ANNEXURE N

Vaal Aerotropolis Design (Pty) Ltd

STORMWATER MANAGEMENT PLAN

Vaal Aerotropolis Project

REVISION 3
SEPTEMBER 2026

CONFIDENTIAL

Vaal Aerotropolis Design (Pty) Ltd

STORMWATER MANAGEMENT PLAN

Vaal Aerotropolis Project

Document Prepared During Land Preparation Stage (Rev 2) CONFIDENTIAL

Project No. 43103108

REVISION 3

Date: SEPTEMBER 2026

WSP

Building 1, Maxwell Office Park
Magwa Crescent West, Waterfall City
Midrand, 1685
South Africa

Phone: +27 11 254 4800

WSP.com

QUALITY CONTROL

Issue/revision	First issue	Revision 1	Revision 2	Revision 3
Remarks		Interchange update and attenuation pond details added	Update for Specialist Study Submission in support of EIA	Interchange update
Date		2025/10/13	2026/06/26	2026/09/09
Prepared by	Peni Metho and Adam Mahomed		Kosikee Emma-Iwuoha, Pr. Eng Pr No.: 202101752	Kosikee Emma-Iwuoha, Pr. Eng Pr No.: 202101752
Signature				Digitally signed by Kosikee.Emma-Iwuoha@wsp.com Date: 2026.09.10 09:28:19 +02'00'
Checked by	Jason Naidoo	Jason Naidoo	Ruan Gilau, Pr Tech Pr No.: 200970209	Ruan Gilau, Pr Tech Pr No.: 200970209
Signature				Gilau, Ruan (ZAAG0550S) cn=Gilau, Ruan (ZAAG0550S), ou=WSPObjects, emailAddress=Ruan.Gilau@wsp.com DC=net, DC=pbwan, DC=corp, DC=WSPObjects, OU=ZA, OU=Users, OU=Accts, CN=Gilau, Ruan (ZAAG0550S), E=Ruan.Gilau@wsp.com WSP Africa (Pty) Ltd 2026.09.09 15:28:08 +02'00'
Authorised by	Kosikee Emma-Iwuoha	Kosikee Emma-Iwuoha	John Rammutla, Pr. Eng Pr No.: 202101922	John Rammutla, Pr. Eng Pr No.: 202101922
Signature				
Project number	43103108	43103108	43103108	43103108
Report number	01	01	01	01
File reference				

CONTENTS

EXECUTIVE SUMMARY

1 INTRODUCTION 11

1.1 BACKGROUND INFORMATION 11

1.2 DEVELOPMENT LOCALITY 12

1.3 OBJECTIVE OF THE REPORT 13

1.4 LIMITATIONS AND LEVEL OF CONFIDENCE 13

1.4.1 LIMITATIONS 13

1.4.2 DATA AND MODEL RESOLUTION 14

2 PRE-DEVELOPMENT CATCHMENT 15

2.1 TOPOGRAPHY 15

2.2 CLIMATE 15

2.3 LAND USE 16

2.4 NATURAL WATERCOURSES 16

2.5 RECEIVING ENVIRONMENTS OVERVIEW 16

Klein-Rietspruit 17

Leeuspruit 17

Rietspruit 17

2.6 VAAL RIVER CATCHMENT 18

3 POST-DEVELOPMENT CATCHMENT DELINEATION AND DISCHARGE POINTS 21

3.1 DEVELOPMENT PHASING AND SUBCATCHMENTS 22

3.1.1 PHASE 1 22

3.1.2 PHASE 2 23

3.1.3 PHASE 3 23

4 FLOOD LINES DELINEATION 24

4.1 FLOOD ANALYSIS 24

4.1.1 DESIGN RAINFALL 24

4.1.2 DESIGN FLOODS 24

4.2 1:100-YEAR FLOOD LINES 25

4.3 FLOODLINE DEVELOPMENT 25

4.4 FLOOD RISK MITIGATION 26

4.5 PROPOSED ADDITIONAL REFINEMENT 26

4.5.1 OUTFLOW RECORDS FOR EXISTING DAMS 26

5 DEVELOPMENT RAINFALL ANALYSIS 27

5.1 DATA SOURCING AND PREPARATION 27

5.2 STATISTICAL ANALYSIS 31

5.3 HYDRAULIC MODEL INPUT 33

6 DESIGN CRITERIA AND STANDARDS 35

6.1 LEGAL AND POLICY FRAMEWORK 35

6.1.1 APPLICABLE LEGISLATION 35

6.1.2 ENGINEERING STANDARDS AND GUIDLEINES 35

6.2 DESIGN CRITERIA 36

6.3 ATTENUATION REQUIREMENTS 37

7 DESIGN PHILOSOPHY 38

7.1 AIRSIDE DRAINAGE 38

7.2 LANDSIDE DRAINAGE 39

7.3 GENERAL DESING PRINCIPLES 39

7.3.1 LOW-IMPACT DESIGN 39

7.3.2 MAJOR AND MINOR DRAINAGE SYSTEM 39

7.3.3 FIRST FLUSH SYSTEM AND CLEAN/DIRTY WATER SEPARATION 39

7.3.4 ATTENUATION TO PRE-DEVELOPMENT DISCHARGE RATES 40

7.4 SITE SPECIFIC DESIGN PRINCIPLES 40
7.4.1 RUNWAY DRAINAGE AND FLOW ROUTING 40
7.4.2 AVOIDANCE OF STANDING OPEN WATER 40
7.5 ATTENUATION STRATEGY 40
8 PROPOSED STORMWATER MANAGEMENT NETWORK 42
8.1 AEROTROPOLIS 42
8.1.1 MINOR SYSTEM 42
8.1.2 MAJOR SYSTEM 42
8.1.3 EMERGENCY ESCAPE ROUTES 43
8.2 AEROTRPOLIS ATTENUATION POND 43
8.2.1 LEGISLATIVE CONTEXT 43
8.2.2 BASIS OF DESIGN 43
8.2.3 POND DESIGN CONCEPT 44
8.2.4 SAFETY AND STABILITY 47
Safety 47
Stability 47
8.2.5 ENVIRONMENTAL INTERFACES 47
Existing Aquatic Ecosystems 47
Wetland Registration 47
8.3 STORMWATER MANAGEMENT AT INTERCHANGES 47
8.3.1 N1/R54/D2459 SPLIT DIAMOND INTERCHANGE 47
Existing Route 47
Proposed Solution 48
Stormwater Drainage Concept 48
8.4 WATER QUALITY MANAGEMENT 50
8.4.1 POLLUTANT MANAGEMENT 50
8.4.2 EROSION AND SEDIMENT TRANSPORT CONTROLS 50
9 CONSTRUCTION PHASE IMPACT MANAGEMENT 51
9.1 AEROTROPOLIS 51

9.1.1 GENERAL GUIDELINES 51

9.2 INTERCHANGES 51

9.3 STORMWATER CONTROLS AT THE COMMENCEMENT AND CLOSURE OF EACH DEVELOPMENT PHASE 52

10 OPERATIONS, MAINTENANCE AND POST-CONSTRUCTION MONITORING 53

10.1 PURPOSE AND INTENT 53

10.2 ROLES, RESPONSIBILITIES AND EMPR LINKAGES 53

10.3 OPERATIONAL PERFORMANCE REQUIREMENTS 54

10.3.1 FUNCTIONAL READINESS AT EACH PHASE “CHECKPOINT” 54

10.3.2 DRAWDOWN AND CAPACITY RESTORATION 54

10.3.3 NO UNCONTROLLED DISCHARGE 54

10.4 MAINTENANCE FREQUENCY TABLES 54

10.5 RISK-BASED TRIGGER FRAMEWORK 56

10.6 MONITORING 58

10.6.1 POST-STORM INSPECTIONS (SYSTEM PERFORMANCE) 58

10.6.2 WATER QUALITY SCREENING (EVENT-BASED) 58

10.6.3 ANNUAL O&M REPORTING 58

10.6.4 HANDOVER REQUIREMENTS 58

11 CONCLUSIONS AND RECOMMENDATIONS 59

11.1 SUMMARY OF THE STORMWATER NETWORK AND MANAGEMENT DESIGN 59

11.2 RECOMMENDATIONS 59

11.3 FUTURE WORK 59

11.3.1 DETAILED DESIGN 59

TABLES

Table 1-1 – Data and model resolution 14

Table 3-1 - Design rainfall station description and rainfall depths 24

Table 3-2 - Calculate flow peaks in m^3/s 24
Table 5-1 - Station details for current rainfall records 27
Table 5-2 - Station details for historical rainfall records 27
Table 5-3 - Statistical Analysis of Distribution Functions 31
Table 5-4 - Probability Design Rainfall from Vereeniging Rainfall Records 31
Table 6-1 – Minimum Design Criteria 36
Table 7-1 – Airside Drainage Requirements 38
Table 8-1 – Basis of design summary 43
Table 10-1 – Roles and Responsibilities 53
Table 10-2 - Underground pipe network, inlets and structures 55
Table 10-3 - Open channels, swales, overland routing and erosion controls 55
Table 10-4 - Pre-treatment, first-flush and clean/dirty separation components 56
Table 10-5 - Risk triggers and mandatory corrective actions 56

FIGURES

Figure 1-1 – Vaal Aerotropolis Development Extent And Locality Plan 12
Figure 2-1 - Site Topography (slope) 15
Figure 2-2 – Rietspruit Catchment Land Use And Wetland Maps 16
Figure 2-3 - Receiving Environments Schematic 18
Figure 2-4 – Vaal River catchment and longest watercourse 19
Figure 2-5 - Vaal River Catchment upstream of the Vaal Aerotropolis Development Site with full river network (left) and longest watercourse (right) 20
Figure 4-1 – Catchment Delineation 21
Figure 3-1 - Initial and refined 1:100 year flood lines for the essential rivers in the development's hydrological catchment 25
Figure 5-1 - Cumulative rainfall from observed rainfall and remotely sensed rainfall products 29
Figure 5-2 - Cumulative Long-term, monthly seasonal distribution of rainfall and correction factors between observed rainfall and TAMSAT point rainfall 29
Figure 5-3 - Cumulative Original and patched time series and cumulative rainfall from 2008 to 2024 30

Figure 5-4 - Full cumulative rainfall record for Vereeniging 30
Figure 5-5 - Distribution Frequencies 31
Figure 5-6 - Probability-Depth-Duration graph 33
Figure 5-7 - Intensity-duration-frequency curve 34
Figure 8-1 - Typical attenuation pond layout 46
Figure 8-2 – N1/R54/D2459 Split Diamond Interchange 48
Figure 8-3 – N1/R54/D2459 Split Diamond Interchange (Cont.) 49
Figure 8-4 – D2459/R54 Interchange 49
Figure 9-1 – King Shaka International Airport during construction (NCC Group, 2025) 51

APPENDICES

APPENDIX A
RUNOFF CALCULATIONS
APPENDIX A.1
INPUT DATA
APPENDIX A.2
CALCULATION SHEETS
APPENDIX A.3
MODEL OUTPUTS AND RESULTS
APPENDIX B
DRAINAGE NETWORK LAYOUT AND TYPICAL DETAILS
APPENDIX B.1
LAYOUT DRAWINGS
APPENDIX B.2
DETAIL DRAWINGS
APPENDIX C
FLOODLINE DRAWING

EXECUTIVE SUMMARY

WSP Group Africa (Pty) Ltd was appointed by Vaal Aerotropolis Design (Pty) Ltd to serve as the professional service provider for the civil infrastructure design of the Vaal Aerotropolis project. The municipal authority is Emfuleni Local Municipality. This project is West of the N1 highway in close proximity to Vlakplaas, South of Johannesburg.

The proposed work will include an aerotropolis which comprises of the Agricultural Hub, Logistical Hub and an International Airport.

This Stormwater Management Plan (SWMP) has been prepared as a specialist supporting study for the Environmental Impact Assessment (EIA) process. The report provides a technical assessment of stormwater management and flood risk associated with the proposed development to inform the Environmental Authorisation decision-making process.

The primary objective of this report is to determine the potential flood risk from the new development and outline the stormwater management plan for the site. Direction and essential elements for the final stormwater management are proposed and will assist with determining future work parameters, infrastructure requirements and the management of stormwater from planning all the way through to operational phase with the scope addressing water quantity and quality regulations.

SWMP Numbers At a Glance:

- Design Rainfall Event for Minor system: 1:50-year recurrence storm event with +30% Climate Change allowance
- Major System to carry runoff for storms greater than 1:50-year recurrence storm event
- Drainage Network Concept:
  - Minimum Pipe Size, class, type for collector pipes: 100D 900 mm Ø concrete pipes
  - Minimum Pipe Size, class, type for bulk drainage pipes: 100D, 1 350 mm Ø concrete pipes
- Attenuation Pond Concept:
  - Storage Volume: 950Ml (950,000 m^3)
  - Max Depth: 4 m
  - Freeboard: 800 mm minimum
  - Maximum footprint: 29 ha
  - Attenuation Strategy: Dry detention, 24 – 48 hr drawdown time
  - Emergency Overflow Control: Spillway
  - Spillway design rainfall event: 1:100-year recurrence storm event

1 INTRODUCTION

1.1 BACKGROUND INFORMATION

In response to the rapid growth and the need for nearby amenities in recent years, the Vaal Aerozone envisions an aerotropolis (hereafter referred to as the Vaal Aerotropolis) that will include an international airport, logistical hub, solar farm and agricultural hub. This development will meet the current and projected socio-economic development requirements and alleviate pressure on O.R Tambo and Lanseria International Airports.

The conceptual design for the Vaal Aerotropolis considers the full development staged in three phases. The first phase will focus on the airport; the second phase will focus on trade zones and the third phase focus on agricultural activities and adding another runway to increase the airport capacity. Airport capacity will increase from 7.2 mppa in Phase 1 to 25 mppa in Phase 2 and 45 mppa at the end of Phase 3. The project timeline is 60 years and has the following statutory context and government support:

- Declaration as a Mega Project by the Gauteng Government, Emfuleni Local Municipality and the Sedibeng District Municipality
- Declaration of the site as a special economic zone (SEZ) by the DTIC and Provincial Government
- Development inclusion in the Spatial Development Framework for Emfuleni and Sedibeng municipalities
- Resolutions supporting the development from the Emfuleni and Sedibeng municipality's Mayoral Committees

Vaal Aerotropolis Design (Pty) Ltd appointed WSP Group Africa (Pty) Ltd to provide professional services for the Vaal Aerotropolis development. This concept phase stormwater management (SWMP) plan forms part of the conceptual design for the Vaal Aerotropolis in the Land Preparation phase.

This SWMP constitutes a specialist study undertaken in support of the Environmental Impact Assessment (EIA), in accordance with the requirements of the National Environmental Management Act (Act 107 of 1998) and the EIA Regulations, including Appendix 6. The study provides independent, specialist input on stormwater management, flood risk, and associated environmental considerations to support regulatory review and decision-making.

The SWMP addresses the Emfuleni Municipality requirement for a stormwater management plan to ensure the development will minimise environmental impacts, the risk of flooding and protect receiving water bodies against negative influences from the development. Furthermore, an aerotropolis is a unique land use which is classified into two zones: an airside and a landside. Both zones have specific drainage requirements and this SWMP highlights these.

1.2 DEVELOPMENT LOCALITY

The Vaal Aerotropolis site is located within Emfuleni Local Municipality, approximately 23km West of Vereeniging. The Site is located east of the N1/R57 interchange, with the R54 running along the southern boundary of the main development area. The nearest existing Airports are as follows:

- O.R. Tambo International Airport, located 74 km Northeast of the site
- Lanseria International Airport, located 71 km North of the site

Figure 1-1 shows the development extent and locality within the surrounding area.

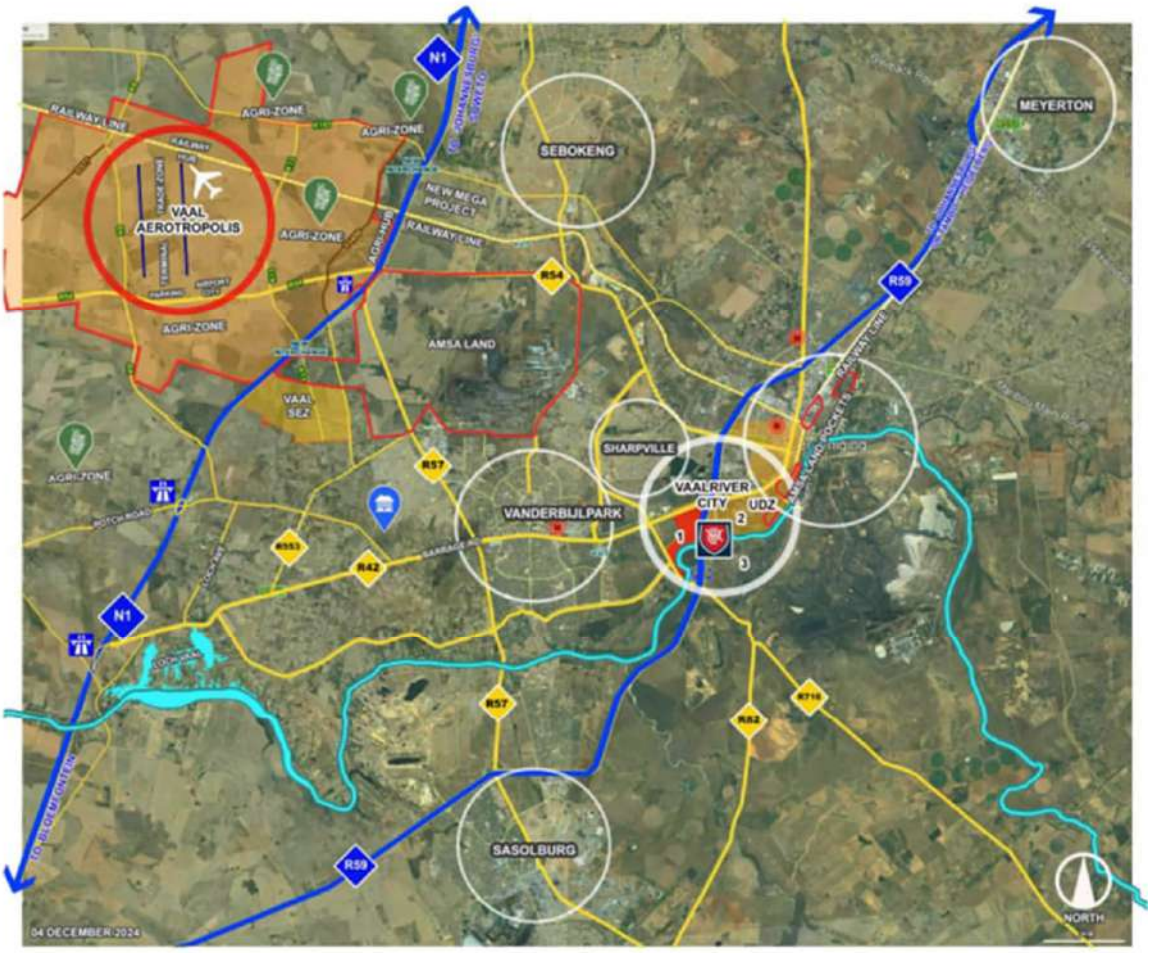


Figure 1-1 – Vaal Aerotropolis Development Extent And Locality Plan

1.3 OBJECTIVE OF THE REPORT

The objective of this report is to present the stormwater management plan. The following aspects for the management plan are discussed:

1. High-level analysis of the development site and study catchment
2. High-level assessment of flood risk and proposed mitigation concepts
3. Proposed stormwater drainage and attenuation strategy at the development site and supporting access roads.
4. Proposed suite of intervention concepts to maintain pre-development quantity and quality of outflows
5. Provide inputs to the scope and deliverables for the detailed stormwater design

1.4 LIMITATIONS AND LEVEL OF CONFIDENCE

1.4.1 LIMITATIONS

This Stormwater Management Plan presented in this report is at a conceptual and strategic stage only. This is due to the current stage of planning, as key development-defining inputs have not yet been finalised. These inputs include final bulk earthworks, and final airport platform and runway levels. These elements fundamentally influence drainage catchments, flow paths, discharge configurations, and infrastructure requirements. Accordingly, the stormwater management measures presented are enabling in nature. While engineering solutions are presented herein, they are not intended to represent preliminary or detailed design components.

The proposed stormwater management system layout and associated hydrological and hydraulic modelling are likewise conceptual. Modelling has been undertaken using preliminary and assumed platform levels and indicative development extents available at the time of study. No system optimisation or detailed design verification has been performed, as these activities are dependent on confirmed engineering inputs and detailed design development. The modelling undertaken was intended to demonstrate overall system feasibility and inform the assessment of flood risk at a strategic level only; refinement and optimisation will be required during subsequent design stages.

1.4.2 DATA AND MODEL RESOLUTION

Table 1-1 – Data and model resolution

Item	Resolution
LiDAR Survey	10m
Terrain Model	12.5m
Development Land Cover	Conceptual
Platform and Final Ground Levels	Preliminary
Flood Model	2D, Unsteady Flow
Hydraulic Model – Major System	Conceptual, not optimised

2 PRE-DEVELOPMENT CATCHMENT

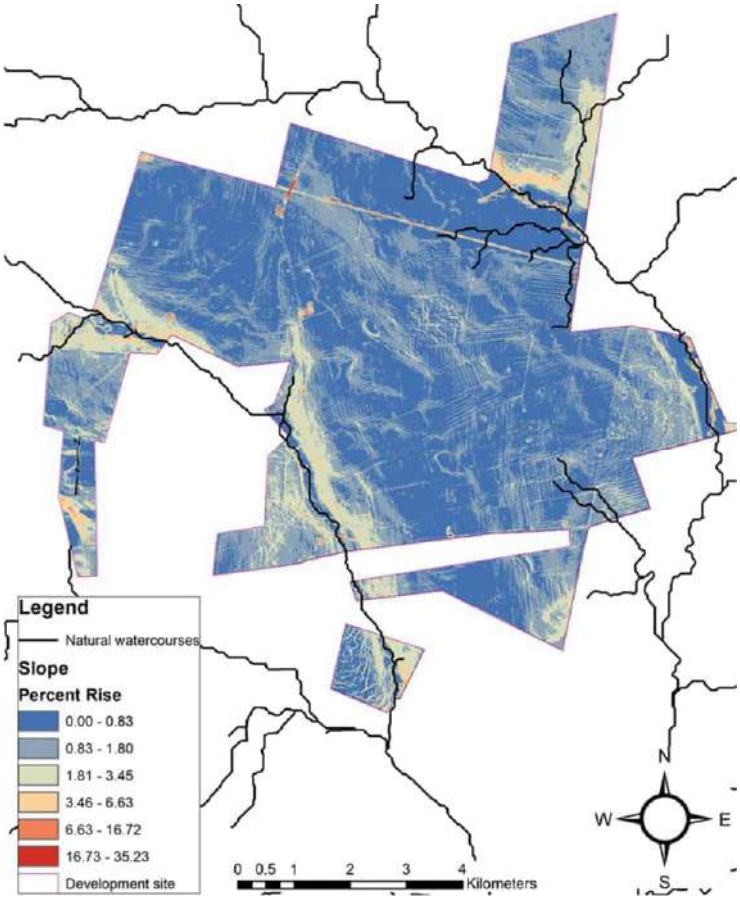
The study catchment relevant to the development extent includes quaternary catchments that have the following characteristics.

2.1 TOPOGRAPHY

The site is relatively flat with depressions in the centre. At the North and South boundaries where the site intersects two ephemeral rivers, the land slopes towards the main watercourse lines.

The site slope ranges from 0.83 % in the valley to 35.23 % for some structures along the railway. The average slope of the site is 1.01 %. Figure 3-1 shows the site topography with slope percentage indicated, based LiDAR survey data.

Figure 2-1 - Site Topography (slope)



2.2 CLIMATE

- Mean Annual Precipitation (MAP): 633 - 639 mm per annum.
- Mean Annual Runoff (MAR): 9.2 - 12.9 million m^3
- Mean Annual Evaporation: 1 650 mm p.a.

2.3 LAND USE

The land use within the study catchment is summarised below (in accordance with the SANLC database).

To the West of the N1, the main land use is agriculture (downstream) and grasslands mostly upstream. To the East of the N1, the main land uses are anthropogenic and industrial with mines, landfills and the built environment. Wetlands are concentrated around the perennial and ephemeral drainage lines and more so along the Leeuspruit (at intersection with the proposed Aerotropolis development) and Rietspruit rivers

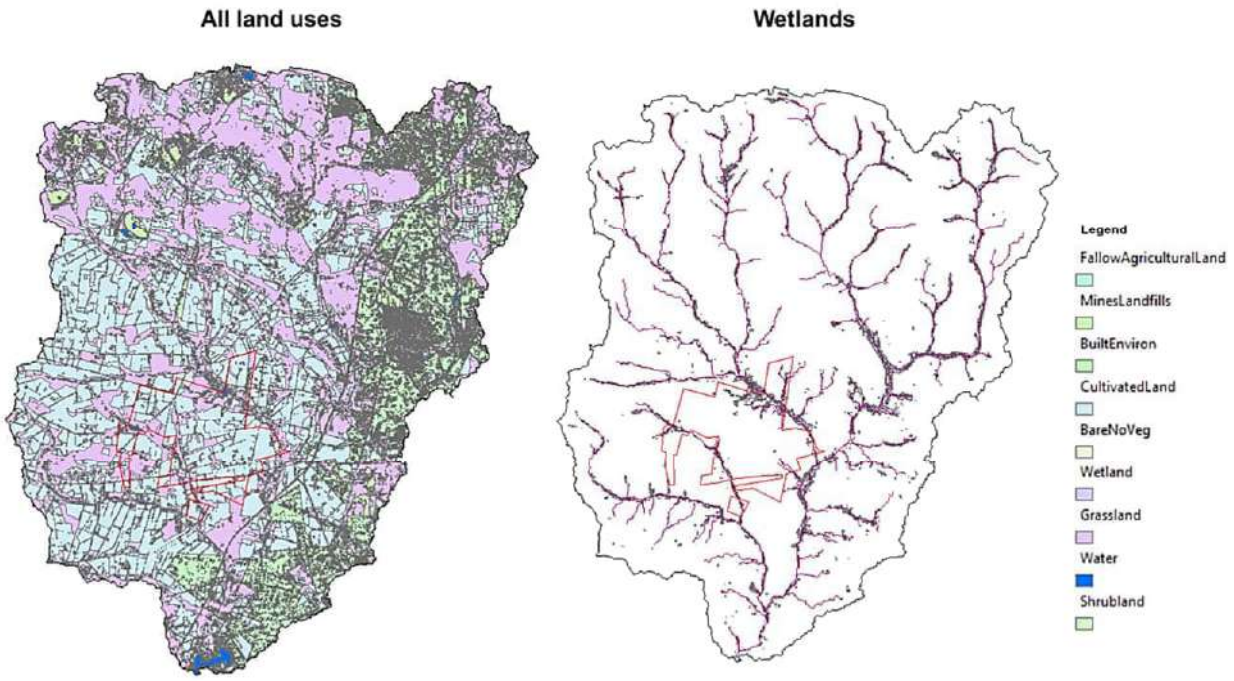


Figure 2-2 – Rietspruit Catchment Land Use And Wetland Maps

2.4 NATURAL WATERCOURSES

The following ephemeral watercourses traverse the development site:

- Klein Rietspruit: tributary of the Rietspruit river. Enters the development at the Western boundary, flows Southeast, exits South.
- Leeuspruit River: Tributary of the Rietspriot River. Enters at the Northern boundary of the development site, flows Southeast, cuts through Northern and Eastern areas of the development, exits Southeast.

2.5 RECEIVING ENVIRONMENTS OVERVIEW

The abovementioned drainage lines function primarily as conveyance features during rainfall events, with downstream linkages to progressively more sensitive receiving environments. Immediate downstream receiving environments are ephemeral to intermittent watercourses draining largely

rural and agricultural land uses. Environmental sensitivity increases downstream, with the Vaal Barrage and Vaal River system representing the ultimate and most sensitive receiving environment

This downstream context underpins the requirement for attenuation, flow control, and water-quality management at the Vaal Aerotropolis discharge points.

Klein-Rietspruit

- Immediate receiving environment
  - Intermittent rural drainage corridors
  - Agricultural land uses, including cultivated fields and grazing areas
- Secondary receiving environment
  - Contributes flows to the Rietspruit catchment
  - Surrounding agricultural areas

Leeuspruit

- Immediate receiving environment
  - Rural and agricultural areas
  - Modified drainage corridors associated with farming activities
- Secondary receiving environment
  - Confluence with Rietspruit
  - Rietspruit floodplain and associated riparian zones

Rietspruit

- Immediate receiving environment
  - Intermittent river channels
  - Associated floodplain with a mix of agricultural and peri-urban areas connected by major transport infrastructure and other municipal assets
- Secondary receiving environment
  - Rietspruit floodplain and associated riparian zones

The ultimate receiving environment is the Vaal Barrage, a strategically important regional water resource supplying potable and industrial water users, and downstream ecological systems. See Figure 2-3 for a schematic mapping stormwater collection, discharge points and receiving environments.

