ Assessment of potential negative and positive impacts during construction and operation ✓ Evaluation of impacts according to the pre-defined criteria ✓ Formulation of the mitigation plan
Position held:	Elena Broughton – socio-economic profiling of the area, land use analysis and affected parties socio-economic profiling, impact modeling, opportunity analysis, impact assessment and evaluation, mitigation plan formulation.
Activities Performed:	Urban-Econ was appointed to undertake socio-economic impact assessment studies of the proposed 75 MW PV facility in the Free State Province.

Experience Record	
Project:	Arriesfontein PV solar facility socio-economic impact assessment
Year:	January 2012 – May 2012
Location:	Northern Cape
Client:	Worley Parsons
Project Features:	✓ Compilation of the socio-economic profile for the area ✓ Site visit and interview of the affected parties ✓ Compilation of the profile of the directly and indirectly affected communities/farms ✓ Economic modelling ✓ Assessment of potential negative and positive impacts during construction and operation ✓ Evaluation of impacts according to the pre-defined criteria ✓ Formulation of the mitigation plan
Position held:	Elena Broughton – socio-economic profiling of the area, land use analysis and affected parties socio-economic profiling, impact modelling, opportunity analysis, impact assessment and evaluation, mitigation plan formulation
Activities Performed:	Urban-Econ was appointed to undertake socio-economic impact assessment studies of the proposed 75 MW PV facility in the Northern Cape Province.

References:

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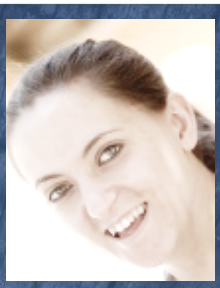
Mariette Steynberg

Date of Birth:	2 January 1987
Profession:	Development Economist
Specialisation:	Impact and Modelling
Years within Firm:	1 Years
Nationality:	RSA
Years of Experience:	4 Years
HDI Status:	White Female



Education:	
2013, University of Free State	Post Graduate Diploma in Financial Planning
2009, University of Johannesburg	BCom (Hon) International Trade and Development Economics
2006 – 2008, University of Johannesburg	BCom Economics and Econometrics

Professional Membership:
Development of Society of Southern Africa
South African Planning Institute

Language Proficiency	Reading	Writing	Speaking
English	Excellent	Excellent	Excellent
Afrikaans	Excellent	Excellent	Excellent

Other Projects:

- Department of Science and Technology – technical evaluation of proposals: Urban-Econ Development Economists was appointed by the DST to undertake a technical assessment of proposal submitted for their General Budget Support Program (GBS). The ten proposals were analysed and advice was provided on whether or not the proposed projects were suitable for funding.
- Eskom, St Faiths Agricultural Economic Impact Study: Urban-Econ Development Economists was appointed by ACER (Africa) Environmental Consultants on behalf of Eskom Holdings (SOC) Limited to undertake an Agricultural Economic Impact Assessment for the proposes St. Faiths 400 kV substation and associated 400 kV and 132 kV distribution lines, assisting in making the decision with respect to the most preferred corridor alternative and site options taking into account potential positive and negative impacts on the agricultural potential of the affected areas.
- Letsatsi Power Project: Community Needs Analysis: Urban-Econ Development Economists was appointed to assist with defining an Economic Development plan that speaks to the scope of the managing company's compliance commitments. It involved the development of comprehensive community profiles and provision of recommendations to address identified gaps.
- Dwarsrug Socio Economic Impacts Assessment: Scoping phase input: Urban-Econ Development Economists was appointed to perform a SEIA for the Dwarsrug Wind Farm near Loeriesfontein in the Northern Cape province of South Africa.
- Gamagara River Flow Restoration Project: Economic Baseline Report: Urban-Econ development Economists was appointed to provide an economic baseline report for the Gamagara River Flow

Restoration Project near Sishen mine. The baseline study was undertaken to guide the assessment during the next phase.

- Kotulo Tsatsi Energy Solar Park: Economic Impact Assessment: Urban-Econ Development Economists was appointed to undertake an economic impact assessment study for the proposed construction of the Kotulo Tsatsi Concentrated Solar Power (CSP) Energy Park in the Northern Cape Province.
- Weltevreden Open Cast Coal Mine: Economic Impact Assessment: Urban-Econ Development Economists was appointed to perform an economic impact assessment on the construction and operation of the proposed Weltevreden Coal Mine in Mpumalanga.
- Bayside Aluminium Smelter Decommissioning: Economic Impact Assessment: Urban-Econ Development Economists was appointed to undertake an economic impact assessment of the closure and decommissioning of the Bayside Aluminium Smelter located in Richards Bay in KwaZulu-Natal.