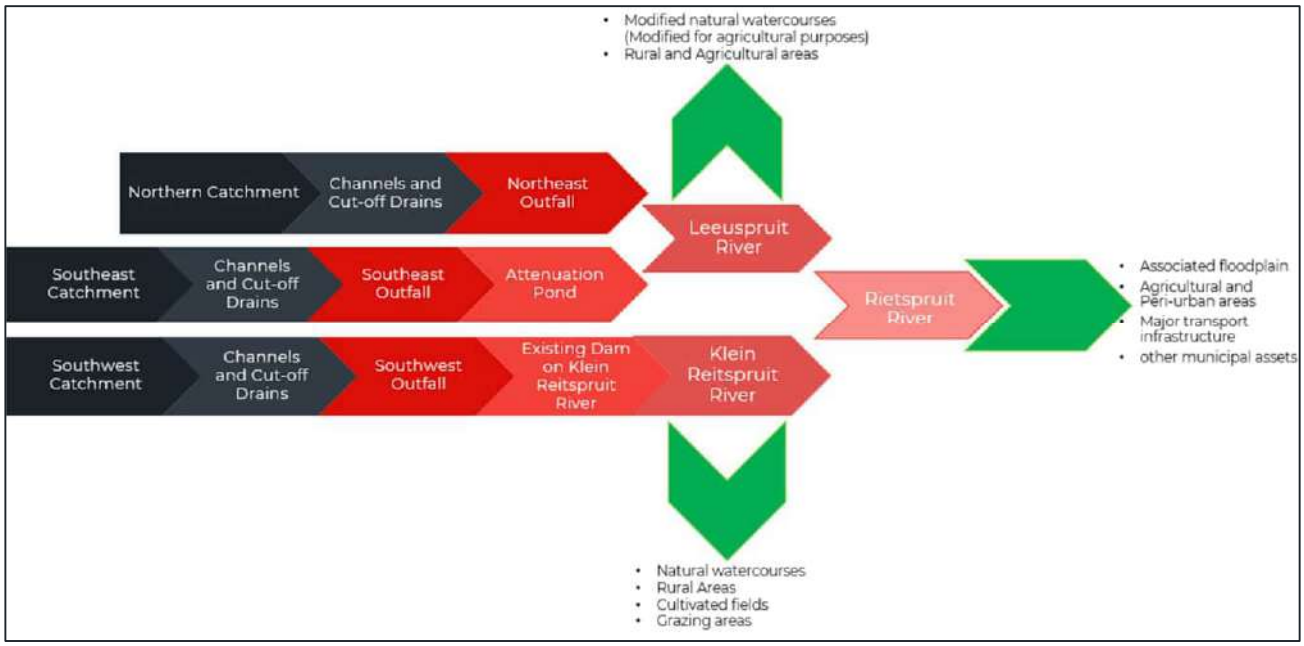


Figure 2-3 - Receiving Environments Schematic

2.6 VAAL RIVER CATCHMENT

The Vaal Aerotropolis is located at the upper reaches of the Vaal River. Figure 2-4 indicates the Vaal River catchment which is approximately 23 km from Vereeniging to the East and 74 km from O.R. Tambo International Airport Northeast of the site.

The Vaal River catchment was delineated using the 30 m digital elevation model from the NASA Shuttle Radar Topography Mission (SRTM). Figure 2-4 depicts the resulting catchment boundary and the longest watercourse.

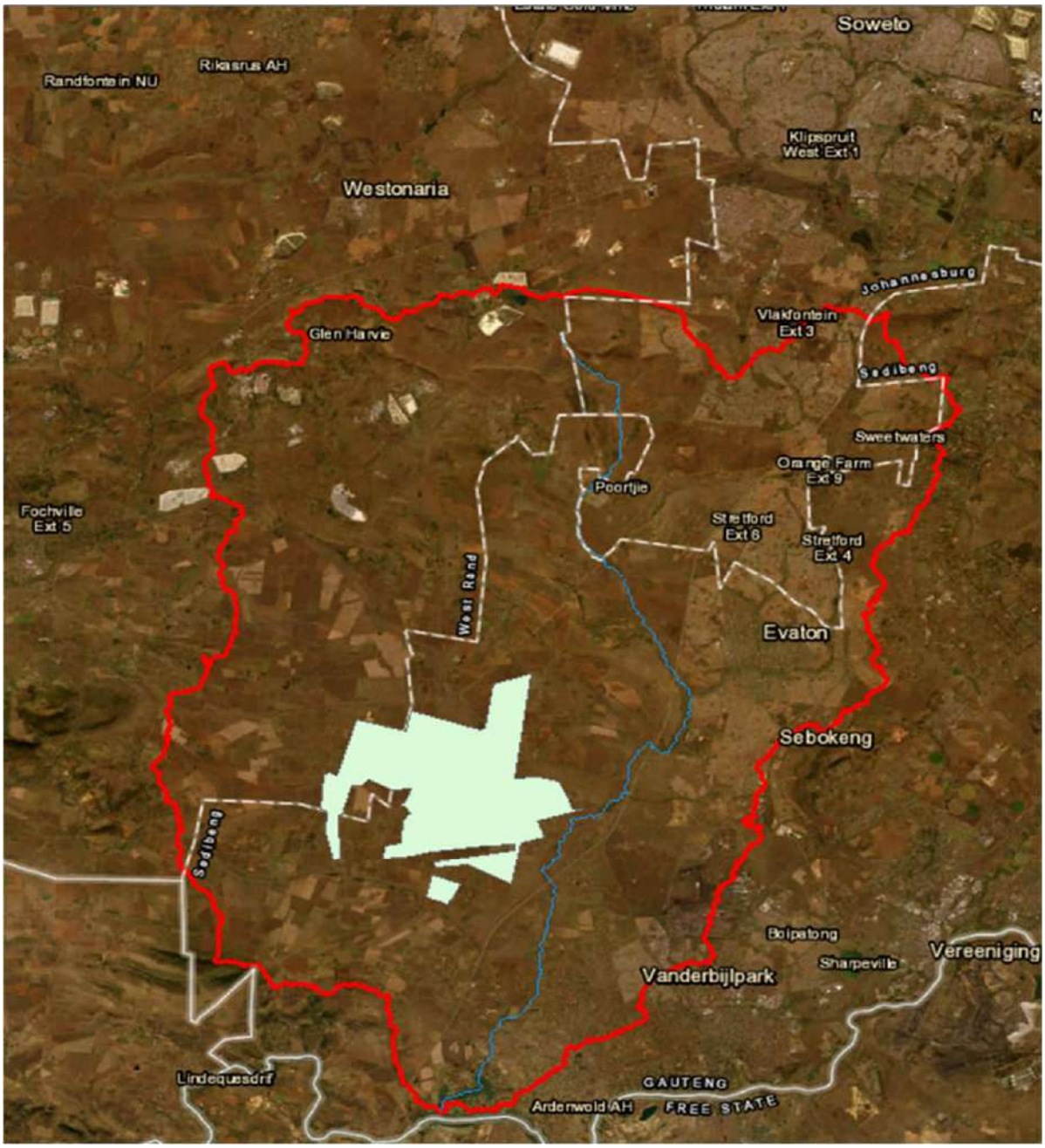


Figure 2-4 – Vaal River catchment and longest watercourse

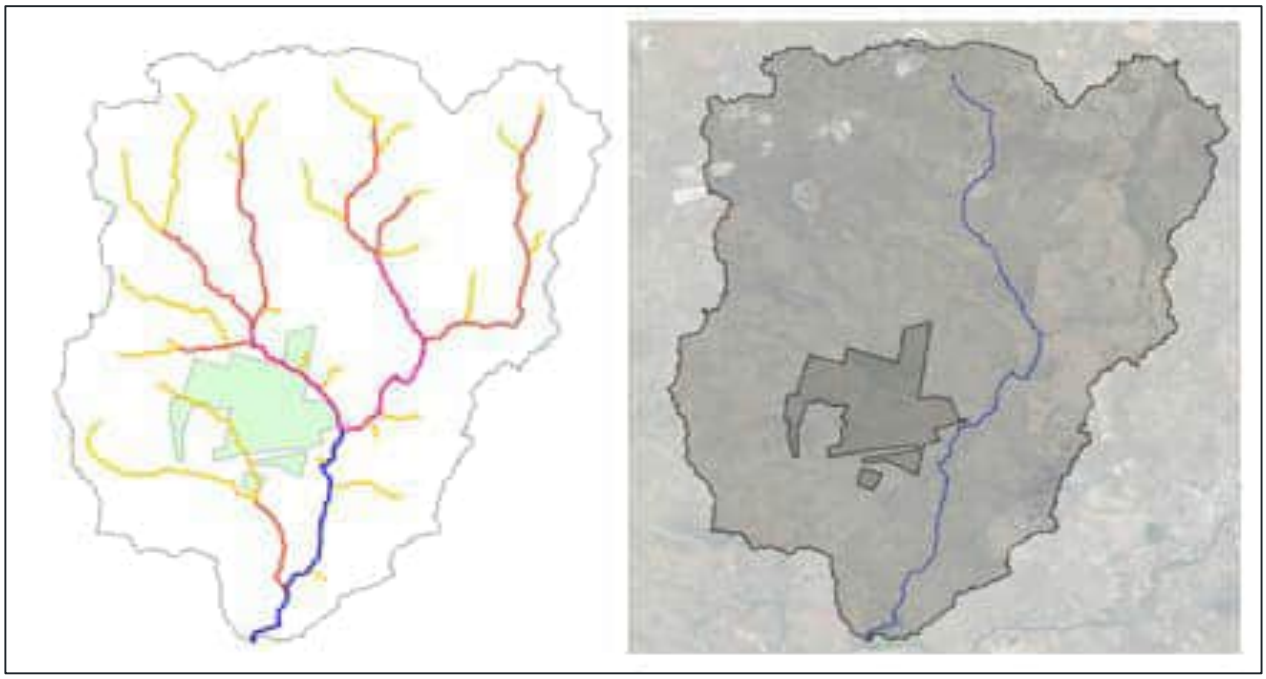


Figure 2-5 - Vaal River Catchment upstream of the Vaal Aerotropolis Development Site with full river network (left) and longest watercourse (right)

Figure 2-5 shows the full river network for the Vaal River catchment delineated. Generally, lower-order streams (yellow, red and pink) are found in the upstream sections of the river network and tend to be seasonal. Conversely, higher-order streams in the downstream section of a catchment tend to flow more frequently. For this high-level assessment, the flood line determination in this study only considers the longest watercourse and rivers near the development site.

At the national level, the catchment delineation of South Africa into quaternary catchments uses the higher order streams. For the Vaal River catchment, the higher-order stream considered at the national scale overlaps with the longest watercourse making it essential to include in the flood line determination. The proposed development intersects lower order streams which were also included in the river network for the site. The total catchment area is 1 155.20 km^2 and the longest watercourse length is 60.18 km. The river slope is 0.0027 m/m.

3 POST-DEVELOPMENT CATCHMENT DELINEATION AND DISCHARGE POINTS

A schematic concept of the catchment delineation for Phase 3 is described in Figure 3-3.

The development was divided into three catchments (A to C as per **Figure 3-1**) based on the following three potential outfall locations identified for the site:

1. To the Northeast upstream of the existing dam (26o 34’43’’ S; 27o 43’14’’ E)
2. To the East near the R54 (26o 35’45’’ S; 27o 44’48’’ E)
3. To the Southwest near the existing dam (26o 37’24’’ S; 27o 40’58’’ E)

Pre-development watercourses are not obstructed or impeded in any way apart from the existing farm dams.

Ultimately catchment B and C were consolidated, and flows will be routed to outfall 2. Catchment A and corresponding outfall 3 will be retained.

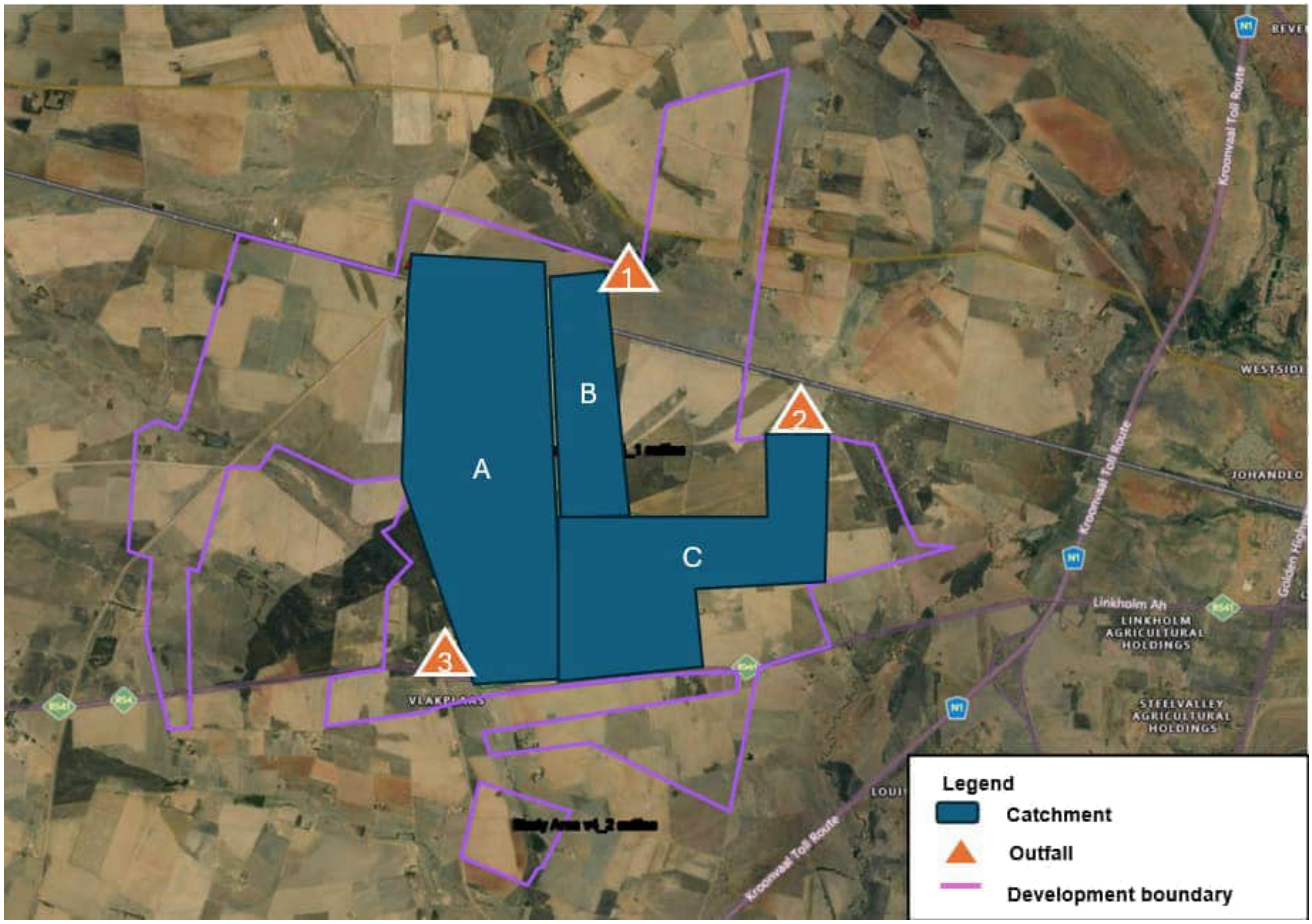


Figure 3-1 – Catchment Delineation

3.1 DEVELOPMENT PHASING AND SUBCATCHMENTS

The site was divided into sub catchments based on planned land use and surface characteristic to inform accurate hydraulic modelling. Summaries of the various catchment areas and their surface types are shown in Appendix A. The development will be constructed in various phases. Therefore, the sub catchment areas were grouped by phase.

Each sub catchment has areas with different types of surfaces such as roof, concrete hardstand, paved surfaces, tarred roads etc which are impervious. The percentage of impervious surfaces is also shown in the tables in Appendix A. The pervious surfaces are grass surfaces. They are shown as percentages of the corresponding sub catchment. It is important to identify the various surfaces as they have various Manning's n values which are important inputs for the stormwater model.

The names for each sub catchment are based on the zones proposed in the Vaal Aerotropolis Master Plan. Subcatchment names and corresponding surface types are discussed below.

3.1.1 PHASE 1

- The Airport City sub catchment:
  - Consists of office, head office, conference centre, small shopping mall, large shopping mall, hospital and a bus office hotel parking area.
  - This sub catchment primarily contains roof and paved surfaces.
- The Valuable Cargo Terminal sub catchment consists of roof, paved and road surfaces which include the runway and walkways.
- The two Future Trade Zone sub catchments consist of roof, paved and road surfaces (including runways and walkways).
- The Solar Farm sub catchment consists of roof, paved areas and road surfaces (which include runways and walkways).
- The Agricultural zone sub catchments (Phase 1) consist of most grassy surfaces which are pervious.
- The two Future Commercial sub catchments consist of mostly roof areas with very few paved surfaces and roads surfaces (which include runways and walkways.
- The car park (including adjacent roads)
- Mainly consists of roof areas
- Also includes paved surfaces and roads surfaces (which include runways and walkways.
- The Airport precinct sub catchment consists of:
  - Roof and concrete hardstand surfaces
  - Tarred road areas (between buildings in the airport precinct)
  - Other roads (which include runways and walkways)
- The Roads on the right- and left-hand side of the Future Trade Zones (which include runways and walkways.

3.1.2 PHASE 2

- The Future Trade Zone sub catchments consist of mostly roof areas, paved surfaces and roads surfaces.
- The Future Agricultural Zone mostly grassy surfaces (pervious surfaces), paved surfaces and roads surfaces.

3.1.3 PHASE 3

- The Future Agricultural Zone sub catchments mostly consist of pervious surfaces with some paved surfaces and roads surfaces.
- The Future Trade Zone sub catchments mostly consist of roof areas with some paved surfaces and roads surfaces.
- The Railway Hub and rail line sub catchments consist of mostly roof areas with some paved surfaces.
- The sub catchments which contain the roads parallel to the Future Trade Zones and those going through the Future Agri Zone on the Southern side of the site consist of only road surfaces.

4 FLOOD LINES DELINEATION

4.1 FLOOD ANALYSIS

4.1.1 DESIGN RAINFALL

The 1-day point rainfall values for the 2-, 50- and 100-year return periods were extracted from the Daily Rainfall Estimation tool (Smithers and Shculze, 2002 and updates) for the rainfall station nearest to the catchment centroid. The final rainfall values from the Rietspruit Station (SAWS Number: 0438514_W) is presented in Table 4-1.

Table 4-1 - Design rainfall station description and rainfall depths

Station details		Rainfall	
Latitude Longitude	26º 34' 27º 46'	Return Period (years)	1-day Design Rainfall (mm)
MAP (mm p.a.)	574	2	50
Altitude(m.a.s.l.)	1 492	50	102
Distance from site (km)	5.1	100	113
Record length (years)	49		

4.1.2 DESIGN FLOODS

According to the SANRAL Drainage Manual and based on the catchment area, the synthetic unit hydrograph (SUH) method is recommended for determining the peak flow. The site falls within Veld Zone 4 for this method and has a storm duration of 8 hours. Using the previously listed catchment physiography and design rainfall, the resulting design flows are tabulated in Table 4-2.

Recommended peak flow values have been based on the design flows. For floodline delineation, a 10 % buffer accounting for the potential of climate change to increase peak flows are tabulated in Table 4-2.

Table 4-2 - Calculate flow peaks in m^3/s

Return Period (years)	2	50	100
Design peak flow	275	843	991
Recommended value	302	928	1 091

These values are consistent with published peak flows expected in the Vaal River ranging from typical values of 300 m^3/s in the summer months to 2 801 m^3/s for a recent flood in 2010 (Jury, 2016).

4.2 1:100-YEAR FLOOD LINES

Flood lines were modelled using HEC-Ras software and consider the full river extent within the catchment, excluding local controls closer to the site. This includes the higher order ephemeral (i.e. not likely to flow throughout the year or have low flows for most of the year) streams.

4.3 FLOODLINE DEVELOPMENT

One round of refinement was carried out on the floodlines Initially a simpler 1D analysis (steady flow with 30 m resolution terrain). Subsequently, a more detailed and sophisticated 2D analysis was conducted.

Firstly, detail was added to the model input. The SRTM 30 m terrain model was replaced with the ALOS PALSAR 12.5 m digital elevation model. Secondly, input flows to the model were described with more spatial distribution, by dividing the catchment into four sections; and temporal distribution, by adding the full hydrograph input. Additionally, a more sophisticated model was used, processing the full hydrograph and interpreting these inputs based on the physics of wave movements through the terrain.

The use of advanced modelling techniques and more detailed terrain input reduced the extent of the flood lines by almost 30%. This significantly improved the delineation of land exposed to flood risk, thereby increasing the extent of developable land. The initial and improved 1 in 100-year rainfall event floodlines are indicated in Figure 4-1. See Appendix C for the detailed floodline drawing.

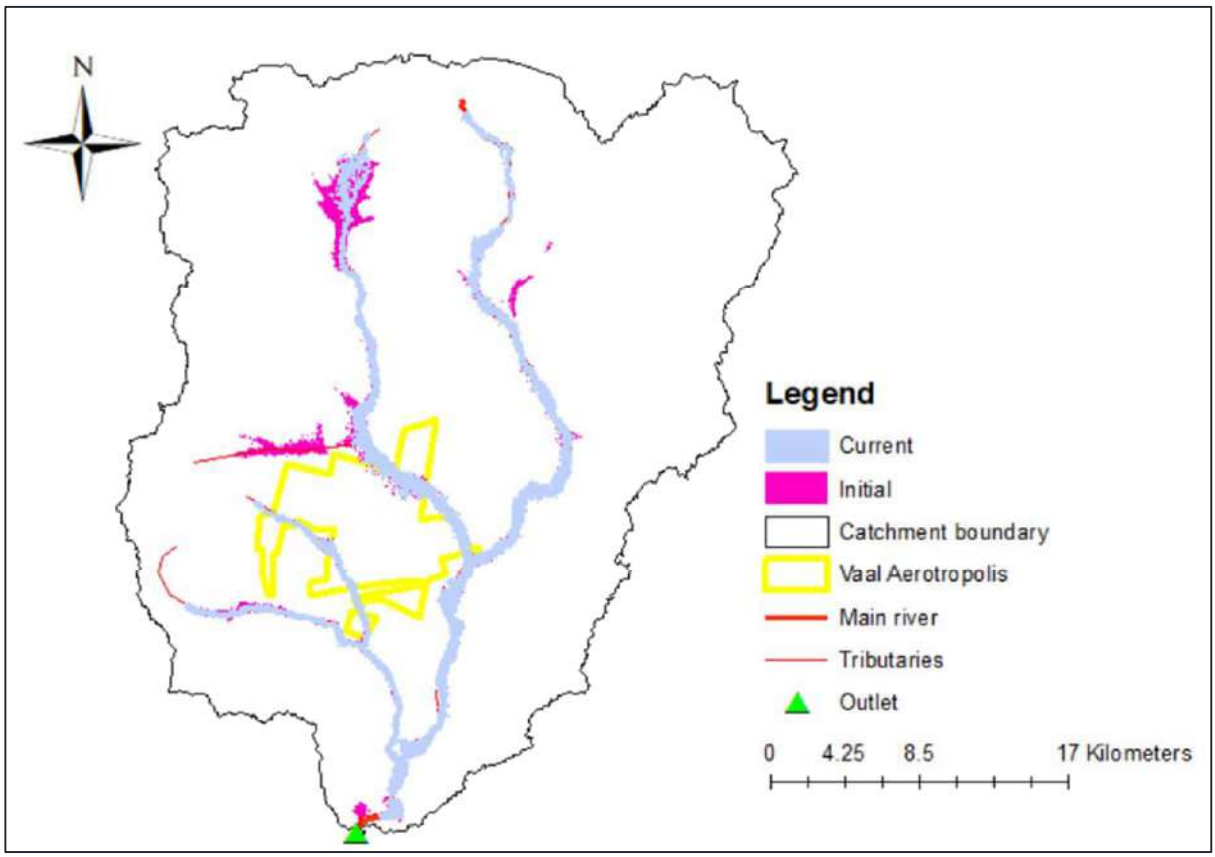


Figure 4-1 - Initial and refined 1:100 year flood lines for the essential rivers in the development's hydrological catchment

4.4 FLOOD RISK MITIGATION

The following approach is recommended to mitigate flood risk for the development:

- 50 m buffer: No development should occur within 50 m of the flood lines.
- Development should not affect natural flow of rivers
- All discharge to these watercourses should be regulate
  - Runoff generated within the development to be attenuated to 1:5 return period pre-development flowrates, and
  - Runoff generated within dirty water areas to be treated before discharge.

4.5 PROPOSED ADDITIONAL REFINEMENT

4.5.1 OUTFLOW RECORDS FOR EXISTING DAMS

The farm dam near the South boundary of the development couldn't be accessed during a site visit as access routes were waterlogged due to recent rainfall. It is yet to be determined and confirmed if the dam outflow is gauged. If the outflow is gauged, outflow records should be obtained and incorporated into the floodline and hydraulic models to improve accuracy of these models and the results thereof.

5 DEVELOPMENT RAINFALL ANALYSIS

5.1 DATA SOURCING AND PREPARATION

Observed rainfall was used as input for the hydraulic modelling related to the stormwater drainage. In light of climate change and the increasing risk of infrastructure damage from extreme events, we motivated the need to assess and include recent rainfall data in the assessment. Rainfall data was purchased from the South African Weather Services (SAWS) to include recent climate and patterns not captured in the historical records. Station details for recent records are summarised in Table 5-1.

Table 5-1 - Station details for current rainfall records

Data	Unit	Value
Station Name		Vereeniging - 0438784 3
Distance to the development	km	23 km
Co-ordinates		-26.5690; 27.9580
Length of record	years	2008/01 – 2024/09
MAP	mm p.a.	641
Altitude	m.a.s.l.	1 481

Station details, available at no cost, for historical records pre-dating 2000 in the same area are summarised in Table 5-2.

Table 5-2 - Station details for historical rainfall records

Data	Unit	Value
Station name		Vereeniging (POW) - 0438729 W
Co-ordinates		-26.50; 27.55
Duration		1900/01 – 2000/08
Length of record	years	100
MAP	mm p.a.	666

Data	Unit	Value
Altitude	m.a.s.l.	1 442

The historical rainfall records were patched when creating the national database (Kunz et al., 2000). This data set was used with no additional data quality checks or patching. The purchased data set with rainfall records from the contemporary climate was assessed and patched where missing data was identified.

Technological advancements, paywalls and the declining availability of rainfall stations in Southern Africa have led to studies investigating using remotely sensed precipitation for hydrological applications (Bailey and Pitman, 2021). Du Plessis and Kibii (2021) compared observed rainfall records from 46 stations evenly distributed across South Africa with rainfall from Climate Hazards Group InfraRed Precipitation (CHIRPS) and resulted in the following findings and recommendations:

1. The relationship between the product and observed rainfall is spatially variable (i.e. changes with each gauge)
2. The relationship between the product and observed rainfall is temporally variable (i.e. the product reasonably estimates monthly rainfall but poorly estimates daily rainfall)
3. A remotely sensed product can be used with existing ground-based observations but not as a replacement for rainfall records.

These findings indicated the option to patch missing data with remotely sensed values and the necessity to identify the relationship between the selected rain gauges.

For the daily time step record obtained from SAWS, we considered the previously assessed product CHIRPS and a daily time step product, Tropical Applications of Meteorology (TAMSAT). TAMSAT was selected as a suitable product for this study. The comparison of cumulative rainfall over the same period is presented in Figure 5-1. In terms of the amount of rainfall, TAMSAT was closer to the observed total at the Vereeniging station of 9 330.9 mm than CHIRPS for both point and catchment rainfall measures. Correction factors (C.F.) were determined based on the long-term trends depicted in Figure 5-2. Within the missing data subset, maximum rainfall outliers were also adjusted based on outliers. Figure 5-3 shows the final, patched time series and cumulative rainfall record for 2008 to 2024.

The final, cumulative rainfall record from 1900 to 2024 is presented in Figure 5-4 and represents 117 hydrological years excluding the period with no data. From this final rainfall record, the long-term mean annual precipitation is 670 mm p.a.

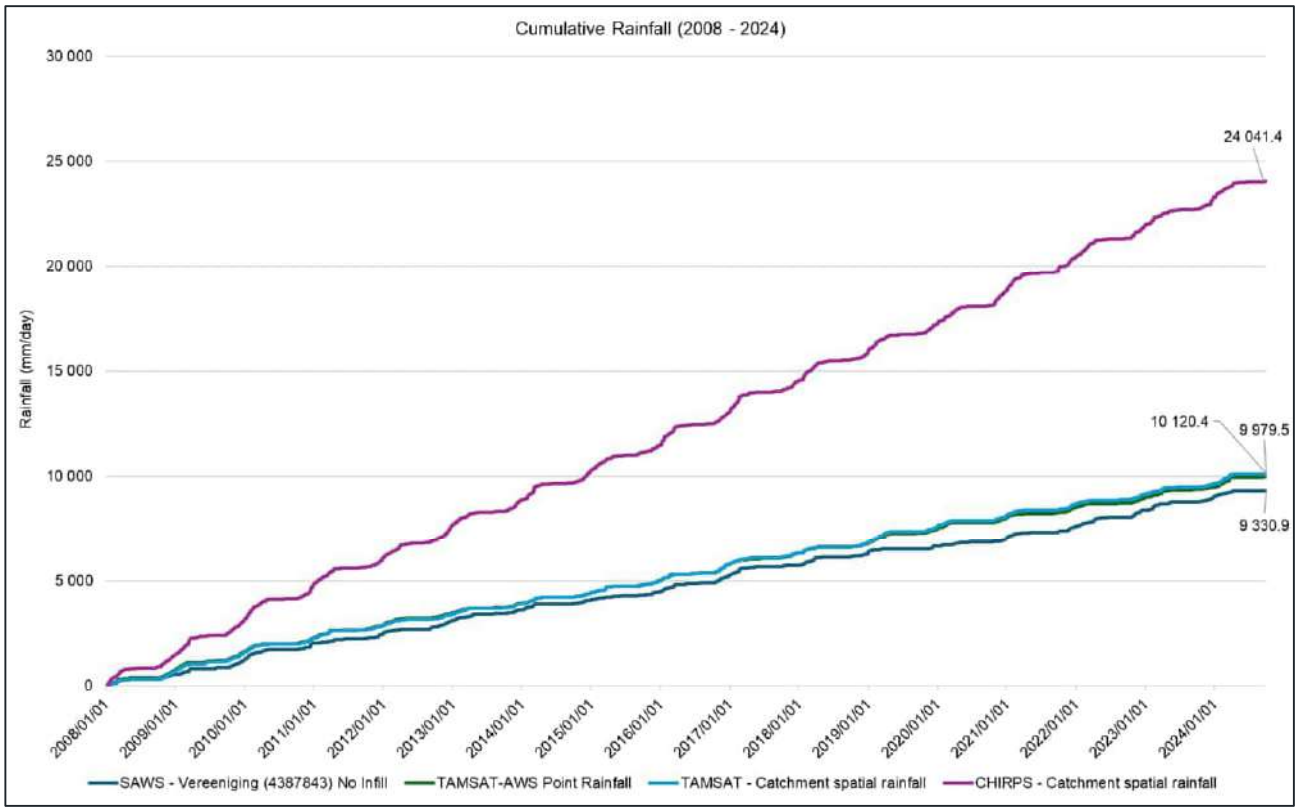


Figure 5-1 - Cumulative rainfall from observed rainfall and remotely sensed rainfall products

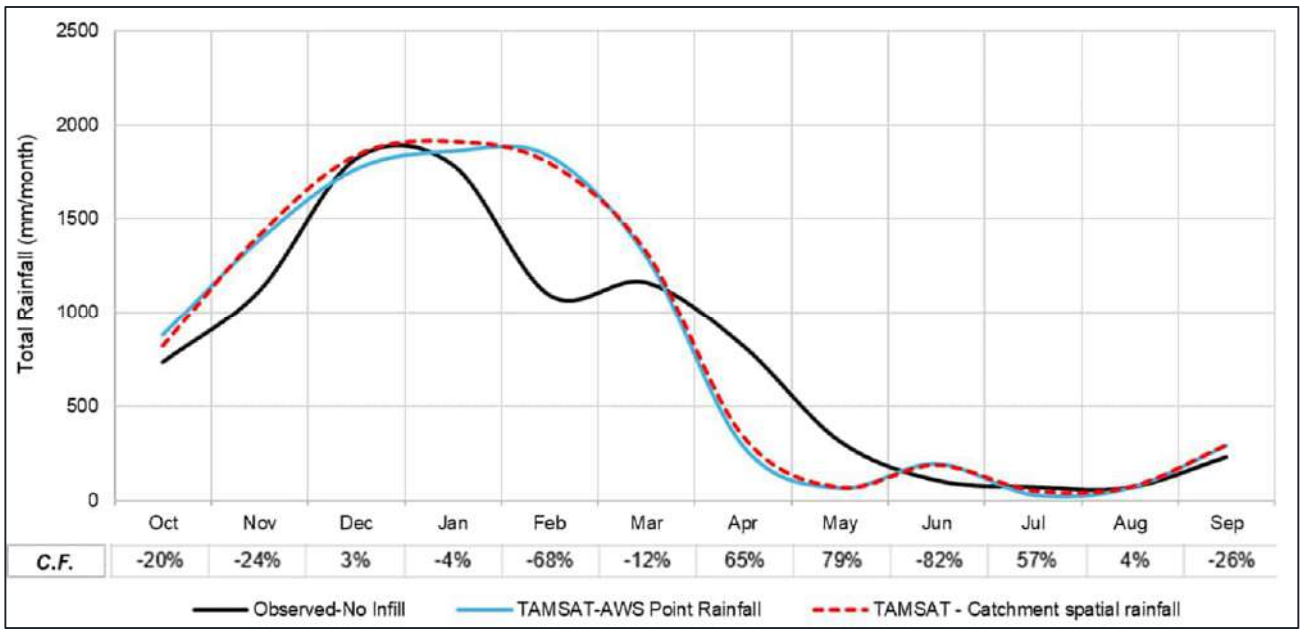


Figure 5-2 - Cumulative Long-term, monthly seasonal distribution of rainfall and correction factors between observed rainfall and TAMSAT point rainfall

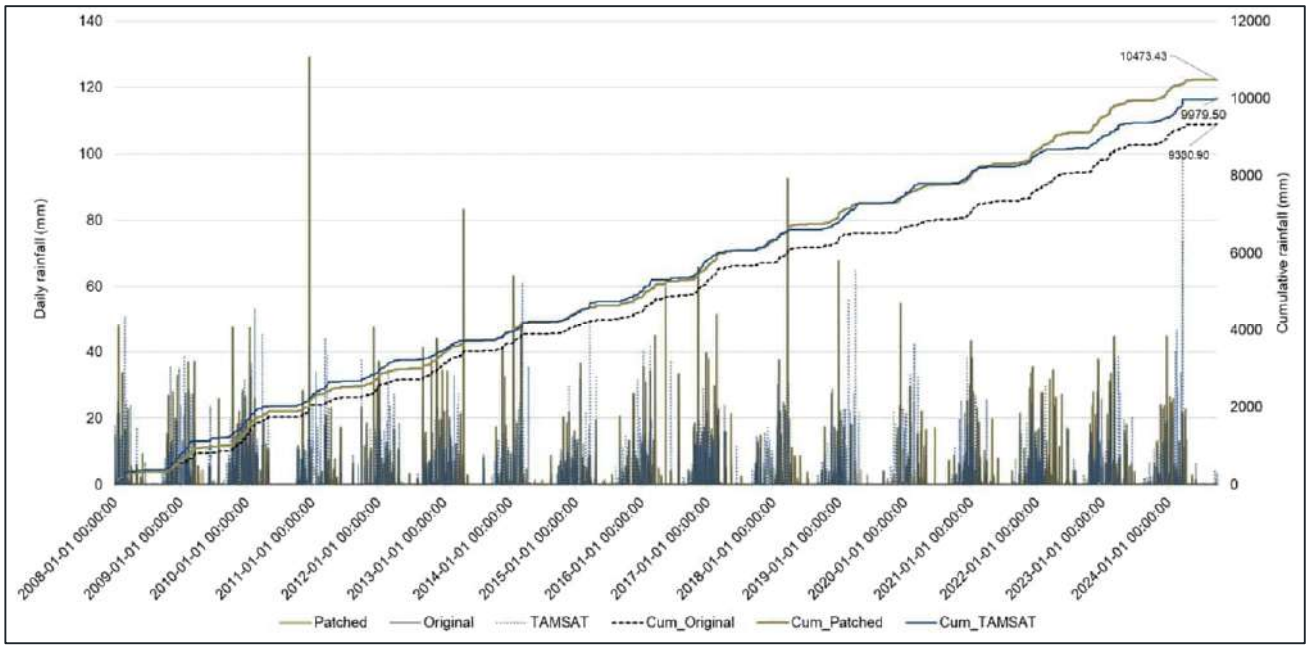


Figure 5-3 - Cumulative Original and patched time series and cumulative rainfall from 2008 to 2024

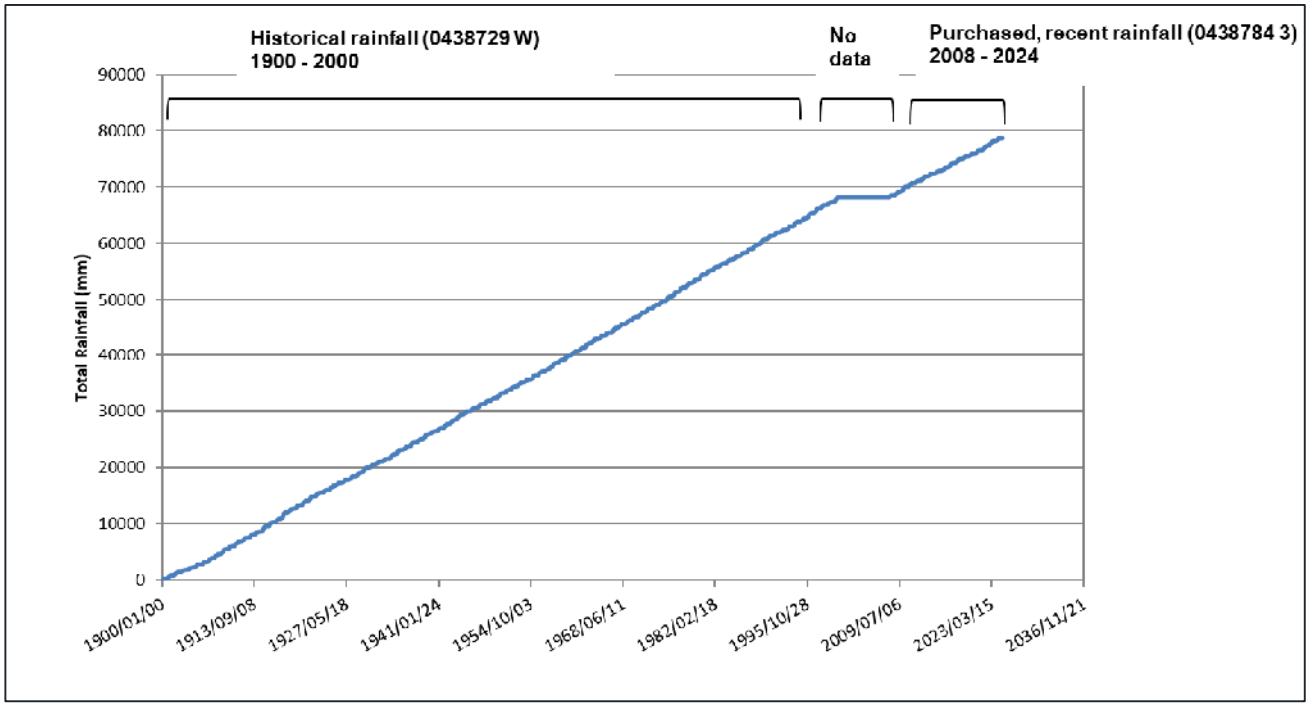


Figure 5-4 - Full cumulative rainfall record for Vereeniging

5.2 STATISTICAL ANALYSIS

The 117-year rainfall record was transformed into an annual maximum series and statistically analysed under several distributions. Figure 5-5 shows the spread of the distributions compared with the observed rainfall sample. The statistics for the distributions are summarised in Table 5-3 with the best statistics calculated from the Gumbel distribution. The associated design rainfall values for selected return periods are summarised in Table 5-4 and visually in Figure 5-6.

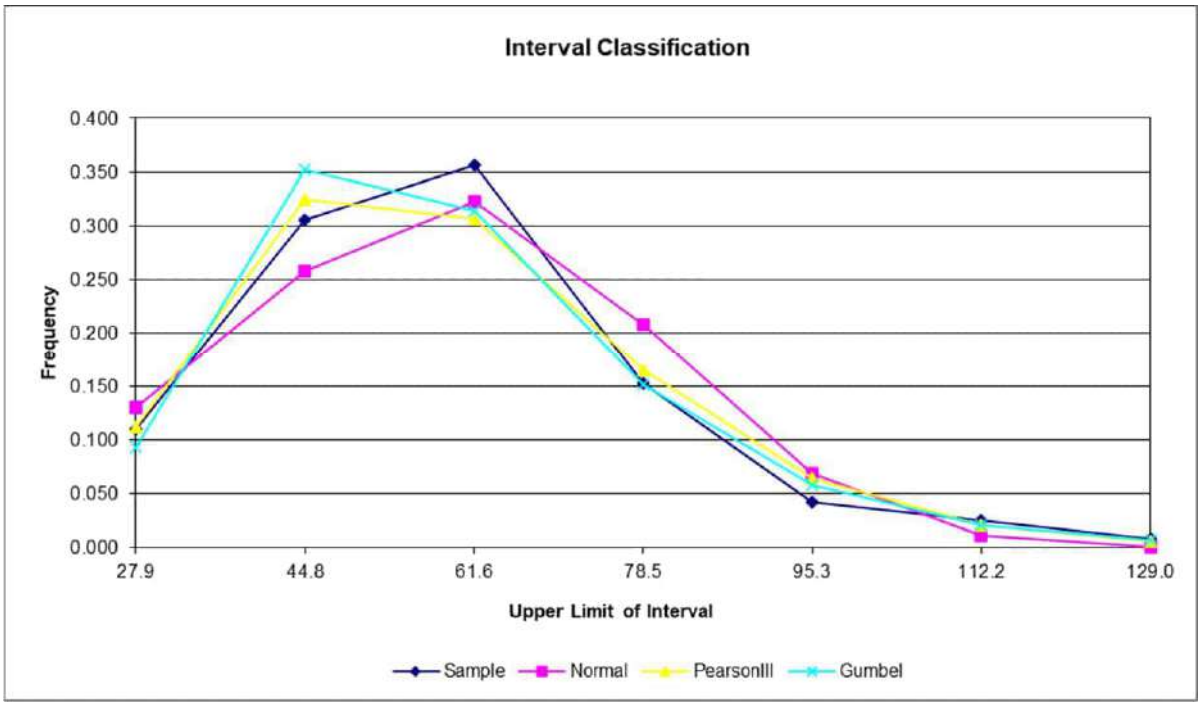


Figure 5-5 - Distribution Frequencies

Table 5-3 - Statistical Analysis of Distribution Functions

Distribution	Normal	Log Normal	Pearson III	Log Pearson III	Gumbel
Coefficient R^2	0.9482	0.9825	0.9816	0.9659	0.9859

Table 5-4 - Probability Design Rainfall from Vereeniging Rainfall Records

Return Period (Years)	Exceedance Probability	Distribution Function Rainfall (mm)
1000	0.1%	149
500	0.2%	139
200	0.5%	124
100	1.0%	113
50	2.0%	102
25	4.0%	91
20	5.0%	88
10	10.0%	77
5	20.0%	65
2	50.0%	47

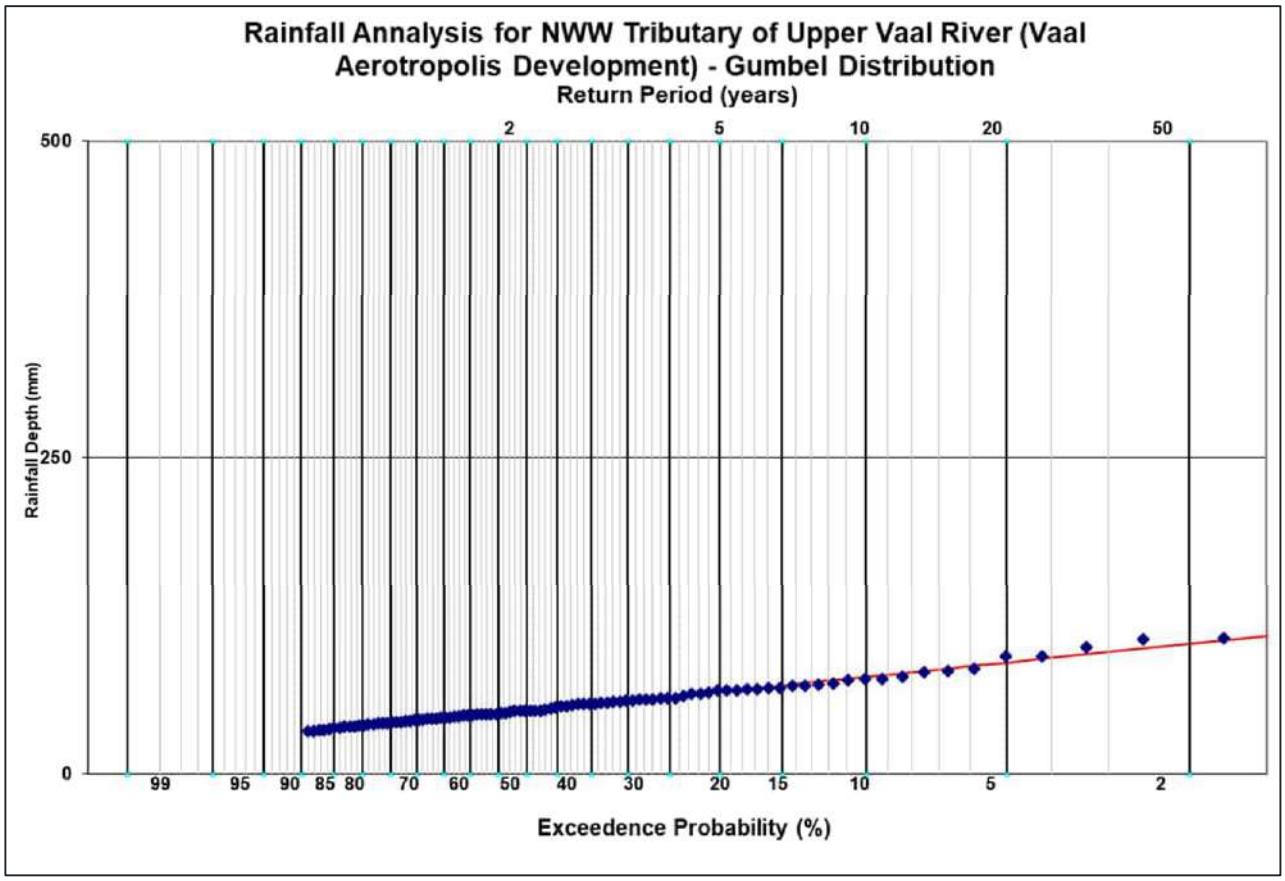


Figure 5-6 - Probability-Depth-Duration graph

5.3 HYDRAULIC MODEL INPUT

This design rainfall was input into PCSWMM as intensity-duration-frequency curves depicted in Figure 5-7. The 50-year return period was set as the benchmark for flood control and an additional scenario with 30 % extra rainfall from climate change was added to the cluster.

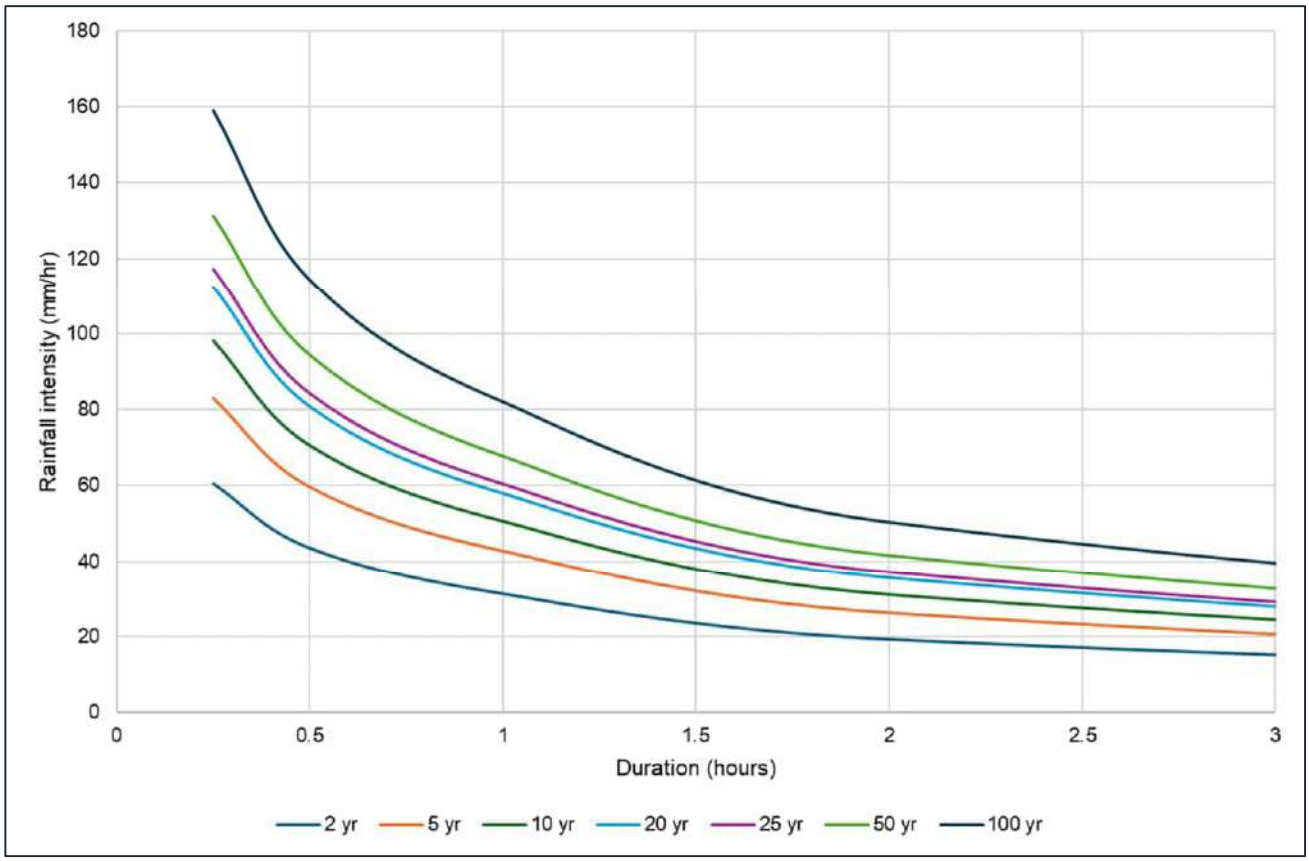


Figure 5-7 - Intensity-duration-frequency curve

6 DESIGN CRITERIA AND STANDARDS

6.1 LEGAL AND POLICY FRAMEWORK

6.1.1 APPLICABLE LEGISLATION

The following legislation is applicable:

- *National Environmental Management Act* (NEMA), (Act No. 107 of 1998) as amended. Government of South Africa, Pretoria
- *National Water Act* (NWA) (Act No. 36 of 1998), as amended. Government of South Africa, Pretoria
- *Regulations Regarding the Procedural Requirements for Water Use Licence Applications and Appeals*. GN R267, Government Gazette No. 40713, 24 March 2017. Department of Water and Sanitation, Pretoria
- *National Environmental Management: Waste Act* (NEM:WA) (Act No. 59 of 2008), as amended. Government of South Africa, Pretoria
- *Disaster Management Act* (Act No. 57 of 2002), as amended. Government of South Africa, Pretoria
- *Emfuleni Spatial Development Framework 2023–2024*. Prepared by Urban Dynamics Gauteng. Emfuleni Local Municipality, Gauteng, South Africa
- *Stormwater Management Policies, By-laws and Associated Guidelines*, as adopted by Emfuleni Local Municipality and amended from time to time.

6.1.2 ENGINEERING STANDARDS AND GUIDLEINES

The following documents serve as the basis for design criteria and standards:

- *The Neighbourhood Planning and Design Guide* (Red Book): *Creating Sustainable Human Settlements.* Department of Human Settlements, Republic of South Africa, Pretoria, 2019
- *SANS 1200: Standardised Specifications for Civil Engineering Construction* (various parts, including LE: Stormwater Drainage). South African Bureau of Standards, Pretoria.
- *SANS 10400-R: The Application of the National Building Regulations – Part R: Stormwater Disposal.* South African Bureau of Standards, Pretoria.
- *Drainage Manual.* 6th Edition. SANRAL, Pretoria, 2013.
- *The South African Guidelines for Sustainable Drainage Systems (SuDS).* Report No. TT 558/13. Water Research Commission, Pretoria, 2013.
- *A Best Practice Guideline for Design Flood Estimation in Municipal Areas in South Africa*. WRC Report No. TT 921/23. Water Research Commission, Pretoria, 2023.
- *Water Management at Airports.* Eco-Airport Toolkit Series. International Civil Aviation Organization (ICAO), Montréal, 2016.

Note that Emfuleni Local Municipality does not have its own local municipality guidelines or standards and instead uses the Red Book, in association with by-laws related to the Emfuleni Spatial Development Framework.

Specific to stormwater management in airports, these additional resources were consulted for international standards and best management practices:

- *Airport Drainage Design. Advisory Circular AC 150/5320-5D*. FAA Office of Airport Safety and Standards, Washington, D.C., 2013.
- *Advisory Circular AC 150/5320-6: Airport Pavement Design and Evaluation.* (latest Ed.). U.S. Department of Transportation, Washington, D.C.
- *Annex 14 to the Convention on International Civil Aviation: Aerodromes – Volume I: Aerodrome Design and Operations*. 9th ed. International Civil Aviation Organization (ICAO), Montréal, 2022.
- *Aerodrome Design Manual – Doc 9157, Part 3: Pavements and Drainage*. International Civil Aviation Organization (ICAO), Montréal, 2023.
- *Airport Services Manual – Doc 9137, Part 9: Airport Maintenance Practices*. International Civil Aviation Organization (ICAO), Montréal, 2021.
- *Airport Stormwater Management Library and Training Materials.* Airport Cooperative Research Program (ACRP) WebResource, Transportation Research Board of the National Academies of Sciences, Engineering, and Medicine, Washington, D.C., 2022
- *Civil Aviation Regulations, 2011 – Part 139: Aerodromes and Heliports*. Department of Transport, Pretoria, 2011 (as amended).
- *South African Civil Aviation Technical Standards (SA-CATS 139): Aerodromes.* South African Civil Aviation Authority (SACAA), Midrand.

6.2 DESIGN CRITERIA

The Emfuleni Municipality requirements for stormwater are as follows:

- Type of Pipe = SANS 677
- Minimum size of pipe (for bulk stormwater pipes) = 900 mm Dia
- Minimum velocity in pipes = 0.8 m/s

Based on the minimum requirements of the abovementioned legislation, policy and guidelines, the following minimum criteria have been assumed to enable the concept design:

Table 6-1 – Minimum Design Criteria

Criteria	Value
Pipe Material and Type	Concrete Interlocking SANS 677
Minimum pipe diameter	900 mm
Minimum pipe velocity	0.8m/s
Minimum pipe slope	1/1000 = 0.1%
Pipe cover	min 900 mm for pipes greater than 450 mm
Pipe cover at road crossing	min 900 mm

Structure type and material	Concrete Manhole Structure (with a slab top)
Structure size	1300 mm
Design storm event for Minor System	1 in 50 year + 30%CC
Design Storm Event for Attenuation Pond Sizing	1 in 50 year + 30%CC
Design Storm Event for Attenuation Pond Spillway Sizing	1 in 100 year

6.3 ATTENUATION REQUIREMENTS

To keep flows at pre-development levels, in accordance with the Emfuleni Stormwater requirements, attenuation is compulsory up to a 1 in 50-year return period.

These criteria need to be met and the final SWMP shall ensure that all runoff collected from the site do no not pose a risk to erosion or ecological damage.

7 DESIGN PHILOSOPHY

Considering site-specific requirements, drainage for an aerotropolis/airport is classified into airside and landside. Additionally, there are design considerations specific to the Vaal Aerotropolis development which must be adhered to.

7.1 AIRSIDE DRAINAGE

The airside layout needs to adhere to the following:

Table 7-1 – Airside Drainage Requirements

Requirement	Reference
Efficient interception and large hydraulic drainage capacity	▪ Airport Drainage Design. Advisory Circular AC 150/5320-5D ▪ Annex 14 to the Convention on International Civil Aviation: Aerodromes – Volume I: Aerodrome Design and Operations. 9th Ed. ▪ Civil Aviation Regulations, 2011 – Part 139: Aerodromes and Heliports ▪ South African Civil Aviation Technical Standards (SA-CATS 139): Aerodromes.
Drainage in trafficked spaces should be safe and secure for travellers and airport personnel with user-friendly gratings and system designs that prevent tampering	▪ Annex 14 to the Convention on International Civil Aviation: Aerodromes – Volume I: Aerodrome Design and Operations. 9th ed. ▪ Civil Aviation Regulations, 2011 – Part 139: Aerodromes and Heliports. ▪ South African Civil Aviation Technical Standards (SA-CATS 139): Aerodromes.
Materials and methods implemented must have proven performance in ultra-duty and heavy-duty environments.	▪ Annex 14 to the Convention on International Civil Aviation: Aerodromes – Volume I: Aerodrome Design and Operations. 9th ed. ▪ Advisory Circular AC 150/5320-6: Airport Pavement Design and Evaluation. (latest Ed.) ▪ Aerodrome Design Manual – Doc 9157, Part 3: Pavements and Drainage. ▪ South African Civil Aviation Technical Standards (SA-CATS 139): Aerodromes.
Quick, simple access for cleaning with low long-term maintenance costs	▪ Airport Services Manual – Doc 9137, Part 9: Airport Maintenance Practices.
Strong, durable and corrosion-resistant to fuels and de-icing salts	▪ Aerodrome Design Manual – Doc 9157, Part 3: Pavements and Drainage. ▪ South African Civil Aviation Technical Standards (SA-CATS 139): Aerodromes.