Countries of Work Experience:

- South Africa

References:

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Memory Madondo

Date of Birth:	17 August 1986
Profession:	Development Economist
Specialisation:	Sustainable Development
Years within Firm:	3 Years
Nationality:	RSA
Years of Experience:	3 Years
HDI Status:	Black Female

Education:	
2011 – 2013, University of South Africa	BSc: Mathematical Statistics
2009, University of Pretoria	BSc: Mathematical Statistics *(not completed)*
2006-2008, University of Pretoria	BCom: Statistics

Professional Membership:
Development of Society of Southern Africa
South African Planning Institute

Language Proficiency:	Reading	Writing	Speaking
English	Excellent	Excellent	Excellent
Zulu	Average	Average	Poor
Shona	Poor	Poor	Average

Key Qualification

Memory Madondo completed a BSc degree in Mathematical Statistics from the University of South Africa in 2013, her majors being Mathematics and Statistics. She also holds a BCom in Statistics from the University of Pretoria. She is fully computer literate including computerised statistics (which is referred to as SAS – Statistical Analysis System), Structured Query Language (SQL) and MS Access Database Management. Her interests lie in statistical analysis and any numerical challenges.

Memory joined Urban-Econ in 2011 as a Technical Assistant working on the company's electronic database system and gradually started assisting with some projects. She has gained experience in several economic arenas such as collation and analytic processing of economic data, trend analysis, forecasting and economic development amongst others. She has also carried out a number of socio-economic impact assessments of varying magnitude and has in turn gained good skill in report writing and presentation. She continues to gain further knowledge as well as expertise in the economic field.

Experience Record	
Project:	Waterval East Filling Station Study
Year:	2012
Location:	Rustenburg
Client:	Private
Project Features:	✓ Provide an understanding of local market area ✓ Analysis of the local market's potential to absorb the proposed development
Position held:	Researcher
Activities Performed:	Economic Impact Assessment
Project:	NC Renewable Energy
Year:	2012
Location:	Northern Cape

Experience Record	
Client:	Northern Cape Department of Economic Development and Tourism
Project Features:	✓ Description of the status and potential of the local renewable energy sector ✓ Investigation of the potential to establish clean and green sustainable development projects in the Province in line with the optimal mix identified.
Position held:	Researcher
Activities Performed:	Strategy and implementation plan formulation

Other Projects:

- Zonnebloem Comparative Analysis: Urban-Econ Development Economists was appointed by Golder Associates to undertake an economic impact assessment study for the proposed Zonnebloem Coal Mine situated near Middelburg in the Mpumalanga Province. The included providing a baseline profile of the study area - analysis of parameters such as population size, household numbers, income levels, structure and growth of the economy, labour force and employment situation.
- Nelson Mandela Scoping: Urban-Econ Development Economists was appointed to undertake a specialist market analysis as part of planning for provision of infrastructure to the Nelson Mandela Bay Metropolitan Municipality. The primary objective of this study was to identify the growth rates and anticipated number of households per demand zone within the Nelson Mandela Bay Metropolitan Municipality to gain insight on the Metro's infrastructural needs.
- Land Claims Re-opening: Urban-Econ Development Economists was appointed to undertake a Socio-Economic Impact Assessment study as part of the Regulatory Impact Assessment on the feasibility of the reopening of lodgement of claims and provisions to the 19 June cut-off date to accommodate the descendants of the Khoi and San and claims on heritage sites and historical landmarks.
- Suncorp Solar PV EIA: The study presented the socio-economic development (SED) and enterprise development (ED) plans for the proposed Hertzogville Solar Photovoltaic (PV) energy facility. These plans form part of the requirements of the bidding processes for new power generation facilities under the Renewable Energy Independent Power Producer Procurement (IPPP) Programme.
- RBN Mining Procurement Assessment: The objective of the study was to determine the first set of business opportunities that can be established in the Royal Bafokeng area considering the current procurement practices of the selected mines.
- Saldanha REE Separation Plant EIA: Urban-Econ Development Economists was appointed by AGES (Pty) Ltd to undertake an economic impact assessment study for the proposed construction and operation of a Rare Earth Elements (REE) separation plant in Saldanha Bay. This study presented the analysis of economic impacts that are expected to ensure from the proposed project during various stages of the project's life cycle and considering both positive and negative effects.
- Exarro Power Station SEIA: Urban-Econ Development Economists was requested by Savannah Environmental (Pty) Ltd. (Savannah Environmental) to undertake a Socio-Economic Impact Study for the proposed Exxaro coal-powered power station near the town of Lephalale, the Limpopo province. This study presented the analysis of socio-economic impacts that are expected to ensure from the proposed project during various stages of the project's life cycle and considering both positive and negative effects.

Countries of Work Experience:

- South Africa

References:

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