7.2 LANDSIDE DRAINAGE

The landside areas are open to the public; therefore, the drainage system must achieve the following:

Requirement	Reference
▪ Drainage in busy, public spaces should be safe and secure for travellers and airport personnel with user-friendly gratings and system designs that prevent tampering ▪ Drainage channels should ensure safe passage for trolleys, prams, mobility aids and pedestrians ▪ No impact on accessibility of airport facilities	▪ Airport Drainage Design. Advisory Circular AC 150/5320-5D ▪ Annex 14 to the Convention on International Civil Aviation: Aerodromes – Volume I: Aerodrome Design and Operations. 9th ed. ▪ Civil Aviation Regulations, 2011 – Part 139: Aerodromes and Heliports. ▪ South African Civil Aviation Technical Standards (SA-CATS 139): Aerodromes.

7.3 GENERAL DESING PRINCIPLES

7.3.1 LOW-IMPACT DESIGN

The stormwater management system will aim to manage stormwater as close to the source as possible. Furthermore, the system will maintain, as much as possible, pre-development flow paths and flowrates at the discharge points.

Erosion controls will be implemented at discharge points using riprap, gabions and energy-dissipating solutions as appropriate, to prevent erosion and discharge velocities higher than in the pre-development scenario. This will ensure that the system does not create erosion and associated environmental degradation.

7.3.2 MAJOR AND MINOR DRAINAGE SYSTEM

A drainage approach consisting of a minor and major system will be implemented to collect and convey stormwater within the development. The design return periods for both systems are discussed in Section 8.1. The major system will be sized to carry runoff for storm events exceeding the minor system design storm event.

7.3.3 FIRST FLUSH SYSTEM AND CLEAN/DIRTY WATER SEPARATION

Runoff from green spaces and landscaped areas will be separated from runoff generated in industrialised, impervious areas. Dirty runoff will be screened and treated accordingly.

Furthermore, first flush systems will be implemented within dirty water collection infrastructure. The first-flush i.e. the initial, most polluted runoff will be diverted to nearby pre-treatment facilities to reduce the load on downstream treatment.

The volume for first flush will be estimated based on the first 15 – 25mm of runoff from dirty runoff generating areas. This estimated volume will be used to select a first flush design storm event. The selected storm event to be such that the runoff volume generated closely matches or slightly exceeds the estimated first flush volume.

Overflow systems will be implemented to ensure that clean, unpolluted runoff is separated and routed directly to water treatment infrastructure.

7.3.4 ATTENUATION TO PRE-DEVELOPMENT DISCHARGE RATES

Attenuation facilities will be provided where needed to ensure that pre-development discharge flowrates are maintained. The following design principles apply to the attenuation facilities:

- Attenuation facilities will be designed for the 1 in 50 return period with a 30 % climate change buffer added
- Runoff calculations will be based on symmetrical rainfall distributions over a 24-hour period
- Pre-development watercourses flow naturally with no obstructions and low flows
- Post-development flows will be larger than predevelopment flows
- Post Development scenario will incorporate overland flow routes for agricultural areas
- The attenuation volume will be determined as the difference between runoff generated from the site under pre-development and post-development conditions.

7.4 SITE SPECIFIC DESIGN PRINCIPLES

7.4.1 RUNWAY DRAINAGE AND FLOW ROUTING

Regarding drainage for Runways, the following is required:

- No routes and open channels near the runways to reduce environmental risks
- Maximised flow divergence away from the runways to maintain runway friction for landing and take-off

The abovementioned requirements are in accordace with the following standards and guidelines:

- Airport Drainage Design. Advisory Circular AC 150/5320-5D.
- Aerodrome Design Manual – Doc 9157, Part 3: Pavements and Drainage
- Civil Aviation Regulations, 2011 – Part 139: Aerodromes and Heliports

7.4.2 AVOIDANCE OF STANDING OPEN WATER

Stormwater management options must avoid creating areas with standing open water. Open water is not advised for aerotropolis', especially within the airport, because it attracts wildlife including birds, which introduces hazards for aviation.

As per Emfuleni Stormwater requirements, storm attenuation is compulsory for storm events up to the 1:50 year return period. Since standing water presents a safety hazard, only temporary storage facilities were implemented. Additionally, the system will be optimised such that the time allowed for standing water in attenuation facilities is minimized in the vicinity of the airport precinct.

7.5 ATTENUATION STRATEGY

Where necessary outflows will be attenuated by routing stormwater through an attenuation pond or similar facility. Attenuation facilities will ensure that pre-development discharge flowrates are maintained for storm events up to the 1 in 50-year storm, in accordance with Emfuleni Municipality Guidelines. This design storm used for sizing attenuation was selected on the basis that the site is a greenfields site. The Emfuleni Municipality is required to confirm and provide details about

classifying the site as greenfields versus brownfields or mixed. Currently, the only confirmed design storm event for attenuation purposes is the 50-year return period storm.

The Attenuation Strategy includes two key interventions, namely distribution of outflows and use of facilities store attenuated flows temporarily with a quick drawdown time:

- Post-development outflows will be distributed among multiple discharge points, instead of consolidating outflows at one location
- Standing water must be strictly minimised to avoid aviation risk related to wildlife and birds. Attenuation facilities must provide temporary runoff storage only and must ensure a quick drawdown time for stored water.

Based on this strategy, there is a need for attenuating stormwater outflows from post-development catchment 3 (see section 8.2) to protect the Leeuspruit river from post-development impacts. This introduces the need to implement an attenuation pond on site, although this is not advised for airports.

Run-off from the runways, roads and other high pollutant surfaces will contribute dirty water to this attenuation pond (even with pretreatment). Thus, strategic monitoring and access will be required to manage environmental risks.

8 PROPOSED STORMWATER MANAGEMENT NETWORK

8.1 AEROTROPOLIS

A typical aerotropolis has access roads, internal roads, parking lots, aircraft runways, taxiways, various buildings, roofs and storage sites. All development features significantly increase the impervious area on site which will increase the site's volume of stormwater and introduce hydrocarbons. The stormwater management plan will also need to accommodate for other potential pollutants, including but not limited to aviation and motor mechanical fluids (e.g. oils and petroleum) and agricultural- or produce-related chemicals.

The initial phases of the development require the site to source water independently of Rand Water and municipal supplies. Therefore, the development will rely on groundwater to a large extent. Stormwater retention and reuse will be required to avoid water shortages or similar supply impacts to the surrounding agricultural activities caused by the development's water abstraction.

8.1.1 MINOR SYSTEM

The minor system is typically designed to manage runoff resulting from storms with relatively frequent recurrence intervals within the drainage area.

However, in accordance with the Emfuleni Municipality guidelines and discussions with officials, the minor system must accommodate flows up to and including the 1 in 50-year return period. This is due to the sensitivity and importance of the receiving environment.

The minor system will consist of:

- Class 100D 900 mm Ø pipes (SANS 677),
- Kerbs for collecting run-off along internal roads, and
- Channels along the major internal roads

Run-off from taxiways and runways will be diverted towards strategically placed grid inlets,and dry swale systems to reduce the amount of stormwater on these surfaces which can pose a risk to aircraft due to loss of friction.

8.1.2 MAJOR SYSTEM

The major system is responsible for receiving stormwater discharge from the minor system and for larger, less frequent storms.

A grid system will guide the design, layout and routes. Multiple catch pits and specific airside drainage systems will collect runoff through the minor network to form the major routes. As far as possible, there will be no routes and open channels near the runways to reduce environmental and wildlife-related risks. Flow movement away from the runway will be maximised to maintain runway friction for landing and take-off.
Proposed routes will consist of:

- 100D, 1 350 mm Ø concrete pipes (SANS 677)

Appendix B depicts the proposed major system piped drainage network

Pipe flow modelling will adhere to no flooding or surcharging in any underground pipes and manholes. The results will determine the final pipe diameters, lengths and locations.

8.1.3 EMERGENCY ESCAPE ROUTES

Emergency overland flow escape routes have not been identified at conceptual stage, with the exception of overland flow routes in agricultural areas. Emergency escape routes will be identified during the detailed design stage, after platforms and bulk earthworks designs are completed.

The emergency escape routes will be configured to mitigate impacts of severe flooding and failure of the minor and/or major system.

8.2 AEROTRPOLIS ATTENUATION POND

8.2.1 LEGISLATIVE CONTEXT

The proposed attenuation pond constitutes stormwater management infrastructure intended to detain, attenuate and safely discharge surface runoff generated within the development area. As such, the planning, design, construction and operation of the attenuation pond are regulated primarily by the National Water Act, 1998 (Act No. 36 of 1998) (NWA), read together with the Regulations Regarding the Procedural Requirements for Water Use Licence Applications and Appeals (GN R267 of 2017).

In terms of the NWA, any activity that entails the use of water as defined in Section 21 may not commence unless it is authorised under a General Authorisation or a Water Use Licence (WUL), as applicable. Based on the current conceptual design and the anticipated function of the attenuation pond, it is expected that the proposed works will trigger one or more water uses listed in Section 21 of the NWA.

In accordance with GN R267 of 2017, the precise nature of the water uses, the level of risk to the water resource, and the appropriate form of authorisation (Water Use Licence or General Authorisation) will be confirmed through formal engagement with DWS. Should a Water Use Licence be required, a Water Use Licence Application will be prepared and submitted, supported by the necessary technical assessments, including hydrological, hydraulic and environmental inputs, as required by the regulations and associated DWS guidance.

8.2.2 BASIS OF DESIGN

The attenuation pond design is currently at a concept level. The conceptual design is based on the preliminary parameters summarized in the table below. These parameters will be refined during detailed design.

Table 8-1 – Basis of design summary

Design input	Value	Comment
Contributing catchment	Approx.. 31.13 km²	To be refined during detailed design based on the actual sub-catchments draining to the facility
Design Storm for detention pond	1:50 ARI + 30% CC	Municipal standard requirement.

Design input	Value	Comment
Design Storm for emergency spillway sizing	1:100 ARI (24 h)	Risk-based ARI selection
Time of Concentration (Tc)	Bracketed, approx.75–115 min	To be confirmed during detailed design
Runoff coefficients: Pre Development Post Development	 Farmland/Rural: C_pre ≈ 0.30 Weighted coefficient: C_post ≈ 0.692	 High-level Based on development land-use schedule
Rainfall Data: Sub-daily (60/90/120 min) Daily (24-hour) design depths	 Taken from recognised regional curves Derived from the nearest daily station record (2008–2024)	 Type-3 envelope used for conservatism. To be replaced with station-based IDF at detailed design.
Stage -storage Curve	Not incorporated	To be determined at detailed design stage based on pond final location, depth and shape.

8.2.3 POND DESIGN CONCEPT

The table below summarises the conceptual envelope of the proposed attenuation pond.

Item	Value	Motivation
Type of Pond	Dry detention basin (normally empty)	Ensuring no standing water to limit wildlife attraction near the airport and to restore attenuation capacity between events
Drawdown Time	24 – 48 hours	Ensuring no standing water to limit wildlife attraction near the airport and to restore attenuation capacity between events
Storage Capacity	0.95 million m^3 (950 Ml), including 10% safety buffer	
Operating Depth	4m maximum	
Average pond depth	65% of max depth = 3.25m	Estimated based on existing ground levels and pond footprint
Conceptual Plan Area	Approx. 29 Ha	Based on average pond depth

Item	Value	Motivation
Side Slopes	1V:3H minimum, 1V:4H maximum	
Access Ramp Slope:	1V:8H minimum	
Freeboard	300mm minimum	
Internal shelves, weirs, islands	None	Avoid creating sections of standing water which promotes a wading habitat
Erosion protection at inlets, outlets, energy dissipators	Rock/Rip-rap or gabion baskets	
Energy Dissipation at inlets, outlets and culverts	Rip-rap basin or stilling basin	Rip-rap basin most cost effective CSU basin most appropriate if there are space constraints
Pre-treatment	Oil and Water separator(s)	Removal of floatables, free hydrocarbons and suspended solids prior to detention. Separator sizing and bypass arrangements will be finalised at detailed design. Waste from the separator will be removed by a licensed waste contractor. Number and position to be confirmed at detailed design phase.
Sediment Control	Silt Trap	To be located upstream of the pond.
Pond Outlet	Staged Orifices or Culvert	Must ensure peak outflow is ≤ Q_pre for ARI = 1:50 + 30% CC, must enable drawdown time of 24–48 hours.
Emergency Spillway	Trapezoidal channel	Must convey 1:100 (24 h) storm event flood without embankment overtopping.
Discharge to receiving watercourse	Release from outlet structure to energy-dissipator, finally to channel section stabilised with erosion protection measures	
Outlet Protection at discharge location	Energy dissipator: dissipator basin or Rip/Rap basin Channel stabilisation at discharge point – Erosion blanket and/or gabions	Outlet, energy dissipator and erosion protection to be positioned to avoid bed/bank erosion, prevent local scour, and maintain downstream watercourse stability.

Item	Value	Motivation
Discharge Water Quality	Treated stormwater (pre-treatment and detention)	No discharge of free product or gross pollutants. Compliance monitoring proposed (see Section 10.6)
Receiving watercourse	Leeuspruit	

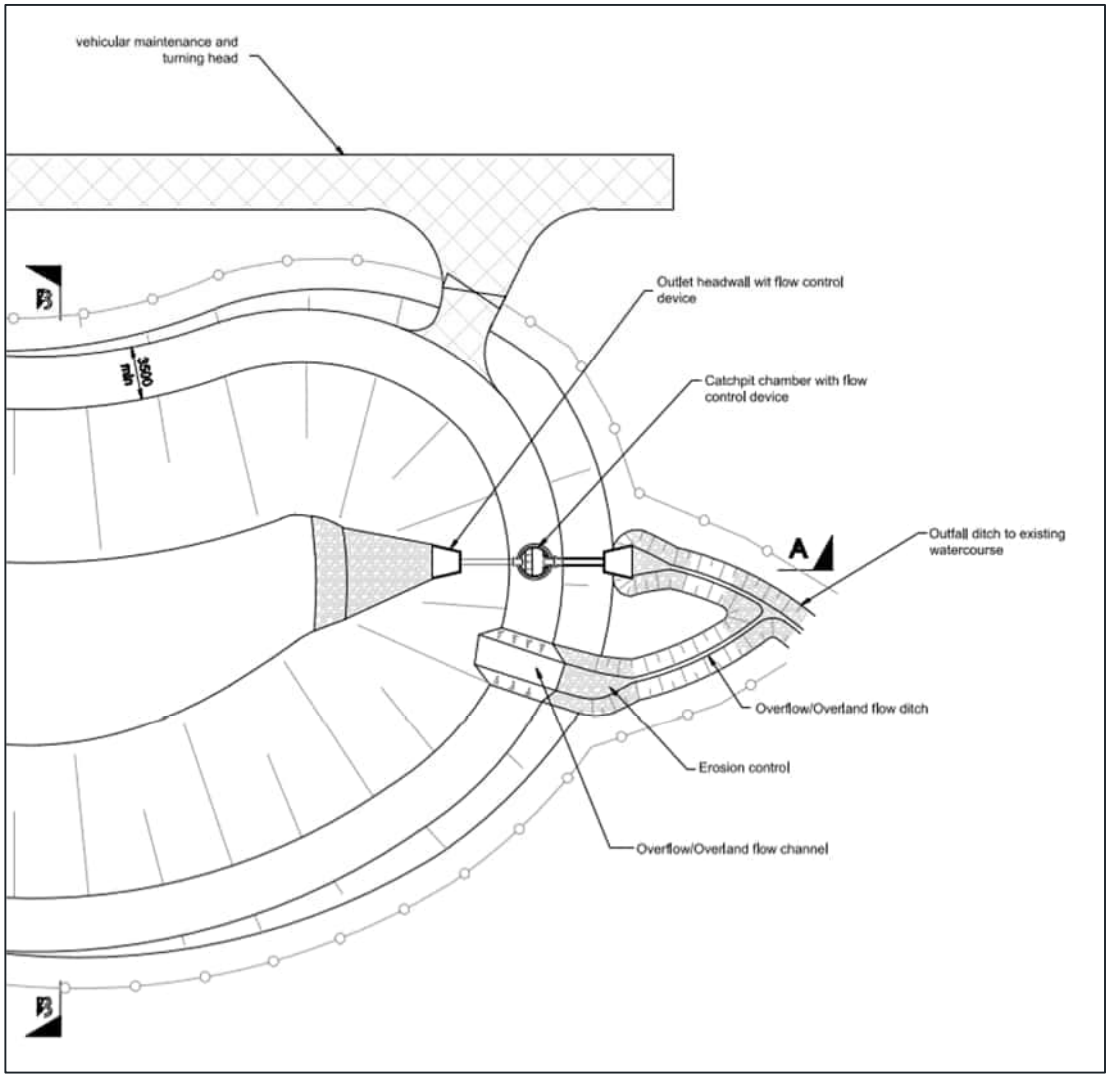


Figure 8-1 - Typical attenuation pond layout

Regulatory note: The pre-treatment and controlled-release approach is consistent with a s21(f) authorisation (if triggered) and with standard s21(b)/(c)/(i) conditions concerning erosion control, capacity, and water-quality protection

8.2.4 SAFETY AND STABILITY

Safety

Given the provisional volume and depth, the basin may fall within the category of Dams with a Safety Risk. The DWS Dam Safety Office will be consulted at detailed design to confirm registration, classification, and any additional approvals.

Stability

A detailed geotechnical investigation must be conducted to inform requirements for slope stability, seepage (including liners, subsoil drainage, etc), and settlement control. The findings and recommendations thereof will be incorporated into final design and specifications.

8.2.5 ENVIRONMENTAL INTERFACES

Existing Aquatic Ecosystems

A freshwater specialist will verify any nearby wetlands/watercourses potentially affected by the outlet and construction footprint; avoidance/minimisation measures will be applied.

Wetland Registration

This facility is an engineered, detention basin (dry under normal conditions) with fast drawdown and no permanent pool or shelves, i.e., it is not intended to function as a wetland. Under South African delineation methods, a feature is a wetland if it exhibits wetland hydrology, hydric soils, and hydrophytic vegetation. The concept design explicitly avoids creating those conditions.

It is recommended not to register or describe the detention basin as a wetland. Instead, it is recommended to:

- Record it as a stormwater management facility in the WUL; and
- Undertake a freshwater specialist assessment at detailed design to confirm that no new wetland is created and that nearby natural wetlands (if present) are avoided/protected.

8.3 STORMWATER MANAGEMENT AT INTERCHANGES

To improve the access and flow of traffic in the area and to the aerotropolis, changes are being proposed to existing roads. Changes in the road network will result in changes in the adjoining drainage. Refer to Appendix B for layouts. This section of the report discusses the stormwater management system requirements for both options respectively.

8.3.1 N1/R54/D2459 SPLIT DIAMOND INTERCHANGE

Existing Route

The R54 overpass over the N1 provides access to the proposed airport to and from the Sebokeng and Vanderbijlpark areas. There is no access to and from the proposed airport from the N1 highway.

Proposed Solution

- Access to and from the airport will be facilitated via the N1/R54/D2459 Split diamond interchange and D2459/R54 interchange.
- The N1South on-ramp to the R54 will enable traffic flow from Johannesburg to the airport
- From the R54 road, the N1 South off-ramp will allow for traffic flow from the proposed airport towards Johannesburg.
- The N1 North off-ramp will enable traffic flow from Bloemfontein via the D2459 road into the R54 West on-ramp leading the proposed airport.

Stormwater Drainage Concept

The proposed drainage will consist of new channels, culverts and one bridge at the D2459/R54 interchange. They are shown in cyan on Figure 8-2, Figure 8-3 and Figure 8-4. The proposed drainage will tie into the existing drainage which may require upgrades based on the flow volumes generated. This which will make up the major drainage system for the proposed interchange.

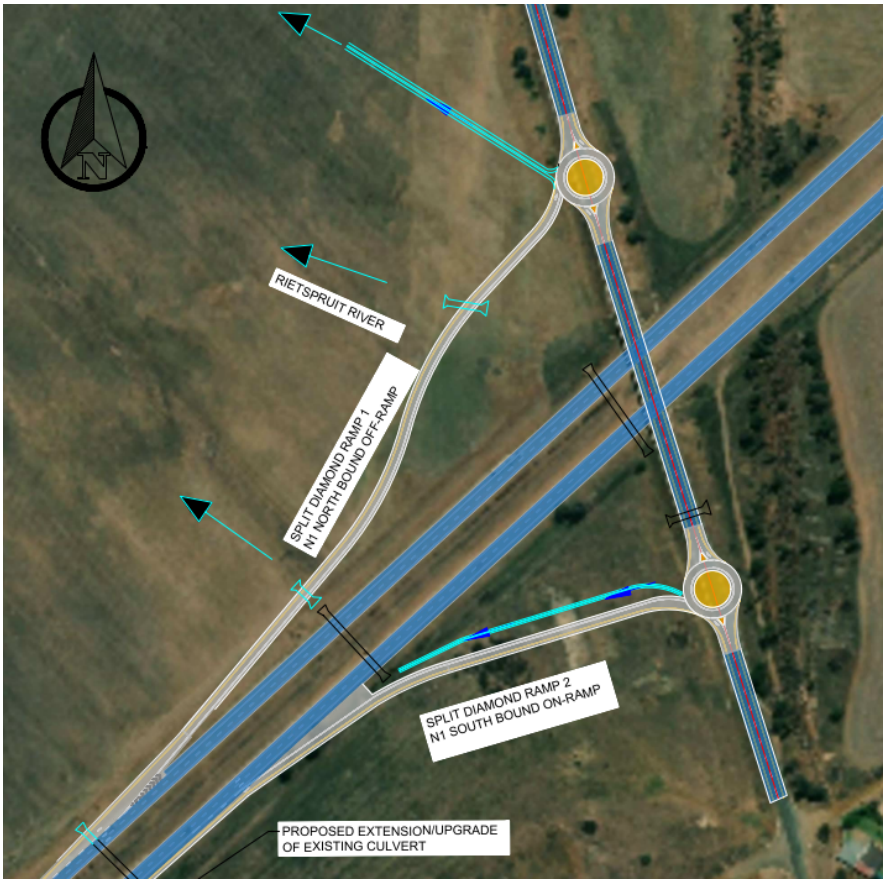


Figure 8-2 – N1/R54/D2459 Split Diamond Interchange

Figure 8-3 – N1/R54/D2459 Split Diamond Interchange (Cont.)

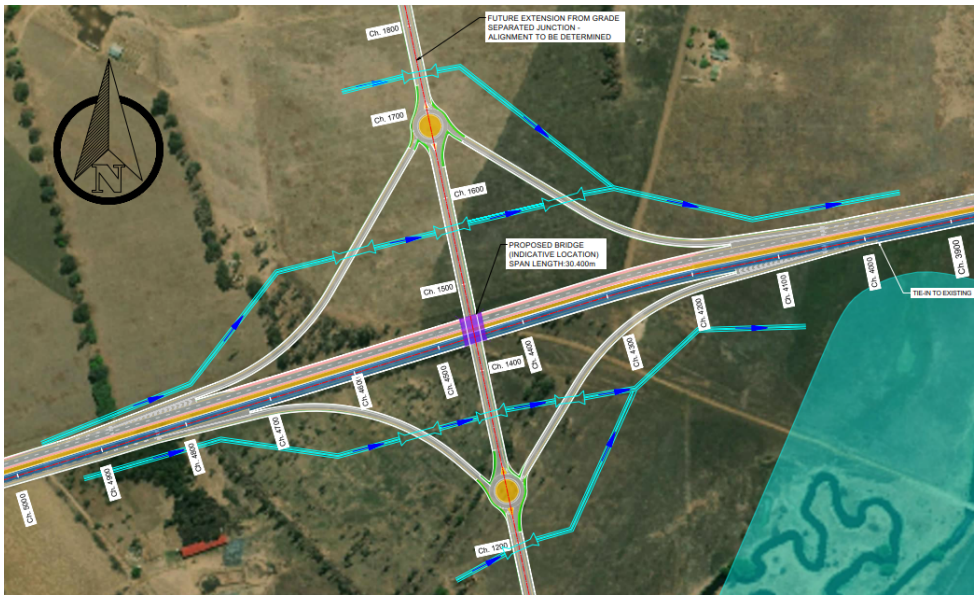


Figure 8-4 – D2459/R54 Interchange

8.4 WATER QUALITY MANAGEMENT

8.4.1 POLLUTANT MANAGEMENT

Stormwater from the development will pass through oil-water separation tanks before discharging into ponds and watercourses to improve the outflow water quality and meet the required environmental water use water quality standards.

The stormwater system is designed as a separate system from the sewage system. Stormwater drainage network to be kept separate from sewage systems.

8.4.2 EROSION AND SEDIMENT TRANSPORT CONTROLS

- Sustainable urban drainage systems (SUDS) shall be implemented wherever possible
- After the completion of bulk earthworks, road works and foundation works, green spaces and landscaped areas in the development must be vegetated and rehabilitated as soon as possible, taking specific airport requirements and specifications into consideration (see Section 9)
- Infiltration should be maximised in green spaces
- Open and exposed areas should be planted and landscaped into gardens, provided they are sufficient distance away from the take off and approach corridors, as specified by the airport's requirements.
- Exposed embankments should be covered with topsoil or vegetation to prevent erosion and sediment transport
- Hard infrastructure that intercepts, traps and reduces sediment load should be included in the design of the routes and attenuation structures (see section
- Energy dissipation, using nature and drainage infrastructure, shall be maximised to reduce the velocity of all stormwater.
- Any additional erosion or gullies identified during the construction shall be addressed with an immediate, temporary remedy of covering with vegetation or constructing silt fences

9 CONSTRUCTION PHASE IMPACT MANAGEMENT

9.1 AEROTROPOLIS

Impacts on receiving environments are often highest during construction and should be addressed in the preliminary phase and before construction commences

Stormwater management during construction is essential since impact risk is high. This should be developed by the engineers and environmental officers in consultation with municipality officials and guidelines.

An image of OR Tambo International Airport during construction is shown in Figure 9-1highlighting the significantly transformed lad cover within the construction area. Areas under construction typically high erosion and sediment risk which must be managed proactively and effectively.

During construction, materials transported in and out of the site must be regulated and prevented from polluting surface water and groundwater.

Figure 9-1 – King Shaka International Airport during construction (NCC Group, 2025)

9.1.1 GENERAL GUIDELINES

General guidelines for stormwater management during the construction phase include

- Implementing temporary cut-off channels and berms around dirty water generating areas.
- Routing clean stormwater runoff towards existing watercourses and drainage lines. This will be essential considering the relatively flat layout of the land and the potential for waterlogging in the central areas.
- Implementing appropriate erosion protection and sediment control measures.
- Complying with the site-specific Environmental and Wildlife Management Plan.

9.2 INTERCHANGES

Temporary runoff management will be required as part of the Construction Environmental Management Plan (EMP).

Temporary road closures are expected

9.3 STORMWATER CONTROLS AT THE COMMENCEMENT AND CLOSURE OF EACH DEVELOPMENT PHASE

The final SWMP must specify fully operational drainage features required for each phase of the Vaal Aerotropolis development.

Stormwater management and infrastructure at the start and end of each phase must be defined and included as a checkpoint for quality assurance and to ensure that the development is not causing any environmental harm through the unregulated stormwater.

Stormwater management for access roads and any proposed auxiliary pumps, substations and buildings should also be planned.

10 OPERATIONS, MAINTENANCE AND POST-CONSTRUCTION MONITORING

10.1 PURPOSE AND INTENT

The stormwater management system for the development comprises a minor and major drainage system, incorporating catchpits/manholes, underground concrete pipelines, kerbs and channels, dry swales/overland routing (where applicable), pre-treatment and first-flush/clean–dirty separation measures, and controlled discharge at outfalls with energy dissipation and scour protection, with allowance for emergency overland escape routes to mitigate extreme events.

This section sets out the minimum operational controls, inspections, maintenance activities and monitoring measures required to maintain design intent, prevent environmental harm, and support compliance with anticipated authorisations.

Requirements will be confirmed and quantified at detailed design once final platform levels, pipe slopes, structures, inlet/outlet details, and operational constraints are finalised.

10.2 ROLES, RESPONSIBILITIES AND EMPR LINKAGES

The EMPr shall allocate responsibilities across all stormwater components (not only the pond), and shall require auditable records of inspections, maintenance, waste disposal, and corrective actions.

Table 10-1 – Roles and Responsibilities

Role (As per EMPr)	Accountability	Responsibilities
Developer (Owner)	Overall compliance and resourcing	Ensure O&M budgets/contracts are in place for pipes/structures, pre-treatment, outfalls and erosion protection; appoint an O&M Responsible Person; ensure annual reporting is produced and retained.
Engineer (Design / Professional Team)	Performance requirements & handover	Define O&M requirements for each asset at detailed design (including triggers, access provisions, safety); issue as-builts and O&M manuals for minor/major systems, outfalls, energy dissipation and any first-flush/clean–dirty separation devices. [
Contractor (Construction phase)	Correct installation and readiness	Keep stormwater structures clear of construction debris; protect assets from siltation during construction; rectify defects; provide commissioning and close-out information.
ECO / Environmental Site Representative (Construction EMPr)	Construction compliance	Verify controls are installed/functional before commissioning; verify waste handling records for removed hydrocarbons/sediments; record and close out non-conformances.
O&M Responsible Person (Operations phase)	Day-to-day operation & records	Implement routine inspections; initiate clean-out/desilting; coordinate repairs; maintain the logbook and corrective

Role (As per EMPr)	Accountability	Responsibilities
		action register; coordinate monitoring and annual O&M reporting.
Specialist contractors (licensed)	Waste/legal compliance	Remove and dispose of hydrocarbon wastes and contaminated sediments lawfully; provide manifests/certificates for recordkeeping.

EMPr requirement: Maintain (i) a Stormwater O&M Logbook, (ii) a Corrective Action Register, and (iii) a Waste Disposal Dossier (manifests/certificates) where relevant.

10.3 OPERATIONAL PERFORMANCE REQUIREMENTS

10.3.1 FUNCTIONAL READINESS AT EACH PHASE "CHECKPOINT"

Consistent with the SWMP intent that stormwater controls must be functional at the start/end of each development phase, the EMPr shall require "stage-gate" verification that:

- Each phase has a completed and functional drainage path from collection → conveyance → treatment (where applicable) → attenuation/control → discharge; and
- Temporary works do not become permanent bottlenecks (e.g., silted catchpits, blocked inlets, unfinished outfalls).

10.3.2 DRAWDOWN AND CAPACITY RESTORATION

For attenuation/detention components (including the attenuation pond), system operation shall maintain a normally dry condition, restoring capacity typically within 24–48 hours following the design storm, subject to downstream conditions and outlet performance.

10.3.3 NO UNCONTROLLED DISCHARGE

Stormwater shall be routed such that discharge occurs only via designed outfalls and protected channels, with energy dissipation and scour control maintained to prevent erosion and downstream impacts.

10.4 MAINTENANCE FREQUENCY TABLES

The tables below extend the frequency schedule beyond separators and ponds to include the minor/major networks, structures, outfalls, channels/swales and emergency routes described in the SWMP.

Table 10-2 - Underground pipe network, inlets and structures

Asset / Activity	Monthly	Quarterly	Post-storm (significant event*)	Minimum standard / notes
Kerb inlets, grated inlets, catchpits	✓		✓	Remove litter/sediment; ensure grates secure and not tampered with; confirm inflow is not bypassing due to blockages.
Manholes / junction boxes		✓	✓	Check for surcharge evidence, debris, structural damage; verify access covers secure.
Underground pipes (minor and major)		✓	✓ (if surcharge reported)	CCTV/jetting where repeated blockages occur; confirm minimum flow velocities not compromised by sediment build-up (conceptual).
Headwalls, wingwalls, culvert inlets/outlets		✓	✓	Remove debris; check cracking, undermining, settlement; reinstate protection as needed.
Access controls & safety (covers, grates, fencing where required)	✓	✓		Particularly important in public/airport areas to prevent tampering and ensure safe passage.

* "Significant event" to be defined at detailed design/EMPr (e.g., rainfall prompting detention, overtopping of minor system, observed surcharge/ponding).

Table 10-3 - Open channels, swales, overland routing and erosion controls

Asset / Activity	Monthly	Quarterly	Post-storm	Minimum standard / notes
Dry swales / vegetated channels		✓	✓	Maintain conveyance and infiltration capacity; remove litter; re-establish vegetation where erosion occurs.
Open channels / roadside channels (where used)		✓	✓	Remove sediment deposition; repair erosion/scour; maintain free flow to outfalls.
Overland emergency escape routes		✓	✓	Confirm routes are unobstructed (no stockpiles/fencing blocking flow paths); repair erosion if flow has activated routes.
Erosion protection (rip-rap, gabions, lined sections)		✓	✓	Inspect for displacement, undermining, toe failure; repair promptly to prevent progressive erosion.

Table 10-4 - Pre-treatment, first-flush and clean/dirty separation components

Asset / Activity	Monthly	Quarterly	Post-storm	Minimum standard / notes
Oil & silt separators	✓	✓	✓	Check hydrocarbon layer and silt sump; initiate clean-out at triggers; ensure lawful disposal.
Gross pollutant traps / silt traps (if used)	✓	✓	✓	Remove accumulated litter/silt; prevent bypassing and odour; maintain accessibility for cleaning.
First-flush diversion components (if used)		✓	✓	Verify functioning and reset after activation; ensure diverted polluted runoff is routed to appropriate treatment/containment.
Clean/dirty separation interfaces		✓	✓	Confirm separation is maintained (no cross-connections or shortcuts); rectify where polluted runoff is entering “clean” lines.

10.5 RISK-BASED TRIGGER FRAMEWORK

The triggers below expand beyond pond desilting/separator clean-out to include network blockages, inlet siltation, surcharge evidence, and erosion at outfalls. Final numeric trigger levels must be confirmed at detailed design based on pipe sizes, slopes, access and operational constraints.

Table 10-5 - Risk triggers and mandatory corrective actions

Component	Risk	Trigger	Mandatory response	Records required
Kerb inlets/catchpits	Local flooding, debris transfer downstream	Recurrent ponding at inlet; inlet blocked by litter/silt; evidence of bypassing	Clean and remove debris; increase inspection frequency in that area; identify upstream source of litter/sediment	Inspection log; photos; corrective action entry
Manholes / junction boxes	Surcharge, safety risk, pollution mobilisation	Evidence of surcharge (debris line/sediment smear/odour); cover displacement	Investigate and clear blockage; jet/clean upstream/downstream pipes if recurrence; repair cover/security	Inspection log; maintenance record; corrective action entry

Component	Risk	Trigger	Mandatory response	Records required
Underground pipes	Loss of capacity, progressive siltation	Repeated blockages; recurring surcharge; reduced conveyance due to sediment	Jetting/CCTV and targeted cleaning; confirm structural integrity; adjust maintenance interval	CCTV/jetting record; corrective action entry
Oil & silt separator – hydrocarbons	Discharge of free product	Visible sheen/free oil; or hydrocarbon storage capacity nearing limit (per supplier method)	Pump-out by licensed contractor; investigate source control upstream	Waste manifest; inspection log; corrective action entry
Oil & silt separator – silt	Reduced treatment efficiency	Sediment accumulation materially reduces separator performance (per supplier guidance)	Desilt/clean; review upstream erosion controls	Waste manifest; maintenance record
Attenuation pond	Loss of storage, wildlife risk, water quality risk	Standing water persists beyond design intent; sediment reduces storage; inlet/outlet obstructed	Clear outlet/inlet; desilt if storage compromised; restore “normally dry” operation; repair erosion	Logbook; photos; removal quantities; disposal evidence if applicable
Outfalls & energy dissipation	Scour, bank instability, downstream impact	Evidence of scour/undermining; displaced rip-rap/gabions; headcut formation	Repair/replace armouring; stabilise banks; review outlet velocity controls at detailed design if recurrent	Inspection log; photos; corrective actions
Emergency escape routes	Uncontrolled flooding, damage to infrastructure	Escape route activated with erosion; route obstructed by development works	Reinstate route; repair erosion; remove obstructions; update phase checklist controls	Logbook; corrective actions

10.6 MONITORING

Monitoring requirements discussed in this section remain practical and conceptual at this stage, and will be refined after detailed design based on the actual components implemented in the stormwater management system and the detailed specification thereof.

10.6.1 POST-STORM INSPECTIONS (SYSTEM PERFORMANCE)

- After significant events, the O&M Responsible Person shall document:
- Locations of any ponding, overtopping, or surcharge at structures;
- Condition of outfalls and energy dissipation (scour/erosion);
- Performance of pre-treatment devices (evidence of bypassing, hydrocarbon sheen

10.6.2 WATER QUALITY SCREENING (EVENT-BASED)

As previously stated, implement:

- Visual hydrocarbon checks;
- Turbidity/TSS spot checks at the outlet after significant events (trend-based).

10.6.3 ANNUAL O&M REPORTING

The annual report shall summarise:

- Completion of scheduled inspections;
- Maintenance undertaken across inlets, pipes, manholes, separators, pond, outfalls, and erosion controls;
- Waste disposal documentation;
- Incidents and corrective actions;
- Any trends indicating need for design refinement at detailed stage

10.6.4 HANDOVER REQUIREMENTS

Prior to operational handover, the Contractor/Engineer shall ensure:

- As-built drawings and asset register for the minor and major systems are provided;
- Access points (manholes, catchpits, separator access, pond access ramp) are confirmed and safe;
- Baseline condition photos are captured (inlets, outfalls, pond, dissipation structures);
- The EMPr includes the finalised inspection frequency and trigger values developed at detailed design.

11 CONCLUSIONS AND RECOMMENDATIONS

In this SWMP, the proposed stormwater management has been outlined and covers the main details of the stormwater network design. The proposed stormwater management plan is subject to the detailed design stage, where additional information is required from the airport engineering and bulk earthworks designs. All management options proposed in this SWMP comply with the site conditions and standards listed locally and internationally.

11.1 SUMMARY OF THE STORMWATER NETWORK AND MANAGEMENT DESIGN

Stormwater management for the Vaal Aerotropolis development will encompass a minor and major system designed for the 1 in 50 return period, according to the Emfuleni Municipality requirements, and an additional excess of 30 % to factor in climate change.

Attenuation, erosion controls and water quality remediation of post-development flows will be considered in the final SWMP.

Erosion and sediment transport will be closely regulated during construction and the development's operational phase.

11.2 RECOMMENDATIONS

- As a best management practice and to accommodate the development's phased design, we propose that the final SWMP specifically address each phase.
- Post-development, monitoring and maintenance plans are recommended.
- The supporting flood line study provides a favourable and reasonable extent for the development and to maintain the health and integrity of the watercourse and ecology. Further calibration can and should be implemented to ensure that the flood lines have taken all available information into account.
- Careful engineering design and drainage are required relative to the waterlogging and distribution of wetlands throughout the site and river network within which the development is located.
- Additional dam gauge information should be obtained to understand the current outflows from the existing dams for detailed design.

11.3 FUTURE WORK

11.3.1 DETAILED DESIGN

The SWMP provides details relative to a conceptual level of detail and should not be considered as the final layout and design of the full network. The drainage system for the Aerotropolis and interchanges are subject to detailed design, taking detailed design of all associated infrastructure into account which may result in changes to the overall stormwater management plan.

CONFIDENTIAL

Appendix A

RUNOFF CALCULATIONS

CONFIDENTIAL

Appendix A.1

INPUT DATA

Table C-1 – Summary of sub catchment delineation (Phase 1)

Catchments	CATCHMENT AREA (ha)	% Imperv					
		Estimate roof area	Estimate Concrete hardstand	Estimate Paved area	Tarred road areas between buildings in airport etc.	Roads (including runway) and walkway	Total: (Ultimate)
Catchment 1 (Office + Head office)	3.72	41%		30%			71.0%
Catchment 2 (Conference Centre)	1.70	30%	0%	35%		0%	65.0%
Catchment 3 (Small Shopping area 1)	0.74	55%	0%	32%		0%	87.0%
Catchment 4 (Large Shopping area 2)	3.96	80%	0%	10%		0%	90.0%
Catchment 5 (Hospital)	0.86	93%	7%			0%	100.0%
Catchment 6 (Bus Office Hotelpark)	4.58	27%	0%	31%		11%	69.0%
Catchment 7 (PH1 T. Valuable Cargo Terminal)	6.86	75%	0%	10%		10%	95.0%
Catchment 10 (2 x PH 1 Future T Zone 18 HA)	52.62	75%	0%	10%		10%	95.0%
Catchment 14 (PH 1 Solar Farm 1, 2,3 and 4-568 + 183 + 171 + 186 HA)	1108.00	50%		20%		10%	80.0%
Catchment 17 (PH 1 Agri Zone)	357.20	0%	0%	5%		5%	10.0%
Catchment 23 (2x Future Commecial)	13.48	75%		5%		5%	85.0%
Catchment 24 (Car park including adjacent roads) Phase 1	86.1	65%		10%		20%	95.0%
Catchment 25 (Airport area) Phase 1	546.3	35%	30%	4%	6%	7%	82.0%
Catchment 26 (Road areas next to Future T. Zone) LHS	30					55%	55.0%
Catchment 27 (Roads next to Future T. Zone) RHS	30					55%	55.0%

Table A-2 - Summary of sub catchment delineation (Phase 2)

Catchments	CATCHMENT AREA (ha)	% Imperv					
		Estimate roof area	Estimate Concrete hardstand	Estimate Paved area	Tarred road areas between buildings in airport etc.	Roads (including runway) and walkway	Total: (Ultimate)
Catchment 8 (PH 2 Future T Zone 25 + 15 HA)	53.52	75%	0%	10%		10%	95.0%
Catchment 11 (2 x PH 2 Future T Zone 18 HA)	45.37	75%	0%	10%		10%	95.0%
Catchment 16 (PH 2 Future Agri Zone 391 HA)	391.00	0%	0%	5%		5%	10.0%
Catchment 18 (PH 2 Future Agri Lab)	655.00	0%	0%	5%		5%	10.0%

Table A-3 - Summary of sub catchment delineation (Phase 3)

Catchments	CATCHMENT AREA (ha)	% Imperv					
		Estimate roof area	Estimate Concrete hardstand	Estimate Paved area	Tarred road areas between buildings in airport etc.	Roads (including runway) and walkway	Total: (Ultimate)
Catchment 15 (PH 3 Future Agri Zone 338 HA)	338.00	0%	0%	5%		5%	10.0%
Catchment 19 (PH 3 Future Trade Zone 338 HA)	127.00	85%	0%	10%		0%	95.0%
Catchment 20 (PH 3 Future Trade Zone 67 HA)	67.00	85%	0%	10%		0%	95.0%
Catchment 21 (PH 3 Future Trade Zone 124 HA)	124.00	85%	0%	10%		0%	95.0%
Catchment 22 (PH 3 Future Agri Zone)	942.00	0%	0%	5%		5%	10.0%
Catchment 28 (Railway Hub and rail line) Phase 3	10.4	85%		10%			95.0%
Catchment 29 (Road next parallel to FH3 Future Trade Zones (124 Ha)+ Road going through PH3 Future Agri Zone (South) 338HA)	27.8					100%	100.0%

Appendix A.2

CALCULATION SHEETS

PCSWMM SUBCATCHMENT PROPERTIES FOR VAAL AEROTROPOLIS

PCSWMM Subcatchments	Catchments	CATCHMENT AREA (ha)	% Imperv						0-5yr's
			Estimate roof area	Estimate Concrete hardstand	Estimate Paved area	Tarred road areas between buildings in airport etc.	Roads (including runway) and walkway	Total: (Ultimate)	50%
S79	Catchment 1 (Office + Head office)	3.72	41%		30%			**71.0%**	**35.5%**
S81	Catchment 2 (Conference Centre)	1.70	30%	0%	35%		0%	**65.0%**	**32.5%**
S82	Catchment 3 (Small Shopping area 1)	0.74	55%	0%	32%		0%	**87.0%**	**43.5%**
S82	Catchment 4 (Large Shopping area 2)	3.96	80%	0%	10%		0%	**90.0%**	**45.0%**
S80	Catchment 5 (Hospital)	0.86	93%	7%			0%	**100.0%**	**50.0%**
S78	Catchment 6 (Bus Office Hotelpark)	4.58	27%	0%	31%		11%	**69.0%**	**34.5%**
S64, S67, S56, S51	Catchment 7 (PH1 T. Valuable Cargo Terminal)	6.86	75%	0%	10%		10%	**95.0%**	**47.5%**
S77, S71, S70, S60, S86	Catchment 8 (PH 2 Future T Zone 25 + 15 HA)	53.52	75%	0%	10%		10%	**95.0%**	**47.5%**
S58	Catchment 10 (2 x PH 1 Future T Zone 18 HA)	52.62	75%	0%	10%		10%	**95.0%**	**47.5%**
S62	Catchment 11 (2 x PH 2 Future T Zone 18 HA)	45.37	75%	0%	10%		10%	**95.0%**	**47.5%**
	Catchment 14 (PH 1 Solar Farm 1, 2,3 and 4- 568 + 183 + 171 + 186 HA)	1108.00	50%		20%		10%	**80.0%**	**40.0%**
	Catchment 15 (PH 3 Future Agri Zone 338 HA)	338.00	0%	0%	5%		5%	**10.0%**	**5.0%**
S83	Catchment 16 (PH 2 Future Agri Zone 391 HA)	391.00	0%	0%	5%		5%	**10.0%**	**5.0%**
S54, S53, S85	Catchment 17 (PH 1 Agri Zone)	357.20	0%	0%	5%		5%	**10.0%**	**5.0%**
S82	Catchment 18 (PH 2 Future Agri Lab)	655.00	0%	0%	5%		5%	**10.0%**	**5.0%**
	Catchment 19 (PH 3 Future Trade Zone 338 HA)	127.00	85%	0%	10%		0%	**95.0%**	**47.5%**
S92, S42, S88, S84	Catchment 20 (PH 3 Future Trade Zone 67 HA)	67.00	85%	0%	10%		0%	**95.0%**	**47.5%**
S92, S43	Catchment 21 (PH 3 Future Trade Zone 124 HA)	124.00	85%	0%	10%		0%	**95.0%**	**47.5%**
	Catchment 22 (PH 3 Future Agri Zone)	942.00	0%	0%	5%		5%	**10.0%**	**5.0%**
75,76	Catchment 23 (2x Future Commecial)	13.48	75%		5%		5%	**85.0%**	**42.5%**
S76, S75, S67, S66, S65, S55	Catchment 24 (Car park) Phase 1	86.1	65%		10%		20%	**95.0%**	**47.5%**
S56, S51, S68, S69, S64, S57, S63, S59, S87, S91,	Catchment 25 (Airport area) Phase 1	546.3	35%	30%	4%	6%	7%	**82.0%**	**41.0%**
73,74	Catchment 26 (Road areas next to Future T. Zone) LHS	30					55%	**55.0%**	**27.5%**
S90, S93	Catchment 27 (Roads next to Future T. Zone) RHS	30					55%	**55.0%**	**27.5%**
S89, S1	Catchment 28 (Railway Hub and rail line) Phase 3	10.4	85%		10%			**95.0%**	**47.5%**

PCSWMM SUBCATCHMENT PROPERTIES FOR VAAL AEROTROPOLIS

PCSWMM Subcatchments	Catchments	CATCHMENT AREA (ha)	N-Imperv					
			Roof area	Concrete hardstand	Paved area	Tarred road areas between buildings in airport etc.	Roads and sidewalks	Average
S79	Catchment 1 (Office + Head office)	3.72	added under % Zer-Imperv	0.013	0.014	0.011	0.011	**0.014**
S81	Catchment 2 (Conference Centre)	1.70		0.013	0.014	0.011	0.011	**0.014**
S82	Catchment 3 (Small Shopping area 1)	0.74		0.013	0.014	0.011	0.011	**0.014**
S82	Catchment 4 (Large Shopping area 2)	3.96		0.013	0.014	0.011	0.011	**0.014**
S80	Catchment 5 (Hospital)	0.86		0.013	0.014	0.011	0.011	**0.001**
S78	Catchment 6 (Bus Office Hotelpark)	4.58		0.013	0.014	0.011	0.011	**0.012**
S64, S67, S56, S51	Catchment 7 (PH1 T. Valuable Cargo Terminal)	6.86		0.013	0.014	0.011	0.011	**0.008**
S77, S71, S70, S60, S86	Catchment 8 (PH 2 Future T Zone 25 + 15 HA)	53.52		0.013	0.014	0.011	0.011	**0.008**
S58	Catchment 10 (2 x PH 1 Future T Zone 18 HA)	52.62		0.013	0.014	0.011	0.011	**0.008**
S62	Catchment 11 (2 x PH 2 Future T Zone 18 HA)	45.37		0.013	0.014	0.011	0.011	**0.008**
	Catchment 14 (PH 1 Solar Farm 1, 2,3 and 4- 568 + 183 + 171 + 186 HA)	1108.00		0.013	0.014	0.011	0.011	**0.010**
	Catchment 15 (PH 3 Future Agri Zone 338 HA)	338.00		0.013	0.014	0.011	0.011	**0.008**
S83	Catchment 16 (PH 2 Future Agri Zone 391 HA)	391.00		0.013	0.014	0.011	0.011	**0.008**
S54, S53, S85	Catchment 17 (PH 1 Agri Zone)	357.20		0.013	0.014	0.011	0.011	**0.008**
S82	Catchment 18 (PH 2 Future Agri Lab)	655.00		0.013	0.014	0.011	0.011	**0.008**
	Catchment 19 (PH 3 Future Trade Zone 338 HA)	127.00		0.013	0.014	0.011	0.011	**0.014**
S92, S42, S88, S84	Catchment 20 (PH 3 Future Trade Zone 67 HA)	67.00		0.013	0.014	0.011	0.011	**0.014**
S92, S43	Catchment 21 (PH 3 Future Trade Zone 124 HA)	124.00		0.013	0.014	0.011	0.011	**0.014**
	Catchment 22 (PH 3 Future Agri Zone)	942.00		0.013	0.014	0.011	0.011	**0.008**
75,76	Catchment 23 (2x Future Commecial)	13.48		0.013	0.014	0.011	0.011	**0.008**
S76, S75, S67, S66, S65, S55	Catchment 24 (Car park) Phase 1	86.1		0.013	0.014	0.011	0.011	**0.007**
S56, S51, S68, S69, S64, S57, S63, S59, S87, S91,	Catchment 25 (Airport area) Phase 1	546.3		0.013	0.014	0.011	0.011	**0.007**
73,74	Catchment 26 (Road areas next to Future T. Zone) LHS	30		0.013	0.014	0.011	0.011	**0.006**
S90, S93	Catchment 27 (Roads next to Future T. Zone) RHS	30		0.013	0.014	0.011	0.011	**0.006**
S89, S1	Catchment 28 (Railway Hub and rail line) Phase 3	10.4		0.013	0.014	0.011	0.011	**0.014**

PCSWMM SUBCATCHMENT PROPERTIES FOR VAAL AEROTROPOLIS

PCSWMM Subcatchments	Catchments	CATCHMENT AREA (ha)	N-Perv						
			Assumed wearing coarse	Assumed wearing coarse Area %	Assumed grass (short, prarie)	Assumed grass Area %	Natural Area	Natural Area %	Average
S79	Catchment 1 (Office + Head office)	3.72	0.03	70	0.15	20	0.025	10	**0.053**
S81	Catchment 2 (Conference Centre)	1.70	0.03	50	0.15	30	0.025	20	**0.065**
S82	Catchment 3 (Small Shopping area 1)	0.74	0.03	70	0.15	20	0.025	10	**0.053**
S82	Catchment 4 (Large Shopping area 2)	3.96	0.03	70	0.15	20	0.025	10	**0.053**
S80	Catchment 5 (Hospital)	0.86	0.03	0	0.15	0	0.025	0	**0.000**
S78	Catchment 6 (Bus Office Hotelpark)	4.58	0.03	70	0.15	20	0.025	10	**0.053**
S64, S67, S56, S51	Catchment 7 (PH1 T. Valuable Cargo Terminal)	6.86	0.03	70	0.15	20	0.025	10	**0.053**
S77, S71, S70, S60, S86	Catchment 8 (PH 2 Future T Zone 25 + 15 HA)	53.52	0.03	70	0.15	20	0.025	10	**0.053**
S58	Catchment 10 (2 x PH 1 Future T Zone 18 HA)	52.62	0.03	70	0.15	20	0.025	10	**0.053**
S62	Catchment 11 (2 x PH 2 Future T Zone 18 HA)	45.37	0.03	70	0.15	20	0.025	10	**0.053**
	Catchment 14 (PH 1 Solar Farm 1, 2,3 and 4- 568 + 183 + 171 + 186 HA)	1108.00	0.03	70	0.15	20	0.025	10	**0.053**
	Catchment 15 (PH 3 Future Agri Zone 338 HA)	338.00	0.03	10	0.15	80	0.025	10	**0.125**
S83	Catchment 16 (PH 2 Future Agri Zone 391 HA)	391.00	0.03	10	0.15	80	0.025	10	**0.125**
S54, S53, S85	Catchment 17 (PH 1 Agri Zone)	357.20	0.03	10	0.15	80	0.025	10	**0.125**
S82	Catchment 18 (PH 2 Future Agri Lab)	655.00	0.03	10	0.15	80	0.025	10	**0.125**
	Catchment 19 (PH 3 Future Trade Zone 338 HA)	127.00	0.03	80	0.15	10	0.025	10	**0.041**
S92, S42, S88, S84	Catchment 20 (PH 3 Future Trade Zone 67 HA)	67.00	0.03	80	0.15	10	0.025	10	**0.041**
S92, S43	Catchment 21 (PH 3 Future Trade Zone 124 HA)	124.00	0.03	80	0.15	10	0.025	10	**0.041**
	Catchment 22 (PH 3 Future Agri Zone)	942.00	0.03	10	0.15	80	0.025	10	**0.125**
75,76	Catchment 23 (2x Future Commecial)	13.48	0.03	70	0.15	20	0.025	10	**0.053**
S76, S75, S67, S66, S65, S55	Catchment 24 (Car park) Phase 1	86.1	0.03	70	0.15	20	0.025	10	**0.053**
S56, S51, S68, S69, S64, S57, S63, S59, S87, S91,	Catchment 25 (Airport area) Phase 1	546.3	0.03	60	0.15	20	0.025	20	**0.053**
73,74	Catchment 26 (Road areas next to Future T. Zone) LHS	30	0.03	100	0.15	0	0.025	0	**0.030**
S90, S93	Catchment 27 (Roads next to Future T. Zone) RHS	30	0.03	100	0.15	0	0.025	0	**0.030**
S89, S1	Catchment 28 (Railway Hub and rail line) Phase 3	10.4	0.03	70	0.15	20	0.025	10	**0.053**

PCSWMM SUBCATCHMENT PROPERTIES FOR VAAL AEROTROPOLIS

PCSWMM Subcatchments	Catchments	CATCHMENT AREA (ha)	Dstore-Imperv (mm)					
			Roof area	Concrete hardstand	Paved area	Tarred road areas between buildings in airport etc.	Roads and sidewalks	Average
S79	Catchment 1 (Office + Head office)	3.72	added under % Zer-Imperv	1.5	2	2.5	2.5	**2.0**
S81	Catchment 2 (Conference Centre)	1.70		1.5	2	2.5	2.5	**2.0**
S82	Catchment 3 (Small Shopping area 1)	0.74		1.5	2	2.5	2.5	**2.0**
S82	Catchment 4 (Large Shopping area 2)	3.96		1.5	2	2.5	2.5	**2.0**
S80	Catchment 5 (Hospital)	0.86		1.5	2	2.5	2.5	**1.5**
S78	Catchment 6 (Bus Office Hotelpark)	4.58		1.5	2	2.5	2.5	**2.1**
S64, S67, S56, S51	Catchment 7 (PH1 T. Valuable Cargo Terminal)	6.86		1.5	2	2.5	2.5	**2.3**
S77, S71, S70, S60, S86	Catchment 8 (PH 2 Future T Zone 25 + 15 HA)	53.52		1.5	2	2.5	2.5	**2.3**
S58	Catchment 10 (2 x PH 1 Future T Zone 18 HA)	52.62		1.5	2	2.5	2.5	**2.3**
S62	Catchment 11 (2 x PH 2 Future T Zone 18 HA)	45.37		1.5	2	2.5	2.5	**2.3**
	Catchment 14 (PH 1 Solar Farm 1, 2,3 and 4- 568 + 183 + 171 + 186 HA)	1108.00		1.5	2	2.5	2.5	**2.2**
	Catchment 15 (PH 3 Future Agri Zone 338 HA)	338.00		1.5	2	2.5	2.5	**2.3**
S83	Catchment 16 (PH 2 Future Agri Zone 391 HA)	391.00		1.5	2	2.5	2.5	**2.3**
S54, S53, S85	Catchment 17 (PH 1 Agri Zone)	357.20		1.5	2	2.5	2.5	**2.3**
S82	Catchment 18 (PH 2 Future Agri Lab)	655.00			2	2.5		**1.0**
	Catchment 19 (PH 3 Future Trade Zone 338 HA)	127.00		1.5	2	2.5	2.5	**2.0**
S92, S42, S88, S84	Catchment 20 (PH 3 Future Trade Zone 67 HA)	67.00		1.5	2	2.5	2.5	**2.0**
S92, S43	Catchment 21 (PH 3 Future Trade Zone 124 HA)	124.00		1.5	2	2.5	2.5	**2.0**
	Catchment 22 (PH 3 Future Agri Zone)	942.00		1.5	2	2.5	2.5	**2.3**
75,76	Catchment 23 (2x Future Commecial)	13.48		1.5	2	2.5	2.5	**2.3**
S76, S75, S67, S66, S65, S55	Catchment 24 (Car park) Phase 1	86.1		1.5	2	2.5	2.5	**2.3**
S56, S51, S68, S69, S64, S57, S63, S59, S87, S91,	Catchment 25 (Airport area) Phase 1	546.3		1.5	2	2.5	2.5	**1.8**
73,74	Catchment 26 (Road areas next to Future T. Zone) LHS	30		1.5	2	2.5	2.5	**2.5**
S90, S93	Catchment 27 (Roads next to Future T. Zone) RHS	30		1.5	2	2.5	2.5	**2.5**
S89, S1	Catchment 28 (Railway Hub and rail line) Phase 3	10.4		1.5	2	2.5	2.5	**2.0**

PCSWMM SUBCATCHMENT PROPERTIES FOR VAAL AEROTROPOLIS

PCSWMM Subcatchments	Catchments	CATCHMENT AREA (ha)	Dstore-Perv (mm)				% Zero-Imperv	
			Assumed wearing coarse	Assumed grass (short, prarie)	Natural Area	Average	Ultimate	
S79	Catchment 1 (Office + Head office)	3.72	3	4	5	**3**	100%	50%
S81	Catchment 2 (Conference Centre)	1.70	3	4	5	**4**	100%	50%
S82	Catchment 3 (Small Shopping area 1)	0.74	3	4	5	**3**	100%	50%
S82	Catchment 4 (Large Shopping area 2)	3.96	3	4	5	**3**	100%	50%
S80	Catchment 5 (Hospital)	0.86	3	4	5	**0**	93%	47%
S78	Catchment 6 (Bus Office Hotelpark)	4.58	3	4	5	**3**	71%	36%
S64, S67, S56, S51	Catchment 7 (PH1 T. Valuable Cargo Terminal)	6.86	3	4	5	**3**	88%	44%
S77, S71, S70, S60, S86	Catchment 8 (PH 2 Future T Zone 25 + 15 HA)	53.52	3	4	5	**3**	88%	44%
S58	Catchment 10 (2 x PH 1 Future T Zone 18 HA)	52.62	3	4	5	**3**	88%	44%
S62	Catchment 11 (2 x PH 2 Future T Zone 18 HA)	45.37	3	4	5	**3**	88%	44%
	Catchment 14 (PH 1 Solar Farm 1, 2,3 and 4- 568 + 183 + 171 + 186 HA)	1108.00	3	4	5	**3**	83%	42%
	Catchment 15 (PH 3 Future Agri Zone 338 HA)	338.00	3	4	5	**4**	0%	0%
S83	Catchment 16 (PH 2 Future Agri Zone 391 HA)	391.00	3	4	5	**4**	0%	0%
S54, S53, S85	Catchment 17 (PH 1 Agri Zone)	357.20	3	4	5	**4**	0%	0%
S82	Catchment 18 (PH 2 Future Agri Lab)	655.00	3	4	5	**4**	0%	0%
	Catchment 19 (PH 3 Future Trade Zone 338 HA)	127.00	3	4	5	**3**	100%	50%
S92, S42, S88, S84	Catchment 20 (PH 3 Future Trade Zone 67 HA)	67.00	3	4	5	**3**	100%	50%
S92, S43	Catchment 21 (PH 3 Future Trade Zone 124 HA)	124.00	3	4	5	**3**	100%	50%
	Catchment 22 (PH 3 Future Agri Zone)	942.00	3	4	5	**4**	0%	0%
75,76	Catchment 23 (2x Future Commecial)	13.48	3	4	5	**3**	94%	47%
S76, S75, S67, S66, S65, S55	Catchment 24 (Car park) Phase 1	86.1	3	4	5	**3**	76%	38%
S56, S51, S68, S69, S64, S57, S63, S59, S87, S91,	Catchment 25 (Airport area) Phase 1	546.3	3	4	5	**4**	49%	24%
73,74	Catchment 26 (Road areas next to Future T. Zone) LHS	30	3	4	5	**3**	0%	0%
S90, S93	Catchment 27 (Roads next to Future T. Zone) RHS	30	3	4	5	**3**	0%	0%
S89, S1	Catchment 28 (Railway Hub and rail line) Phase 3	10.4	3	4	5	**3**	100%	50%

PCSWMM SUBCATCHMENT PROPERTIES FOR VAAL AEROTROPOLIS

PCSWMM Subcatchments	Catchments	CATCHMENT AREA (ha)	Infiltration						LID Controls
			Method	Max. Infiltration (mm/hr)	Min. Infiltration (mm/hr)	Decay Const.	Drying time (days)	Max. Infil Vol	
S79	Catchment 1 (Office + Head office)	3.72	Horton	50	10	2	5	**0**	N/A
S81	Catchment 2 (Conference Centre)	1.70	Horton	50	10	2	5	**0**	N/A
S82	Catchment 3 (Small Shopping area 1)	0.74	Horton	50	10	2	5	**0**	N/A
S82	Catchment 4 (Large Shopping area 2)	3.96	Horton	50	10	2	5	**0**	N/A
S80	Catchment 5 (Hospital)	0.86	Horton	50	10	2	5	**0**	N/A
S78	Catchment 6 (Bus Office Hotelpark)	4.58	Horton	50	10	2	5	**0**	N/A
S64, S67, S56, S51	Catchment 7 (PH1 T. Valuable Cargo Terminal)	6.86	Horton	50	10	2	5	**0**	N/A
S77, S71, S70, S60, S86	Catchment 8 (PH 2 Future T Zone 25 + 15 HA)	53.52	Horton	50	10	2	5	**0**	N/A
S58	Catchment 10 (2 x PH 1 Future T Zone 18 HA)	52.62	Horton	50	10	2	5	**0**	N/A
S62	Catchment 11 (2 x PH 2 Future T Zone 18 HA)	45.37	Horton	50	10	2	5	**0**	N/A
	Catchment 14 (PH 1 Solar Farm 1, 2,3 and 4- 568 + 183 + 171 + 186 HA)	1108.00	Horton	50	10	2	5	**0**	N/A
	Catchment 15 (PH 3 Future Agri Zone 338 HA)	338.00	Horton	50	10	2	5	**0**	N/A
S83	Catchment 16 (PH 2 Future Agri Zone 391 HA)	391.00	Horton	50	10	2	5	**0**	N/A
S54, S53, S85	Catchment 17 (PH 1 Agri Zone)	357.20	Horton	50	10	2	5	**0**	N/A
S82	Catchment 18 (PH 2 Future Agri Lab)	655.00	Horton	50	10				
	Catchment 19 (PH 3 Future Trade Zone 338 HA)	127.00	Horton	50	10	2	5	**0**	N/A
S92, S42, S88, S84	Catchment 20 (PH 3 Future Trade Zone 67 HA)	67.00	Horton	50	10	2	5	**0**	N/A
S92, S43	Catchment 21 (PH 3 Future Trade Zone 124 HA)	124.00	Horton	50	10	2	5	**0**	N/A
	Catchment 22 (PH 3 Future Agri Zone)	942.00	Horton	50	10	2	5	**0**	N/A
75,76	Catchment 23 (2x Future Commecial)	13.48	Horton	50	10	2	5	**0**	N/A
S76, S75, S67, S66, S65, S55	Catchment 24 (Car park) Phase 1	86.1	Horton	50	10	2	5	**0**	N/A
S56, S51, S68, S69, S64, S57, S63, S59, S87, S91,	Catchment 25 (Airport area) Phase 1	546.3	Horton	50	10	2	5	**0**	N/A
73,74	Catchment 26 (Road areas next to Future T. Zone) LHS	30	Horton	50	10	2	5	**0**	N/A
S90, S93	Catchment 27 (Roads next to Future T. Zone) RHS	30	Horton	50	10	2	5	**0**	N/A
S89, S1	Catchment 28 (Railway Hub and rail line) Phase 3	10.4	Horton	50	10	2	5	**0**	N/A

Appendix A.3

MODEL OUTPUTS AND RESULTS

```
EPA STORM WATER MANAGEMENT MODEL - VERSION 5.2 (Build 5.2.3)
------------------------------------------------------------

Starting model to build up for Phase 1


WARNING 02: maximum depth increased for Node MH21_(SW_1)
WARNING 02: maximum depth increased for Node MH26_(SW_3)
WARNING 02: maximum depth increased for Node MH28_(SW_4)
WARNING 02: maximum depth increased for Node MH29_(SW_4)
WARNING 02: maximum depth increased for Node MH31_(SW_5)
WARNING 02: maximum depth increased for Node MH36_(SW_6)
WARNING 02: maximum depth increased for Node MH39_(SW_6)
WARNING 02: maximum depth increased for Node MH41_(SW_6)
WARNING 02: maximum depth increased for Node MH44_(SW_6)
WARNING 02: maximum depth increased for Node MH45_(SW_6)
WARNING 02: maximum depth increased for Node MH47_(SW_7)
WARNING 02: maximum depth increased for Node MH49_(SW_7)
WARNING 02: maximum depth increased for Node MH50_(SW_8)
WARNING 02: maximum depth increased for Node MH53_(SW_9)

*************
Element Count
*************
Number of rain gages ...... 7
Number of subcatchments ... 43
Number of nodes ........... 50
Number of links ........... 42
Number of pollutants ...... 0
Number of land uses ....... 0


****************
Raingage Summary
****************
                                                        Data       Recording
Name                  Data Source                       Type       Interval
-------------------------------------------------------------------------
43103108_VAAL_VRNG_IDF_100y 43103108_VAAL_VRNG_IDF_100y    INTENSITY    6 min.
43103108_VAAL_VRNG_IDF_50y 43103108_VAAL_VRNG_IDF_50y     INTENSITY    6 min.
```

****
Subcatchment Summary
****

Name	Area	Width	%Imperv	%Slope	Rain Gage	Outlet
S42	36.25	500.00	95.00	0.5000	43103108_VAAL_VRNG_IDF_50y	J11
S43	48.50	500.00	95.00	0.5000	43103108_VAAL_VRNG_IDF_50y	J13
S53	177.59	500.00	10.00	0.5000	43103108_VAAL_VRNG_IDF_50y	MH18_(SW_1)
S54	54.99	500.00	10.00	0.5000	43103108_VAAL_VRNG_IDF_50y	MH25_(SW_3)
S55	86.72	500.00	95.00	0.5000	43103108_VAAL_VRNG_IDF_50y	MH31_(SW_5)
S56	119.17	500.00	82.00	0.5000	43103108_VAAL_VRNG_IDF_50y	MH19_(SW_1)
S57	42.79	500.00	82.00	0.5000	43103108_VAAL_VRNG_IDF_50y	J1
S58	43.41	500.00	95.00	0.5000	43103108_VAAL_VRNG_IDF_50y	J2
S59	29.14	500.00	82.00	0.5000	43103108_VAAL_VRNG_IDF_50y	J1
S60	34.12	500.00	95.00	0.5000	43103108_VAAL_VRNG_IDF_50y	J3
S61	105.95	500.00	25.00	0.5000	43103108_VAAL_VRNG_IDF_50y	MH52_(SW_9)
S62	40.90	500.00	95.00	0.5000	43103108_VAAL_VRNG_IDF_50y	J2
S63	44.19	500.00	82.00	0.5000	43103108_VAAL_VRNG_IDF_50y	J7
S64	95.12	500.00	95.00	0.5000	43103108_VAAL_VRNG_IDF_50y	MH25_(SW_3)
S65	49.30	500.00	95.00	0.5000	43103108_VAAL_VRNG_IDF_50y	MH32_(SW_5)
S66	37.55	500.00	95.00	0.5000	43103108_VAAL_VRNG_IDF_50y	MH28_(SW_4)
S67	95.12	500.00	95.00	0.5000	43103108_VAAL_VRNG_IDF_50y	MH31_(SW_5)
S68	96.41	500.00	82.00	0.5000	43103108_VAAL_VRNG_IDF_50y	MH46_(SW_6)
S69	5.31	500.00	82.00	0.5000	43103108_VAAL_VRNG_IDF_50y	MH49_(SW_7)
S70	3.25	500.00	95.00	0.5000	43103108_VAAL_VRNG_IDF_50y	MH45_(SW_6)
S71	7.03	500.00	95.00	0.5000	43103108_VAAL_VRNG_IDF_50y	MH44_(SW_6)
S72	6.90	500.00	95.00	0.5000	43103108_VAAL_VRNG_IDF_50y	MH48_(SW_7)
S73	43.81	500.00	55.00	0.5000	43103108_VAAL_VRNG_IDF_50y	J9
S74	38.73	500.00	55.00	0.5000	43103108_VAAL_VRNG_IDF_50y	MH47_(SW_7)
S75	35.23	500.00	85.00	0.5000	43103108_VAAL_VRNG_IDF_50y	MH32_(SW_5)
S76	27.63	500.00	85.00	0.5000	43103108_VAAL_VRNG_IDF_50y	MH28_(SW_4)
S77	3.99	500.00	95.00	0.5000	43103108_VAAL_VRNG_IDF_50y	MH43_(SW_6)
S78	5.69	500.00	69.00	0.5000	43103108_VAAL_VRNG_IDF_50y	MH43_(SW_6)
S79	6.55	500.00	71.00	0.5000	43103108_VAAL_VRNG_IDF_50y	MH43_(SW_6)
S80	3.31	500.00	100.00	0.5000	43103108_VAAL_VRNG_IDF_50y	MH42_(SW_6)
S81	3.71	500.00	65.00	0.5000	43103108_VAAL_VRNG_IDF_50y	MH42_(SW_6)
S82	9.06	500.00	10.00	0.5000	43103108_VAAL_VRNG_IDF_50y	MH42_(SW_6)
S83	160.93	500.00	10.00	0.5000	43103108_VAAL_VRNG_IDF_50y	MH40_(SW_6)
S84	13.05	500.00	95.00	0.5000	43103108_VAAL_VRNG_IDF_50y	MH50_(SW_8)
S85	43.47	500.00	10.00	0.5000	43103108_VAAL_VRNG_IDF_50y	J4
S86	26.94	500.00	95.00	0.5000	43103108_VAAL_VRNG_IDF_50y	J3

S87	22.16	500.00	82.00	0.5000	43103108_VAAL_VRNG_IDF_50y	MH53_(SW_9)
S88	25.42	500.00	95.00	0.5000	43103108_VAAL_VRNG_IDF_50y	J10
S89	122.35	500.00	95.00	0.5000	43103108_VAAL_VRNG_IDF_50y	MH20_(SW_1)
S90	11.95	500.00	55.00	0.5000	43103108_VAAL_VRNG_IDF_50y	MH38_(SW_6)
S91	31.18	500.00	82.00	0.5000	43103108_VAAL_VRNG_IDF_50y	J12
S92	33.88	500.00	95.00	0.5000	43103108_VAAL_VRNG_IDF_50y	J12
S93	17.28	500.00	55.00	0.5000	43103108_VAAL_VRNG_IDF_50y	MH38_(SW_6)

****
Node Summary
****

Name	Type	Invert Elev.	Max. Depth	Ponded Area	External Inflow
J1	JUNCTION	1477.92	7.69	0.0	
J10	JUNCTION	1479.23	1.51	0.0	
J11	JUNCTION	1478.51	2.19	0.0	
J12	JUNCTION	0.00	0.90	0.0	
J13	JUNCTION	1477.61	3.05	0.0	
J14	JUNCTION	1477.54	3.12	0.0	
J2	JUNCTION	1479.01	5.75	0.0	
J3	JUNCTION	1478.09	4.76	0.0	
J4	JUNCTION	1477.22	7.69	0.0	
J5	JUNCTION	1477.44	4.06	0.0	
J6	JUNCTION	1478.90	2.32	0.0	
J7	JUNCTION	1477.99	2.74	0.0	
J8	JUNCTION	1477.80	2.97	0.0	
J9	JUNCTION	1478.85	1.93	0.0	
MH18_(SW_1)	JUNCTION	1479.20	3.73	0.0	
MH19_(SW_1)	JUNCTION	1479.16	8.53	0.0	
MH20_(SW_1)	JUNCTION	1476.54	7.69	0.0	
MH21_(SW_1)	JUNCTION	1479.71	1.19	0.0	
MH23_(SW_2)	JUNCTION	1480.00	6.80	0.0	
MH24_(SW_2)	JUNCTION	1476.95	3.53	0.0	
MH25_(SW_3)	JUNCTION	1480.00	2.53	0.0	
MH26_(SW_3)	JUNCTION	1478.11	2.50	0.0	

MH28_(SW_4)	JUNCTION	1480.00	0.90	0.0
MH29_(SW_4)	JUNCTION	1478.22	2.68	0.0
MH31_(SW_5)	JUNCTION	1480.00	0.90	0.0
MH32_(SW_5)	JUNCTION	1478.74	1.89	0.0
MH34_(SW_6)	JUNCTION	1479.71	1.07	0.0
MH35_(SW_6)	JUNCTION	1478.02	2.76	0.0
MH36_(SW_6)	JUNCTION	1479.71	2.88	0.0
MH37_(SW_6)	JUNCTION	1479.37	1.41	0.0
MH38_(SW_6)	JUNCTION	1478.63	2.15	0.0
MH39_(SW_6)	JUNCTION	1479.53	1.98	0.0
MH40_(SW_6)	JUNCTION	1478.10	2.67	0.0
MH41_(SW_6)	JUNCTION	1479.71	2.80	0.0
MH42_(SW_6)	JUNCTION	1479.49	1.28	0.0
MH43_(SW_6)	JUNCTION	1479.18	1.59	0.0
MH44_(SW_6)	JUNCTION	1479.55	1.43	0.0
MH45_(SW_6)	JUNCTION	1479.65	1.35	0.0
MH46_(SW_6)	JUNCTION	1477.62	4.84	0.0
MH47_(SW_7)	JUNCTION	1480.00	0.90	0.0
MH48_(SW_7)	JUNCTION	1477.69	3.09	0.0
MH49_(SW_7)	JUNCTION	1479.61	3.21	0.0
MH50_(SW_8)	JUNCTION	1480.00	0.90	0.0
MH51_(SW_8)	JUNCTION	1476.80	3.82	0.0
MH52_(SW_9)	JUNCTION	1480.00	1.81	0.0
MH53_(SW_9)	JUNCTION	1477.54	3.07	0.0
MH22_(SW_1)	OUTFALL	1479.85	0.90	0.0
MH27_(SW_3)	OUTFALL	1479.25	0.90	0.0
MH30_(SW_4)	OUTFALL	1479.87	0.90	0.0
MH33_(SW_6)	OUTFALL	1480.00	1.10	0.0

****

Link Summary
****

Name	From Node	To Node	Type	Length	%Slope	Roughness
C1	J12	J14	CONDUIT	456.6	-323.6203	0.0100
P17_(SW_1)	MH18_(SW_1)	MH19_(SW_1)	CONDUIT	41.5	0.1011	0.0100
P18_(SW_1)_1	MH19_(SW_1)	J1	CONDUIT	2076.6	0.1000	0.0100
P18_(SW_1)_3	J1	J4	CONDUIT	700.7	0.0999	0.0100
P18_(SW_1)_4	J4	MH20_(SW_1)	CONDUIT	679.8	0.1000	0.0100
P19_(SW_1)	MH20_(SW_1)	MH21_(SW_1)	CONDUIT	1335.5	-0.0219	0.0100
P20_(SW_1)	MH21_(SW_1)	MH22_(SW_1)	CONDUIT	1332.9	-0.0110	0.0100
P21_(SW_2)_1	MH23_(SW_2)	J2	CONDUIT	989.0	0.1000	0.0100
P21_(SW_2)_2	J3	J5	CONDUIT	648.7	0.1001	0.0100
P21_(SW_2)_3	J2	J3	CONDUIT	920.1	0.1000	0.0100
P21_(SW_2)_5	J5	MH24_(SW_2)	CONDUIT	495.1	0.1000	0.0100
P22_(SW_3)	MH25_(SW_3)	MH26_(SW_3)	CONDUIT	1891.3	0.1000	0.0100
P23_(SW_3)	MH26_(SW_3)	MH27_(SW_3)	CONDUIT	461.5	0.0999	0.0100
P24_(SW_4)	MH28_(SW_4)	MH29_(SW_4)	CONDUIT	1780.0	0.1000	0.0100
P25_(SW_4)	MH29_(SW_4)	MH30_(SW_4)	CONDUIT	134.1	0.0999	0.0100
P26_(SW_5)	MH31_(SW_5)	MH32_(SW_5)	CONDUIT	1259.1	0.1000	0.0100
P27_(SW_6)	MH34_(SW_6)	MH33_(SW_6)	CONDUIT	94.7	-0.5164	0.0100
P28_(SW_6)	MH35_(SW_6)	MH34_(SW_6)	CONDUIT	1686.3	-0.1000	0.0100
P29_(SW_6)	MH36_(SW_6)	MH35_(SW_6)	CONDUIT	58.4	5.8821	0.0100
P30_(SW_6)	MH37_(SW_6)	MH36_(SW_6)	CONDUIT	338.4	-0.0999	0.0100
P31_(SW_6)	MH38_(SW_6)	MH37_(SW_6)	CONDUIT	1368.1	-0.0079	0.0100
P32_(SW_6)	MH39_(SW_6)	MH38_(SW_6)	CONDUIT	174.4	1.1345	0.0100
P33_(SW_6)	MH40_(SW_6)	MH39_(SW_6)	CONDUIT	1606.3	-0.0783	0.0100
P34_(SW_6)	MH41_(SW_6)	MH40_(SW_6)	CONDUIT	285.5	1.2250	0.0100
P35_(SW_6)	MH42_(SW_6)	MH41_(SW_6)	CONDUIT	214.6	-0.1002	0.0100
P36_(SW_6)	MH43_(SW_6)	MH42_(SW_6)	CONDUIT	525.4	-0.0181	0.0100
P37_(SW_6)	MH44_(SW_6)	MH43_(SW_6)	CONDUIT	161.5	0.5498	0.0100
P38_(SW_6)	MH45_(SW_6)	MH44_(SW_6)	CONDUIT	348.7	0.1603	0.0100
P39_(SW_6)	MH46_(SW_6)	MH49_(SW_7)	CONDUIT	2349.7	-0.0697	0.0100
P40_(SW_7)_1	MH48_(SW_7)	J8	CONDUIT	117.3	-0.0997	0.0100
P40_(SW_7)_3	J8	J9	CONDUIT	1042.0	-0.1000	0.0100
P40_(SW_7)_4	J9	MH47_(SW_7)	CONDUIT	680.2	-0.1697	0.0100
P41_(SW_7)	MH49_(SW_7)	MH48_(SW_7)	CONDUIT	391.9	1.0805	0.0100
P42_(SW_8)_1	MH50_(SW_8)	J10	CONDUIT	856.2	0.0897	0.0100
P42_(SW_8)_2	J13	J14	CONDUIT	83.0	0.0891	0.0100

P42_(SW_8)_4	J10	J11	CONDUIT	801.7	0.0898	0.0100
P42_(SW_8)_5	J14	MH51_(SW_8)	CONDUIT	817.8	0.0898	0.0100
P42_(SW_8)_6	J11	J13	CONDUIT	1004.2	0.0897	0.0100
P43_(SW_9)_1	MH52_(SW_9)	J6	CONDUIT	1097.9	0.1000	0.0100
P43_(SW_9)_3	J6	J7	CONDUIT	915.6	0.0999	0.0100
P43_(SW_9)_4	J7	MH53_(SW_9)	CONDUIT	450.8	0.1000	0.0100
P44_(SW_9)_1	MH53_(SW_9)	J12	CONDUIT	60.6	2442.9314	0.0100

****
Cross Section Summary
****

Conduit	Shape	Full Depth	Full Area	Hyd. Rad.	Max. Width	No. of Barrels	Full Flow
C1	CIRCULAR	0.90	0.64	0.23	0.90	1	42.34
P17_(SW_1)	CIRCULAR	0.90	0.64	0.23	0.90	1	0.75
P18_(SW_1)_1	CIRCULAR	0.90	0.64	0.23	0.90	1	0.74
P18_(SW_1)_3	CIRCULAR	0.90	0.64	0.23	0.90	1	0.74
P18_(SW_1)_4	CIRCULAR	0.90	0.64	0.23	0.90	1	0.74
P19_(SW_1)	CIRCULAR	0.90	0.64	0.23	0.90	1	0.35
P20_(SW_1)	CIRCULAR	0.90	0.64	0.23	0.90	1	0.25
P21_(SW_2)_1	CIRCULAR	0.90	0.64	0.23	0.90	1	0.74
P21_(SW_2)_2	CIRCULAR	0.90	0.64	0.23	0.90	1	0.74
P21_(SW_2)_3	CIRCULAR	0.90	0.64	0.23	0.90	1	0.74
P21_(SW_2)_5	CIRCULAR	0.90	0.64	0.23	0.90	1	0.74
P22_(SW_3)	CIRCULAR	0.90	0.64	0.23	0.90	1	0.74
P23_(SW_3)	CIRCULAR	0.90	0.64	0.23	0.90	1	0.74
P24_(SW_4)	CIRCULAR	0.90	0.64	0.23	0.90	1	0.74
P25_(SW_4)	CIRCULAR	0.90	0.64	0.23	0.90	1	0.74
P26_(SW_5)	CIRCULAR	0.90	0.64	0.23	0.90	1	0.74
P27_(SW_6)	CIRCULAR	0.90	0.64	0.23	0.90	1	1.69
P28_(SW_6)	CIRCULAR	0.90	0.64	0.23	0.90	1	0.74
P29_(SW_6)	CIRCULAR	0.90	0.64	0.23	0.90	1	5.71
P30_(SW_6)	CIRCULAR	0.90	0.64	0.23	0.90	1	0.74
P31_(SW_6)	CIRCULAR	0.90	0.64	0.23	0.90	1	0.21
P32_(SW_6)	CIRCULAR	0.90	0.64	0.23	0.90	1	2.51
P33_(SW_6)	CIRCULAR	0.90	0.64	0.23	0.90	1	0.66
P34_(SW_6)	CIRCULAR	0.90	0.64	0.23	0.90	1	2.61

P35_(SW_6)	CIRCULAR	0.90	0.64	0.23	0.90	1	0.75
P36_(SW_6)	CIRCULAR	0.90	0.64	0.23	0.90	1	0.32
P37_(SW_6)	CIRCULAR	0.90	0.64	0.23	0.90	1	1.75
P38_(SW_6)	CIRCULAR	0.90	0.64	0.23	0.90	1	0.94
P39_(SW_6)	CIRCULAR	0.90	0.64	0.23	0.90	1	0.62
P40_(SW_7)_1	CIRCULAR	0.90	0.64	0.23	0.90	1	0.74
P40_(SW_7)_3	CIRCULAR	0.90	0.64	0.23	0.90	1	0.74
P40_(SW_7)_4	CIRCULAR	0.90	0.64	0.23	0.90	1	0.97
P41_(SW_7)	CIRCULAR	0.90	0.64	0.23	0.90	1	2.45
P42_(SW_8)_1	CIRCULAR	0.90	0.64	0.23	0.90	1	0.70
P42_(SW_8)_2	CIRCULAR	0.90	0.64	0.23	0.90	1	0.70
P42_(SW_8)_4	CIRCULAR	0.90	0.64	0.23	0.90	1	0.71
P42_(SW_8)_5	CIRCULAR	0.90	0.64	0.23	0.90	1	0.71
P42_(SW_8)_6	CIRCULAR	0.90	0.64	0.23	0.90	1	0.71
P43_(SW_9)_1	CIRCULAR	0.90	0.64	0.23	0.90	1	0.74
P43_(SW_9)_3	CIRCULAR	0.90	0.64	0.23	0.90	1	0.74
P43_(SW_9)_4	CIRCULAR	0.90	0.64	0.23	0.90	1	0.74
P44_(SW_9)_1	CIRCULAR	0.90	0.64	0.23	0.90	1	116.34

```
****************
Analysis Options
****************
Flow Units ............... CMS
Process Models:
  Rainfall/Runoff ........ YES
  RDII ................... NO
  Snowmelt ............... NO
  Groundwater ............ NO
  Flow Routing ........... YES
  Ponding Allowed ........ NO
  Water Quality .......... NO
Infiltration Method ...... HORTON
Flow Routing Method ...... DYNWAVE
Surcharge Method ......... EXTRAN
Starting Date ............ 11/27/2024 00:00:00
Ending Date .............. 11/28/2024 00:00:00
Antecedent Dry Days ...... 0.0
Report Time Step ......... 00:01:00
```

```
Wet Time Step ............ 00:05:00
Dry Time Step ............ 00:05:00
Routing Time Step ........ 5.00 sec
Variable Time Step ....... YES
Maximum Trials ........... 8
Number of Threads ........ 1
Head Tolerance ........... 0.001500 m


**************************        Volume         Depth
Runoff Quantity Continuity     hectare-m            mm
**************************     ---------       -------
Total Precipitation ......       199.472       102.500
Evaporation Loss .........         0.000         0.000
Infiltration Loss ........        52.417        26.935
Surface Runoff ...........       145.357        74.693
Final Storage ............         1.843         0.947
Continuity Error (%) .....        -0.073
```

```
***************************
Time-Step Critical Elements
***************************
Link P44_(SW_9)_1 (7.73%)


********************************
Highest Flow Instability Indexes
********************************
Link P17_(SW_1) (9)
Link P21_(SW_2)_1 (7)
Link P42_(SW_8)_2 (4)
Link C1 (3)
Link P35_(SW_6) (3)


*********************************
Most Frequent Nonconverging Nodes
*********************************
Node MH22_(SW_1) (6.09%)
Node MH27_(SW_3) (6.09%)
Node MH30_(SW_4) (6.09%)
Node MH33_(SW_6) (6.09%)
Node J4 (1.25%)


************************
Routing Time Step Summary
************************
Minimum Time Step           :     1.61 sec
Average Time Step           :     4.84 sec
```

```
  Maximum Time Step           :     5.00 sec
  % of Time in Steady State   :     0.00
  Average Iterations per Step :     2.85
  % of Steps Not Converging   :     6.09
  Time Step Frequencies       :
      5.000 -  3.155 sec      :    95.25 %
      3.155 -  1.991 sec      :     3.09 %
      1.991 -  1.256 sec      :     1.65 %
      1.256 -  0.792 sec      :     0.00 %
      0.792 -  0.500 sec      :     0.00 %


  ***************************
  Subcatchment Runoff Summary
  ***************************
```

Subcatchment	Total Precip mm	Total Runon mm	Total Evap mm	Total Infil mm	Imperv Runoff mm	Perv Runoff mm	Total Runoff mm	Total Runoff 10^6 ltr	Peak Runoff CMS	Runoff Coeff
S42	102.50	0.00	0.00	2.67	96.71	2.47	99.18	35.95	9.84	0.968
S43	102.50	0.00	0.00	2.69	96.47	2.45	98.92	47.98	11.73	0.965
S53	102.50	0.00	0.00	83.18	10.01	9.07	19.08	33.88	7.50	0.186
S54	102.50	0.00	0.00	73.33	10.03	18.93	28.96	15.92	3.19	0.283
S55	102.50	0.00	0.00	2.78	96.05	2.36	98.41	85.34	21.59	0.960
S56	102.50	0.00	0.00	11.69	82.47	6.77	89.24	106.35	24.37	0.871
S57	102.50	0.00	0.00	10.56	83.04	7.92	90.95	38.92	13.02	0.887
S58	102.50	0.00	0.00	2.70	96.67	2.44	99.11	43.02	13.26	0.967

S59	102.50	0.00	0.00	10.28	83.15	8.20	91.35	26.62	9.80	0.891
S60	102.50	0.00	0.00	2.68	96.79	2.46	99.24	33.86	11.15	0.968
S61	102.50	0.00	0.00	61.12	25.53	15.77	41.29	43.75	9.95	0.403
S62	102.50	0.00	0.00	2.69	96.70	2.44	99.15	40.55	12.72	0.967
S63	102.50	0.00	0.00	10.58	83.02	7.89	90.91	40.17	13.32	0.887
S64	102.50	0.00	0.00	2.79	96.10	2.34	98.44	93.64	21.48	0.960
S65	102.50	0.00	0.00	2.71	96.42	2.43	98.84	48.73	15.06	0.964
S66	102.50	0.00	0.00	2.69	96.54	2.45	98.99	37.17	12.37	0.966
S67	102.50	0.00	0.00	2.79	95.97	2.34	98.31	93.52	22.75	0.959
S68	102.50	0.00	0.00	11.40	82.63	7.06	89.69	86.47	21.77	0.875
S69	102.50	0.00	0.00	9.74	83.42	8.78	92.21	4.90	2.20	0.900
S70	102.50	0.00	0.00	2.62	97.27	2.52	99.79	3.25	1.38	0.974
S71	102.50	0.00	0.00	2.63	97.20	2.52	99.72	7.01	2.89	0.973
S72	102.50	0.00	0.00	2.63	97.37	2.52	99.89	6.89	2.71	0.975
S73	102.50	0.00	0.00	26.80	54.93	19.37	74.30	32.55	11.82	0.725
S74	102.50	0.00	0.00	26.49	54.95	19.68	74.63	28.90	10.84	0.728
S75	102.50	0.00	0.00	8.42	86.75	6.98	93.72	33.02	11.20	0.914
S76	102.50	0.00	0.00	8.31	86.83	7.09	93.92	25.95	9.34	0.916
S77	102.50	0.00	0.00	2.63	97.26	2.52	99.78	3.98	1.68	0.973
S78	102.50	0.00	0.00	16.65	70.38	15.22	85.60	4.87	2.23	0.835
S79	102.50	0.00	0.00	15.60	72.82	14.21	87.03	5.70	2.53	0.849

S80	102.50	0.00	0.00	0.00	102.42	0.00	102.42	3.39	1.42
0.999									
S81	102.50	0.00	0.00	19.10	66.72	16.89	83.61	3.11	1.47
0.816									
S82	102.50	0.00	0.00	57.69	10.16	34.61	44.76	4.06	1.16
0.437									
S83	102.50	0.00	0.00	82.50	10.01	9.75	19.76	31.80	6.97
0.193									
S84	102.50	0.00	0.00	2.64	97.20	2.51	99.71	13.01	4.68
0.973									
S85	102.50	0.00	0.00	71.07	10.03	21.19	31.23	13.57	2.72
0.305									
S86	102.50	0.00	0.00	2.67	96.88	2.47	99.35	26.77	9.31
0.969									
S87	102.50	0.00	0.00	10.13	83.22	8.36	91.58	20.30	7.90
0.893									
S88	102.50	0.00	0.00	2.66	96.92	2.49	99.41	25.27	7.76
0.970									
S89	102.50	0.00	0.00	2.83	94.96	2.30	97.26	119.00	18.75
0.949									
S90	102.50	0.00	0.00	24.57	55.07	21.65	76.72	9.17	4.34
0.748									
S91	102.50	0.00	0.00	10.32	83.14	8.15	91.29	28.46	10.32
0.891									
S92	102.50	0.00	0.00	2.67	96.76	2.47	99.23	33.62	9.43
0.968									
S93	102.50	0.00	0.00	25.00	55.05	21.20	76.25	13.17	5.88
0.744									

****
Node Depth Summary
****

Node	Type	Average Depth Meters	Maximum Depth Meters	Maximum HGL Meters	Time of Max Occurrence days hr:min	Reported Max Depth Meters
J1	JUNCTION	3.37	7.69	1485.61	0 08:30	7.69
J10	JUNCTION	0.38	1.51	1480.74	0 11:18	1.51

J11	JUNCTION	0.54	2.19	1480.71	0	11:13	2.19
J12	JUNCTION	0.77	0.90	0.90	0	04:29	0.90
J13	JUNCTION	0.58	3.05	1480.67	0	11:46	3.05
J14	JUNCTION	0.06	0.18	1477.71	0	12:20	0.18
J2	JUNCTION	2.05	5.75	1484.76	0	07:55	5.74
J3	JUNCTION	2.34	4.76	1482.85	0	10:46	4.76
J4	JUNCTION	3.77	7.69	1484.91	0	09:39	7.69
J5	JUNCTION	2.50	4.06	1481.51	0	07:55	4.06
J6	JUNCTION	0.88	2.32	1481.22	0	09:21	2.32
J7	JUNCTION	1.44	2.74	1480.73	0	11:13	2.74
J8	JUNCTION	1.82	2.97	1480.78	0	09:52	2.97
J9	JUNCTION	1.15	1.93	1480.78	0	10:12	1.93
MH18_(SW_1)	JUNCTION	2.22	3.73	1482.93	0	09:38	3.73
MH19_(SW_1)	JUNCTION	2.75	8.53	1487.69	0	11:51	8.53
MH20_(SW_1)	JUNCTION	4.19	7.69	1484.23	0	09:39	7.69
MH21_(SW_1)	JUNCTION	0.71	1.19	1480.90	0	09:55	1.19
MH23_(SW_2)	JUNCTION	1.33	4.76	1484.76	0	12:17	4.76
MH24_(SW_2)	JUNCTION	2.65	3.53	1480.48	0	06:59	3.53
MH25_(SW_3)	JUNCTION	0.79	2.53	1482.53	0	10:51	2.53
MH26_(SW_3)	JUNCTION	1.44	2.36	1480.47	0	13:51	2.36
MH28_(SW_4)	JUNCTION	0.36	0.90	1480.90	0	10:49	0.90
MH29_(SW_4)	JUNCTION	1.45	2.21	1480.43	0	15:15	2.21
MH31_(SW_5)	JUNCTION	0.64	0.90	1480.90	0	09:27	0.90
MH32_(SW_5)	JUNCTION	1.53	1.89	1480.63	0	05:07	1.89
MH34_(SW_6)	JUNCTION	0.00	0.00	1479.71	0	00:00	0.00
MH35_(SW_6)	JUNCTION	0.00	0.00	1478.02	0	00:00	0.00
MH36_(SW_6)	JUNCTION	0.59	1.36	1481.07	0	11:15	1.33
MH37_(SW_6)	JUNCTION	0.79	1.41	1480.78	0	11:12	1.41
MH38_(SW_6)	JUNCTION	1.28	2.15	1480.78	0	11:05	2.14
MH39_(SW_6)	JUNCTION	0.68	1.34	1480.88	0	11:22	1.34
MH40_(SW_6)	JUNCTION	1.55	2.67	1480.78	0	10:51	2.67
MH41_(SW_6)	JUNCTION	0.73	1.08	1480.79	0	09:19	1.08
MH42_(SW_6)	JUNCTION	0.91	1.28	1480.78	0	09:18	1.28
MH43_(SW_6)	JUNCTION	1.19	1.59	1480.78	0	09:18	1.59
MH44_(SW_6)	JUNCTION	0.93	1.43	1480.97	0	11:39	1.42
MH45_(SW_6)	JUNCTION	0.89	1.35	1481.00	0	11:38	1.35
MH46_(SW_6)	JUNCTION	3.06	4.84	1482.46	0	09:09	4.84
MH47_(SW_7)	JUNCTION	0.49	0.90	1480.90	0	10:20	0.90
MH48_(SW_7)	JUNCTION	1.93	3.09	1480.78	0	09:52	3.09

MH49_(SW_7)	JUNCTION	1.51	3.17	1482.78	0	12:07	3.17
MH50_(SW_8)	JUNCTION	0.21	0.90	1480.90	0	11:24	0.90
MH51_(SW_8)	JUNCTION	0.47	3.82	1480.63	0	12:18	1.11
MH52_(SW_9)	JUNCTION	0.47	1.81	1481.81	0	11:13	1.81
MH53_(SW_9)	JUNCTION	1.63	2.34	1479.88	0	12:06	2.34
MH22_(SW_1)	OUTFALL	0.23	0.38	1480.23	0	11:55	0.38
MH27_(SW_3)	OUTFALL	0.22	0.52	1479.77	0	14:12	0.52
MH30_(SW_4)	OUTFALL	0.15	0.36	1480.22	0	15:16	0.36
MH33_(SW_6)	OUTFALL	0.00	0.00	1480.00	0	00:00	0.00

****
Node Inflow Summary
****

Node	Type	Maximum Lateral Inflow CMS	Maximum Total Inflow CMS	Time of Max Occurrence days	hr:min	Lateral Inflow Volume 10^6 ltr	Total Inflow Volume 10^6 ltr	Flow Balance Error Percent
J1	JUNCTION	22.821	23.566	0	12:06	65.6	75.1	1.218
J10	JUNCTION	7.765	8.085	0	12:06	25.3	30.1	0.068
J11	JUNCTION	9.841	9.995	0	12:06	36	44	0.097
J12	JUNCTION	19.748	32.104	0	12:06	62.1	154	0.105
J13	JUNCTION	11.727	11.882	0	12:06	48	65.5	0.074
J14	JUNCTION	0.000	3.549	0	12:20	0	50	-0.023
J2	JUNCTION	25.979	25.979	0	12:06	83.6	84.1	0.710
J3	JUNCTION	20.463	21.534	0	12:06	60.7	83.6	0.607
J4	JUNCTION	2.721	3.465	0	12:06	13.6	30.2	1.545
J5	JUNCTION	0.000	1.071	0	12:08	0	29.2	1.296
J6	JUNCTION	0.000	0.629	0	15:08	0	12.6	5.004
J7	JUNCTION	13.316	13.862	0	12:06	40.2	52.4	0.861
J8	JUNCTION	0.000	0.256	0	09:49	0	0.761	98.827
J9	JUNCTION	11.820	12.147	0	12:06	32.6	38.7	1.465
MH18_(SW_1)	JUNCTION	7.497	15.463	0	12:06	33.9	110	0.005
MH19_(SW_1)	JUNCTION	24.373	24.373	0	12:06	106	115	0.481
MH20_(SW_1)	JUNCTION	18.753	19.498	0	12:12	119	137	0.970
MH21_(SW_1)	JUNCTION	0.000	1.176	0	12:06	0	42.2	0.982

MH23_(SW_2)	JUNCTION	0.000	0.176	0	08:11	0	0.353	110.826	
MH24_(SW_2)	JUNCTION	0.000	1.071	0	12:08	0	28.8	0.000	
MH25_(SW_3)	JUNCTION	24.672	24.672	0	12:06	110	110	0.056	
MH26_(SW_3)	JUNCTION	0.000	0.798	0	10:57	0	22.8	5.368	
MH28_(SW_4)	JUNCTION	21.717	21.717	0	12:06	63.2	63.2	0.071	
MH29_(SW_4)	JUNCTION	0.000	0.386	0	10:49	0	11.7	10.783	
MH31_(SW_5)	JUNCTION	44.347	44.347	0	12:06	179	179	0.159	
MH32_(SW_5)	JUNCTION	26.258	26.605	0	12:06	81.8	99.3	0.000	
MH34_(SW_6)	JUNCTION	0.000	0.000	0	00:00	0	0	0.000	ltr
MH35_(SW_6)	JUNCTION	0.000	0.000	0	00:00	0	0	0.000	ltr
MH36_(SW_6)	JUNCTION	0.000	0.415	0	11:12	0	0.288	68.945	
MH37_(SW_6)	JUNCTION	0.000	0.484	0	11:10	0	1.35	69.166	
MH38_(SW_6)	JUNCTION	10.222	10.285	0	12:06	22.4	23.1	2.333	
MH39_(SW_6)	JUNCTION	0.000	0.591	0	11:15	0	1.4	78.835	
MH40_(SW_6)	JUNCTION	6.974	6.974	0	12:06	31.8	31.8	1.989	
MH41_(SW_6)	JUNCTION	0.000	0.021	0	09:13	0	0.166	82.903	
MH42_(SW_6)	JUNCTION	4.044	4.047	0	12:06	10.6	10.8	2.290	
MH43_(SW_6)	JUNCTION	6.439	7.261	0	12:06	14.6	21	1.127	
MH44_(SW_6)	JUNCTION	2.892	3.124	0	12:06	7.01	9.02	2.129	
MH45_(SW_6)	JUNCTION	1.379	1.379	0	12:06	3.25	3.32	2.817	
MH46_(SW_6)	JUNCTION	21.768	21.828	0	12:06	86.5	86.7	0.891	
MH47_(SW_7)	JUNCTION	10.836	10.836	0	12:06	28.9	29	0.000	
MH48_(SW_7)	JUNCTION	2.713	4.521	0	12:06	6.89	20.2	0.821	
MH49_(SW_7)	JUNCTION	2.196	2.196	0	12:06	4.9	14.8	10.213	
MH50_(SW_8)	JUNCTION	4.678	4.678	0	12:06	13	13	0.027	
MH51_(SW_8)	JUNCTION	0.000	0.057	0	11:51	0	0.316	0.000	
MH52_(SW_9)	JUNCTION	9.948	9.948	0	12:06	43.8	43.8	-0.006	
MH53_(SW_9)	JUNCTION	7.895	8.919	0	12:06	20.3	42.4	0.620	
MH22_(SW_1)	OUTFALL	0.000	0.428	0	12:16	0	21.2	0.000	
MH27_(SW_3)	OUTFALL	0.000	0.777	0	14:12	0	21.6	0.000	
MH30_(SW_4)	OUTFALL	0.000	0.383	0	15:16	0	10.6	0.000	
MH33_(SW_6)	OUTFALL	0.000	0.000	0	00:00	0	0	0.000	ltr

****
Outfall Loading Summary
****

Outfall Node	Flow Freq Pcnt	Avg Flow CMS	Max Flow CMS	Total Volume 10^6 ltr
MH22_(SW_1)	62.99	0.399	0.428	21.235
MH27_(SW_3)	62.70	0.426	0.777	21.646
MH30_(SW_4)	62.15	0.210	0.383	10.577
MH33_(SW_6)	0.00	0.000	0.000	0.000
System	46.96	1.036	1.587	53.459

****
Link Flow Summary
****

Link	Type	Maximum |Flow| CMS	Time of Max Occurrence days	hr:min	Maximum |Veloc| m/sec	Max/ Full Flow	Max/ Full Depth
C1	CONDUIT	3.549	0	12:20	8.94	0.08	0.60
P17_(SW_1)	CONDUIT	7.966	0	12:04	12.52	10.64	1.00
P18_(SW_1)_1	CONDUIT	0.777	0	11:16	1.22	1.04	1.00
P18_(SW_1)_3	CONDUIT	0.744	0	12:07	1.17	1.00	1.00
P18_(SW_1)_4	CONDUIT	0.744	0	12:10	1.17	1.00	1.00
P19_(SW_1)	CONDUIT	1.176	0	12:06	1.85	3.38	1.00
P20_(SW_1)	CONDUIT	0.428	0	12:16	0.88	1.74	0.71
P21_(SW_2)_1	CONDUIT	0.176	0	08:11	0.49	0.24	1.00
P21_(SW_2)_2	CONDUIT	1.071	0	12:08	1.68	1.44	1.00
P21_(SW_2)_3	CONDUIT	1.071	0	12:08	1.68	1.44	1.00
P21_(SW_2)_5	CONDUIT	1.071	0	12:08	1.68	1.44	1.00

P22_(SW_3)	CONDUIT	0.798	0	10:57	1.25	1.07	1.00
P23_(SW_3)	CONDUIT	0.777	0	14:12	1.60	1.04	0.71
P24_(SW_4)	CONDUIT	0.386	0	10:49	0.61	0.52	1.00
P25_(SW_4)	CONDUIT	0.383	0	15:16	1.42	0.51	0.44
P26_(SW_5)	CONDUIT	0.347	0	12:45	0.54	0.47	1.00
P27_(SW_6)	CONDUIT	0.000	0	00:00	0.00	0.00	0.00
P28_(SW_6)	CONDUIT	0.000	0	00:00	0.00	0.00	0.00
P29_(SW_6)	CONDUIT	0.000	0	00:00	0.00	0.00	0.00
P30_(SW_6)	CONDUIT	0.415	0	11:12	0.71	0.56	1.00
P31_(SW_6)	CONDUIT	0.484	0	11:10	0.77	2.32	1.00
P32_(SW_6)	CONDUIT	0.358	0	11:24	0.85	0.14	0.65
P33_(SW_6)	CONDUIT	0.466	0	11:15	0.77	0.71	1.00
P34_(SW_6)	CONDUIT	0.000	0	00:00	0.00	0.00	0.50
P35_(SW_6)	CONDUIT	0.021	0	09:13	0.04	0.03	1.00
P36_(SW_6)	CONDUIT	0.028	0	09:09	0.14	0.09	1.00
P37_(SW_6)	CONDUIT	0.816	0	12:11	1.28	0.47	1.00
P38_(SW_6)	CONDUIT	0.247	0	12:34	0.39	0.26	1.00
P39_(SW_6)	CONDUIT	0.386	0	10:24	0.61	0.62	1.00
P40_(SW_7)_1	CONDUIT	0.098	0	09:52	0.15	0.13	1.00
P40_(SW_7)_3	CONDUIT	0.199	0	09:51	0.47	0.27	1.00
P40_(SW_7)_4	CONDUIT	0.317	0	12:30	0.73	0.33	1.00
P41_(SW_7)	CONDUIT	1.809	0	12:06	2.90	0.74	0.98
P42_(SW_8)_1	CONDUIT	0.321	0	12:45	0.73	0.46	1.00
P42_(SW_8)_2	CONDUIT	3.505	0	12:20	8.85	4.99	0.60
P42_(SW_8)_4	CONDUIT	0.551	0	11:13	0.97	0.78	1.00
P42_(SW_8)_5	CONDUIT	0.057	0	11:51	0.23	0.08	0.60
P42_(SW_8)_6	CONDUIT	1.125	0	11:20	1.77	1.60	1.00
P43_(SW_9)_1	CONDUIT	0.629	0	15:08	0.99	0.84	1.00
P43_(SW_9)_3	CONDUIT	0.629	0	15:08	0.99	0.84	1.00
P43_(SW_9)_4	CONDUIT	1.082	0	13:48	1.70	1.45	1.00
P44_(SW_9)_1	CONDUIT	8.918	0	12:06	22.67	0.08	0.59

****
Flow Classification Summary
****

Conduit	Adjusted /Actual Length	Fraction of Time in Flow Class: Dry	Up Dry	Down Dry	Sub Crit	Sup Crit	Up Crit	Down Crit	Norm Ltd	Inlet Ctrl
C1	1.00	0.01	0.02	0.00	0.77	0.21	0.00	0.00	0.99	0.00
P17_(SW_1)	1.00	0.01	0.04	0.00	0.95	0.00	0.00	0.00	0.00	0.00
P18_(SW_1)_1	1.00	0.01	0.15	0.00	0.84	0.00	0.00	0.00	0.21	0.00
P18_(SW_1)_3	1.00	0.01	0.00	0.00	0.99	0.00	0.00	0.00	0.07	0.00
P18_(SW_1)_4	1.00	0.01	0.00	0.00	0.99	0.00	0.00	0.00	0.22	0.00
P19_(SW_1)	1.00	0.36	0.01	0.00	0.59	0.00	0.04	0.00	0.00	0.00
P20_(SW_1)	1.00	0.37	0.02	0.00	0.62	0.00	0.00	0.00	0.00	0.00
P21_(SW_2)_1	1.00	0.00	0.33	0.00	0.67	0.00	0.00	0.00	0.00	0.00
P21_(SW_2)_2	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.06	0.00
P21_(SW_2)_3	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.28	0.00
P21_(SW_2)_5	1.00	0.01	0.00	0.00	0.99	0.00	0.00	0.00	0.14	0.00
P22_(SW_3)	1.00	0.01	0.00	0.00	0.99	0.00	0.00	0.00	0.47	0.00
P23_(SW_3)	1.00	0.39	0.00	0.00	0.61	0.00	0.00	0.00	0.00	0.00
P24_(SW_4)	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.25	0.00
P25_(SW_4)	1.00	0.39	0.00	0.00	0.61	0.00	0.00	0.00	0.00	0.00
P26_(SW_5)	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.21	0.00
P27_(SW_6)	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
P28_(SW_6)	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
P29_(SW_6)	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
P30_(SW_6)	1.00	0.39	0.05	0.00	0.56	0.00	0.00	0.00	0.00	0.00
P31_(SW_6)	1.00	0.38	0.01	0.00	0.62	0.00	0.00	0.00	0.00	0.00
P32_(SW_6)	1.00	0.34	0.13	0.00	0.53	0.00	0.01	0.00	0.00	0.00
P33_(SW_6)	1.00	0.35	0.10	0.00	0.55	0.00	0.00	0.00	0.00	0.00
P34_(SW_6)	1.00	0.32	0.68	0.00	0.00	0.00	0.00	0.00	0.00	0.00
P35_(SW_6)	1.00	0.00	0.21	0.00	0.79	0.00	0.00	0.00	0.00	0.00

P36_(SW_6)	1.00	0.00	0.00	0.00	0.90	0.00	0.00	0.09	0.03	0.00
P37_(SW_6)	1.00	0.00	0.21	0.00	0.78	0.00	0.00	0.00	0.10	0.00
P38_(SW_6)	1.00	0.01	0.06	0.00	0.94	0.00	0.00	0.00	0.26	0.00
P39_(SW_6)	1.00	0.01	0.00	0.00	0.94	0.00	0.00	0.05	0.32	0.00
P40_(SW_7)_1	1.00	0.01	0.13	0.00	0.86	0.00	0.00	0.00	0.00	0.00
P40_(SW_7)_3	1.00	0.14	0.20	0.00	0.66	0.00	0.00	0.00	0.07	0.00
P40_(SW_7)_4	1.00	0.34	0.00	0.00	0.65	0.01	0.00	0.00	0.05	0.00
P41_(SW_7)	1.00	0.01	0.43	0.00	0.57	0.00	0.00	0.00	0.55	0.00
P42_(SW_8)_1	1.00	0.01	0.00	0.00	0.99	0.00	0.00	0.00	0.79	0.00
P42_(SW_8)_2	1.00	0.01	0.00	0.00	0.09	0.91	0.00	0.00	0.01	0.00
P42_(SW_8)_4	1.00	0.01	0.00	0.00	0.99	0.00	0.00	0.00	0.73	0.00
P42_(SW_8)_5	1.00	0.02	0.00	0.00	0.98	0.00	0.00	0.00	0.37	0.00
P42_(SW_8)_6	1.00	0.01	0.00	0.00	0.99	0.00	0.00	0.00	0.79	0.00
P43_(SW_9)_1	1.00	0.01	0.00	0.00	0.99	0.00	0.00	0.00	0.46	0.00
P43_(SW_9)_3	1.00	0.01	0.01	0.00	0.99	0.00	0.00	0.00	0.31	0.00
P43_(SW_9)_4	1.00	0.01	0.00	0.00	0.99	0.00	0.00	0.00	0.19	0.00
P44_(SW_9)_1	1.00	0.01	0.38	0.00	0.41	0.20	0.00	0.00	0.62	0.00

Analysis begun on: Mon Jun 22 17:25:45 2026
Analysis ended on: Mon Jun 22 17:25:46 2026
Total elapsed time: 00:00:01

Appendix B

DRAINAGE NETWORK LAYOUT AND TYPICAL DETAILS

CONFIDENTIAL

Appendix B.1

LAYOUT DRAWINGS

LEGEND	
PROPOSED PHASE 1 BULK STORMWATER PIPE (1350 mm dia, Cass 100D)	
PROPOSED ULTIMATE PHASE BULK STORMWATER PIPE (1350 mm dia, Cass 100D)	
PROPOSED PHASE 1 STORMWATER CHANNEL FOR THE AEROTROPOLIS PRECINCT (2m WIDE CHANNEL WITH 3m SIDE SLOPES	
PROPOSED ULTIMATE PHASE STORMWATER CHANNEL FOR THE AEROTROPOLIS PRECINCT (2m WIDE CHANNEL WITH 3m SIDE SLOPES	
PROPOSED HEADWALL COMPLETE WITH RIP RAP BASIN ENERGY DISSIPATOR AND EROSION PROTECTION	
FLOW DIRECTION	

ITEM	UNIT OF MEASURE	VALUE
CHANNELS	LENGTH (m)	75016
BULK STORMWATER PIPES	LENGTH (m)	19000
HEADWALLS	No.	3

REV	DATE	BY	DESCRIPTION	CHK	APD
B	25082026	OD	UPDATED STORMWATER CONCEPT LAYOUT	KE	KE
A	29012025	AM	STORMWATER CONCEPT LAYOUT	JN	DC

REV	DATE	BY	DESCRIPTION	CHK	APD

ARCHITECT:

CLIENT: VAAL AEROZONE

DRAWING STATUS:

A signed version of construction drawings are available in electronic format at the WSP office of origin as well as at the WSP office of issue

VAAL AEROTROPOLIS CONCEPT LAYOUT PLAN

STORMWATER PROPOSED LAYOUT - AEROTROPOLIS PRECINCT

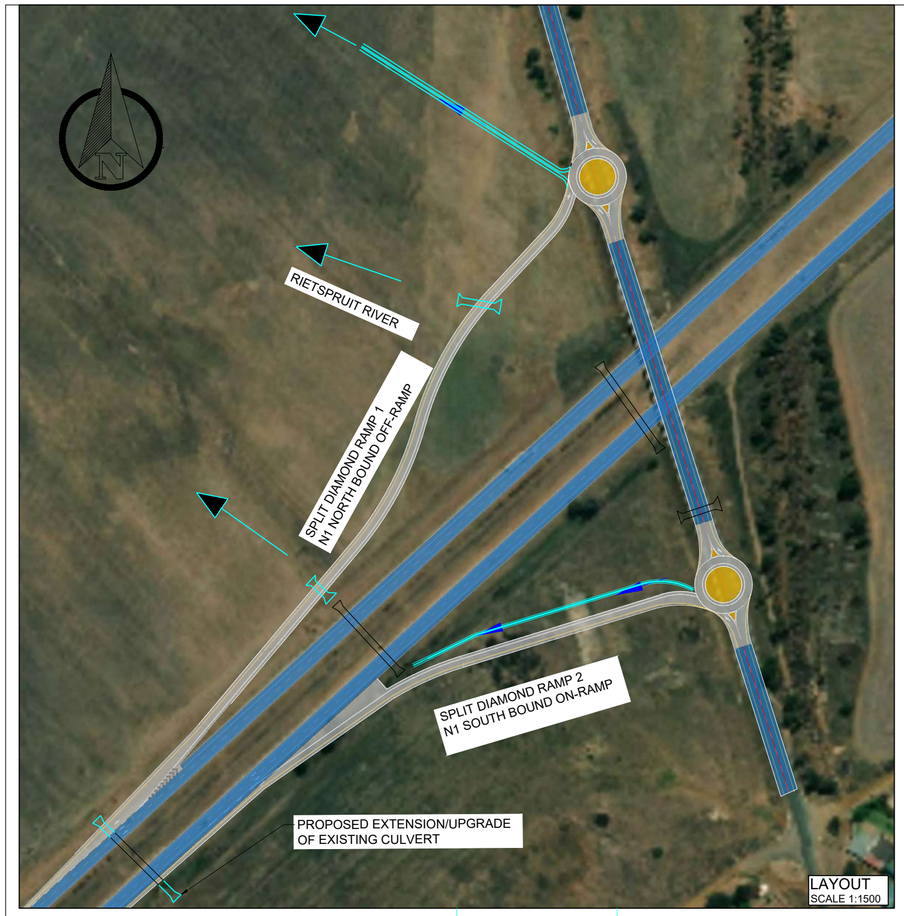
SCALE :	CHECKED:	APPROVED:
1:10 000	KE	KE
DESIGN:	DRAWN:	DATE:
OD	OD	2026/09/01
PROJECT No:	DRAWING No:	REV:
43103108	43103108 - 001	B

© COPYRIGHT RESERVED
The content of this document is privileged and confidential and may not be disclosed or reproduced without the express authorisation of the author, being "WSP GROUP AFRICA (PTY) LTD"

TEMPLATE: VERSION MAY 2017

CAD FILE NAME: C:\CDP\43103108 - VAAL AEROTROPOLIS\43103108 - 001 - STORMWATER PROPOSED LAYOUT - AEROTROPOLIS PRECINCT.DWG

PLOTTED BY: BOSSIAUX, NEIL



LEGEND	
PROPOSED STORMWATER CHANNEL	
EXISTING STORMWATER CHANNEL	
PROPOSED CHANNEL UPGRADE	
EXISTING CULVERT WITH HEADWALLS	
PROPOSED CULVERT WITH HEADWALLS	
PROPOSED TOE DRAINS	
PROPOSED HEADWALL	
DIRECTION OF FLOW IN A PROPOSED CHANNEL	

REV	DATE	BY	DESCRIPTION	CHK	APD
C	09/09/2026	OD	INTERCHANGE STORMWATER UPDATE	KE	KE
B	13/10/2025	JN	INTERCHANGE LAYOUT UPDATE	JN	DC
A	29/12/2025	AM	STORMWATER CONCEPT LAYOUT	JN	DC

REV	DATE	BY	DESCRIPTION	CHK	APD

ARCHITECT:

CLIENT: VAAL AEROZONE

DRAWING STATUS:

A signed version of construction drawings are available in electronic format at the WSP office of origin as well as at the WSP office of issue

VAAL AEROTROPOLIS CONCEPT LAYOUT PLAN

STORMWATER PROPOSED LAYOUT - INTERCHANGE 1

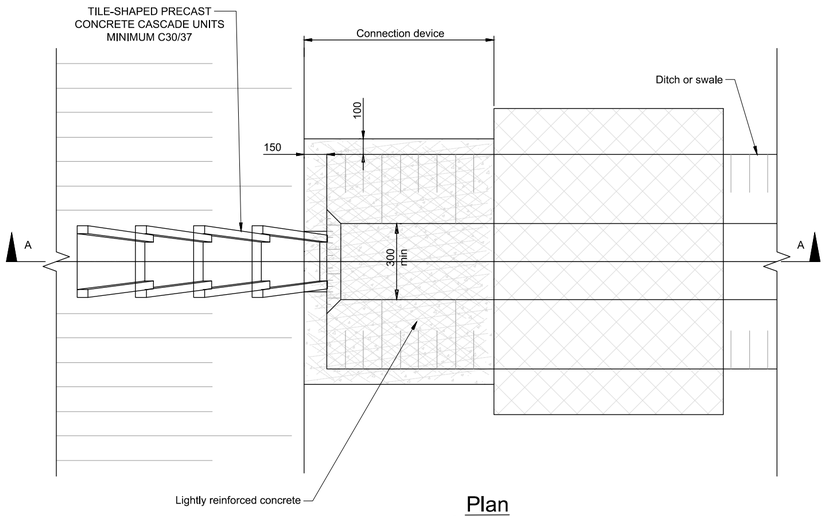
SCALE:	CHECKED:	APPROVED:
AS SHOWN	KE	KE
DESIGN:	DRAWN:	DATE:
OD	OD	2026/09/09
PROJECT No:	DRAWING No:	REV:
43103108	43103108 - 002	C

© COPYRIGHT RESERVED
The content of this document is privileged and confidential and may not be disclosed or reproduced without the express authorisation of the author, being "WSP GROUP AFRICA (PTY) LTD"

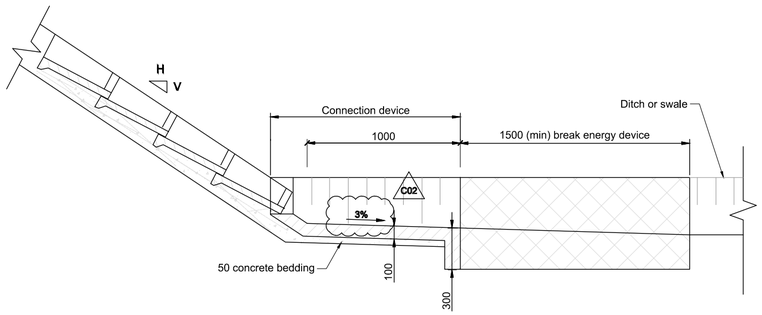
TEMPLATE: VERSION MAY 2017

Appendix B.2

DETAIL DRAWINGS

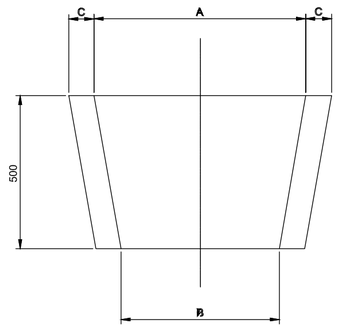


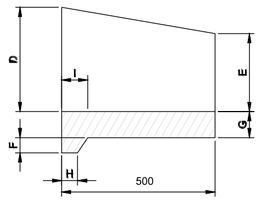
Plan
Scale: 1:20



Section A-A
Scale: 1:20

Tile-shaped cascade





V/H	Capacity Flow (l/s)	
	TCS.025	TCS.050
2/3	120	700
1/2	100	600
1/3	80	475

DESCRIPTION / REFERENCE	A	B	C	D	E	F	G	H	I
LOW FLOW TYPE - TSC.025	360	250	50	150	100	30	50	250	50
HIGH FLOW TYPE - TSC.050	670	500	80	330	250	50	80	50	80

TILE SHAPED CASCADE
LOW FLOW/ HIGH FLOW
SCALE 1:10

REV	DATE	BY	DESCRIPTION	CHK	APD
A	16-05-2025	JN	FOR INFORMATION	JN	DC

ARCHITECT: -

CLIENT: VAAL AEROZONE

DRAWING STATUS: INFORMATION

A signed version of construction drawings are available in electronic format at the WSP office of origin as well as at the WSP office of issue

WSP Group Africa (Pty) Ltd
Transportation and Infrastructure
The Pavilion, 1st Floor, Corner Portswood and Beach Road, Waterfront
Cape Town 8001, South Africa
PO Box 2613 Cape Town 8000
Tel: +27(0)21-481-8700 Fax: +27(0)21-481-8799 www.wsp.com

PROJECT: VAAL AEROTROPOLIS LAND PREPARATION PHASE

TITLE: STORMWATER TYPICAL DETAILS SHEET 1

SCALE :	CHECKED:	APPROVED:
AS SHOWN	JN	DC
DESIGN: JN	DRAWN: JN	DATE: 2025/05/20
PROJECT No: 43103108	DRAWING No: 43103108-VAD-WSP-SW-ZZ-DR-SW-TD0001	REV: A

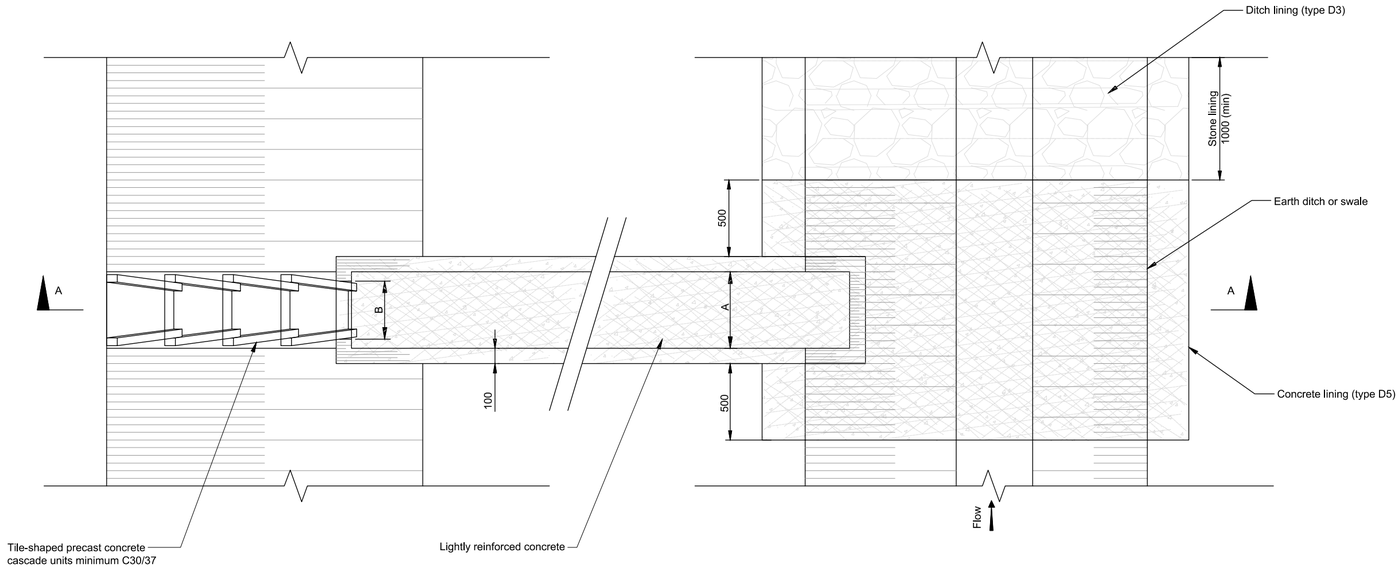
PR No.: —

© COPYRIGHT RESERVED
The content of this document is privileged and confidential and may not be disclosed or reproduced without the express authorisation of the author, being "WSP GROUP AFRICA (PTY) LTD"

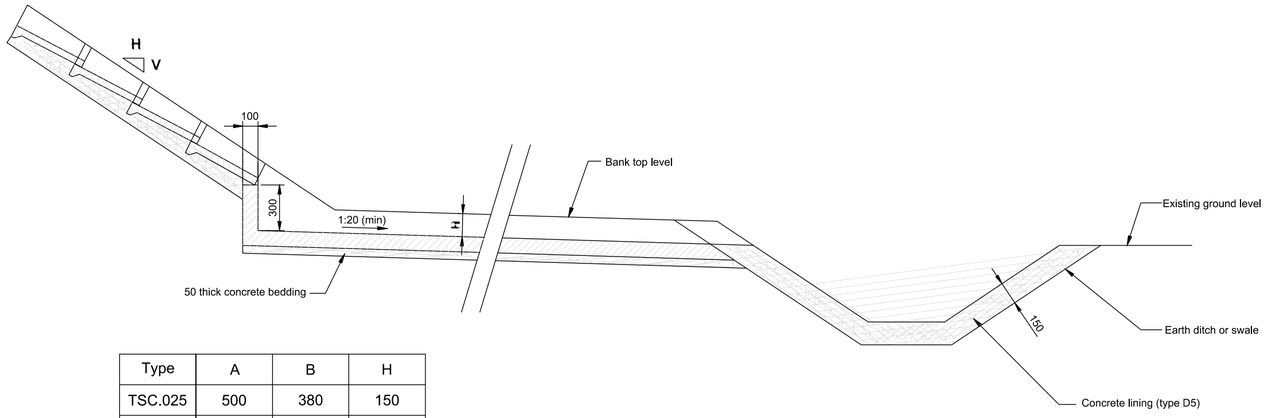
CESA

PLOT DATE: 2025/05/20 09:46:10

TEMPLATE VERSION MAY 2017



Plan - tile-shaped cascade connection to earth ditch or swale



Type	A	B	H
TSC.025	500	380	150
TSC.050	800	750	250

Section A-A

Tile-shaped cascade connection to earth ditch or swale detail

REV	DATE	BY	DESCRIPTION	CHK	APD
A	16-05-2025	JN	FOR INFORMATION	JN	DC

ARCHITECT: -

CLIENT: VAAL AEROZONE

DRAWING STATUS: INFORMATION

A signed version of construction drawings are available in electronic format at the WSP office of origin as well as at the WSP office of issue

WSP Group Africa (Pty) Ltd
Transportation and Infrastructure
The Pavilion, 1st Floor, Corner Portswood and Beach Road, Waterfront
Cape Town 8001, South Africa
PO Box 2613 Cape Town 8000
Tel: +27(0)21-481-8700 Fax: +27(0)21-481-8799 www.wsp.com

PROJECT: VAAL AEROTROPOLIS LAND PREPARATION PHASE

TITLE: STORMWATER TYPICAL DETAILS SHEET 2

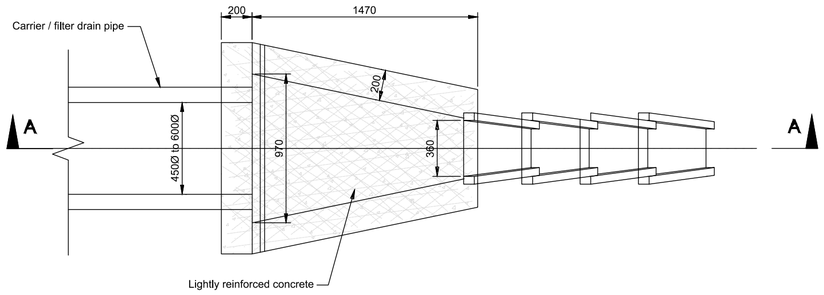
SCALE :	CHECKED:	APPROVED:
AS SHOWN	JN	DC (PR No.: —)
DESIGN: JN	DRAWN: JN	DATE: 2025/05/20
PROJECT No: 43103108	DRAWING No: 43103108-VAD-WSP-SW-ZZ-DR-SW-TD0002	REV: A

© COPYRIGHT RESERVED
The content of this document is privileged and confidential and may not be disclosed or reproduced without the express authorisation of the author, being "WSP GROUP AFRICA (PTY) LTD"

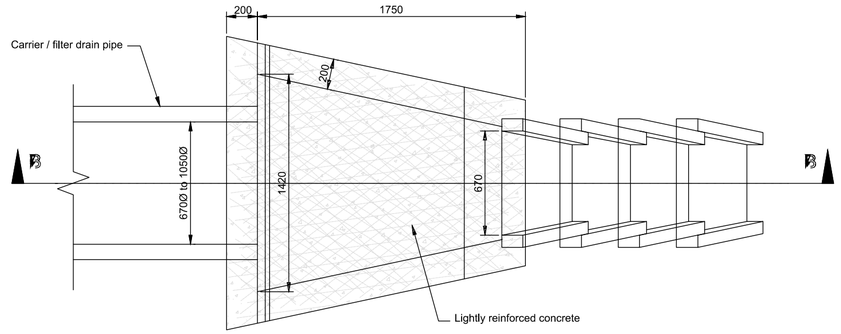
CESA

PLOT DATE: 2025/05/20 09:55:27

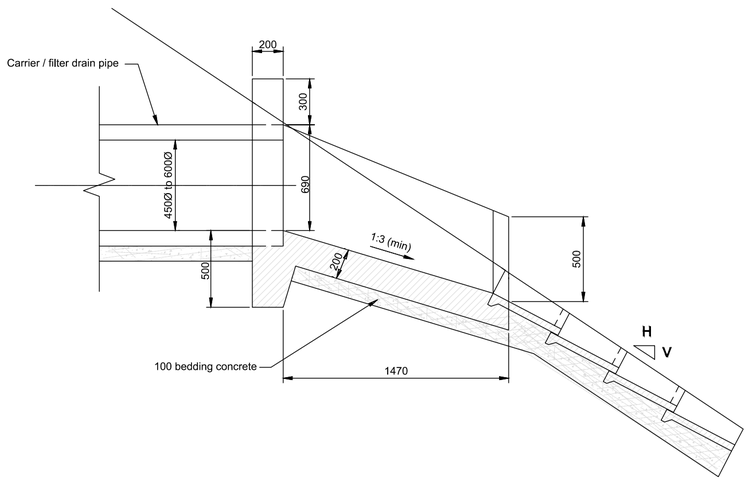
TEMPLATE VERSION MAY 2017



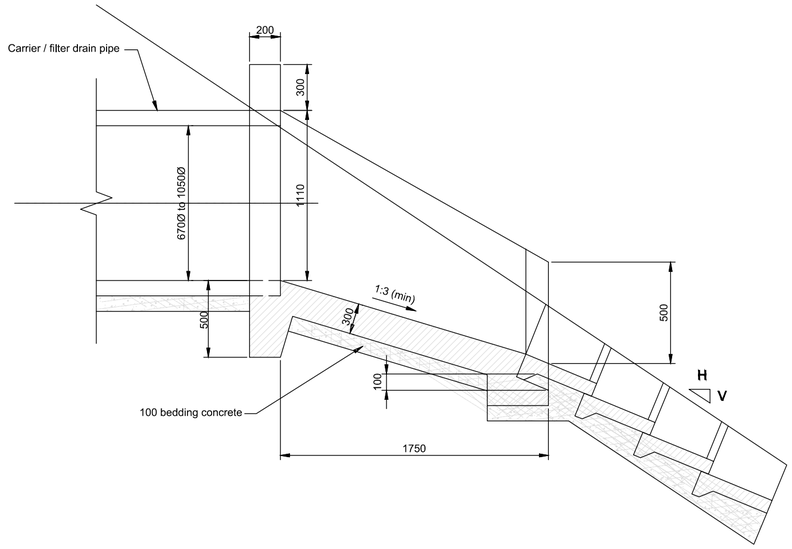
Plan - pipe connection to tile-shaped cascade
(450Ø - 600Ø) for low flow



Plan - pipe connection to tile-shaped cascade
(675Ø - 1050Ø) for high flow



Section A-A



Section B-B

REV	DATE	BY	DESCRIPTION	CHK	APD
A	16-05-2025	JN	FOR INFORMATION	JN	DC

ARCHITECT: -

CLIENT: VAAL AEROZONE

DRAWING STATUS: INFORMATION

A signed version of construction drawings are available in electronic format at the WSP office of origin as well as at the WSP office of issue

WSP Group Africa (Pty) Ltd
Transportation and Infrastructure
The Pavilion, 1st Floor, Corner Portswood and Beach Road, Waterfront
Cape Town 8001, South Africa
PO Box 2613 Cape Town 8000
Tel: +27(0)21-481-8700 Fax: +27(0)21-481-8799 www.wsp.com

PROJECT: VAAL AEROTROPOLIS LAND PREPARATION PHASE

TITLE: STORMWATER TYPICAL DETAILS SHEET 3

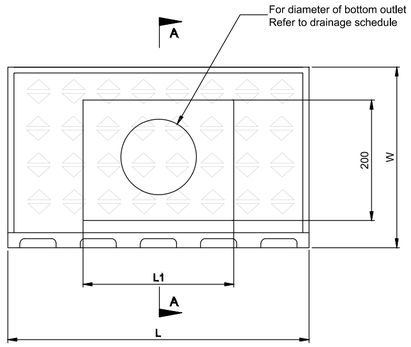
SCALE :	CHECKED:	APPROVED:
AS SHOWN	JN	DC (PR No.: —)
DESIGN: JN	DRAWN: JN	DATE: 2025/05/20
PROJECT No: 43103108	DRAWING No: 43103108-VAD-WSP-SW-ZZ-DR-SW-TD0003	REV: A

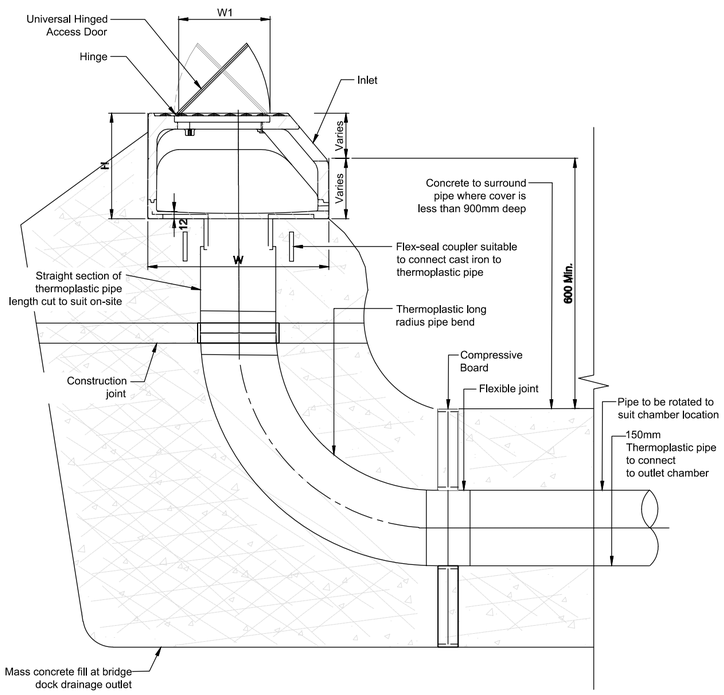
© COPYRIGHT RESERVED
The content of this document is privileged and confidential and may not be disclosed or reproduced without the express authorisation of the author, being "WSP GROUP AFRICA (PTY) LTD"

CESA

TEMPLATE VERSION MAY 2017

PLOT DATE: 2025/05/20 09:06:16



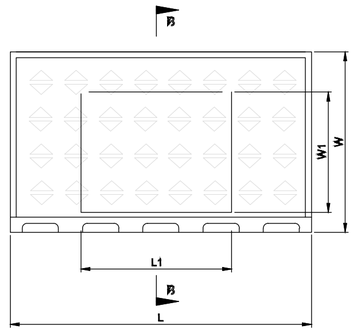


Section A-A

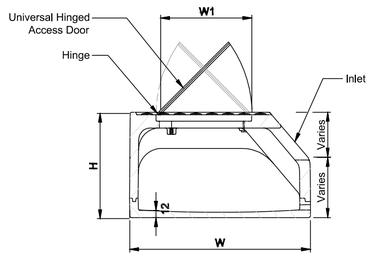
Bridge dock drainage bottom outlet details

Scale 1:5

C02



Plan

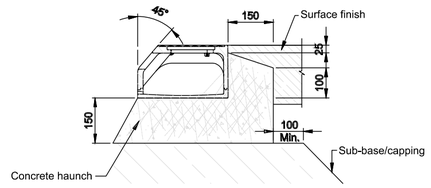


Section B-B

W	BDDU unit total width
W1	Access opening width
L	BDDU unit total length
L1	Access opening length
H	Back of BDDU height

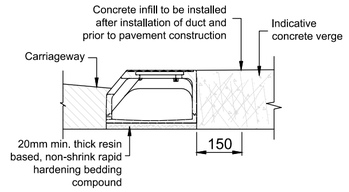
Access unit details

Scale 1:5



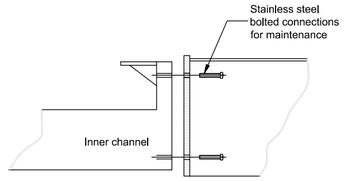
Standard bedding detail - bridge deck unit at verge

Scale 1:10



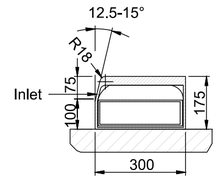
Standard bedding detail - bridge deck drainage unit at the bridge

Scale 1:10



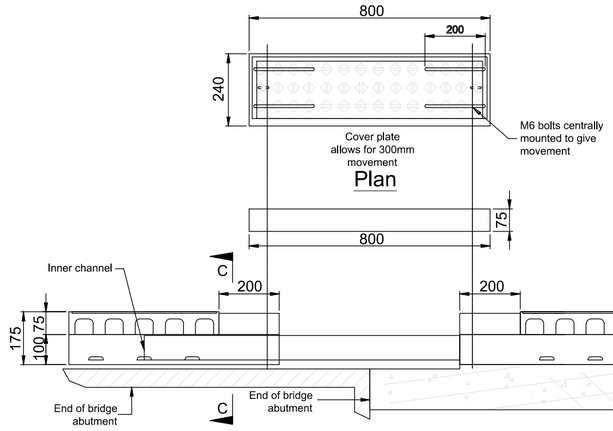
Exloded view of channel bolting arrangement

Scale 1:10



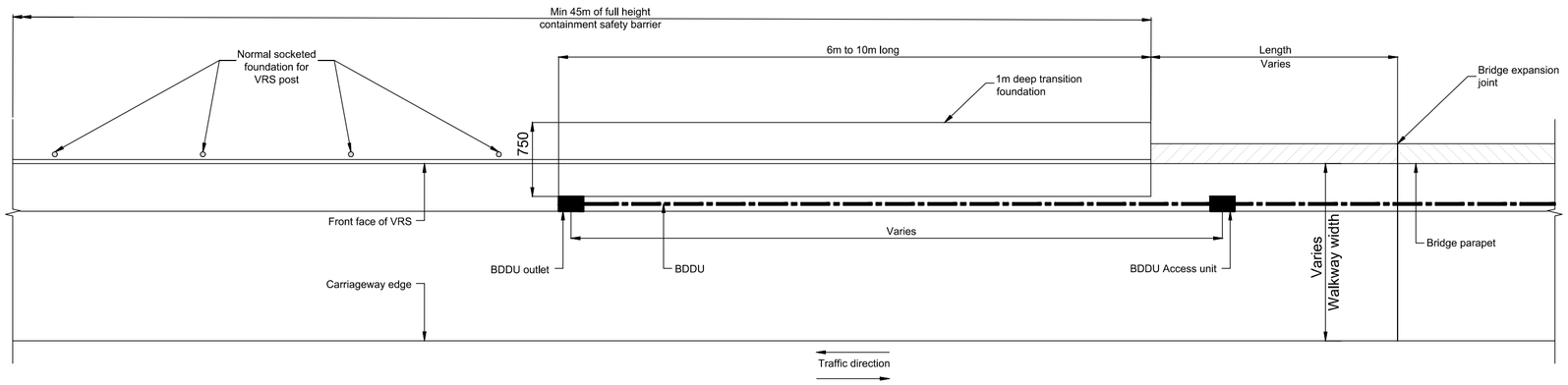
Section C-C

Scale 1:10



Bridge deck drainage unit expansion joint details

Scale 1:10



Bridge deck unit details

NTS

REV	DATE	BY	DESCRIPTION	CHK	APD
A	16-05-2025	JN	FOR INFORMATION	JN	DC

ARCHITECT: -

CLIENT: VAAL AEROZONE

DRAWING STATUS: INFORMATION

A signed version of construction drawings are available in electronic format at the WSP office of origin as well as at the WSP office of issue

WSP Group Africa (Pty) Ltd
Transportation and Infrastructure
The Pavilion, 1st Floor, Corner Portswood and Beach Road, Waterfront
Cape Town 8001, South Africa
PO Box 2613 Cape Town 8000
Tel: +27(0)21-481-8700 Fax: +27(0)21-481-8799 www.wsp.com

PROJECT: VAAL AEROTROPOLIS LAND PREPARATION PHASE

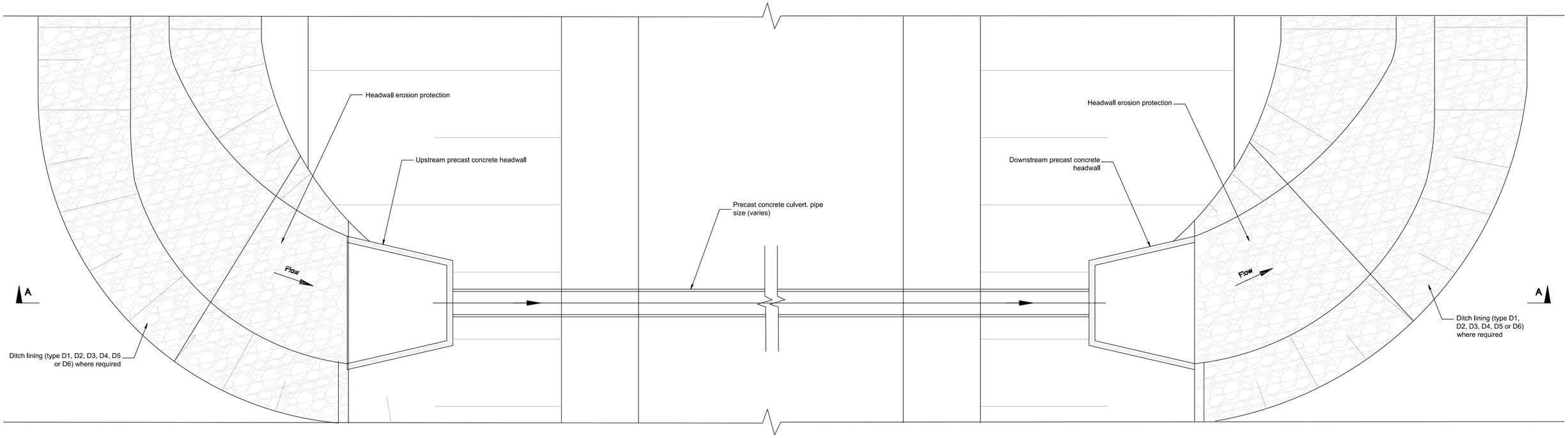
TITLE: STORMWATER TYPICAL DETAILS SHEET 4

SCALE :	CHECKED:	APPROVED:
AS SHOWN	JN	DC
DESIGN: JN	DRAWN: JN	DATE: 2025/05/20
PROJECT No: 43103108	DRAWING No: 43103108-VAD-WSP-SW-ZZ-DR-SW-TD0004	REV: A

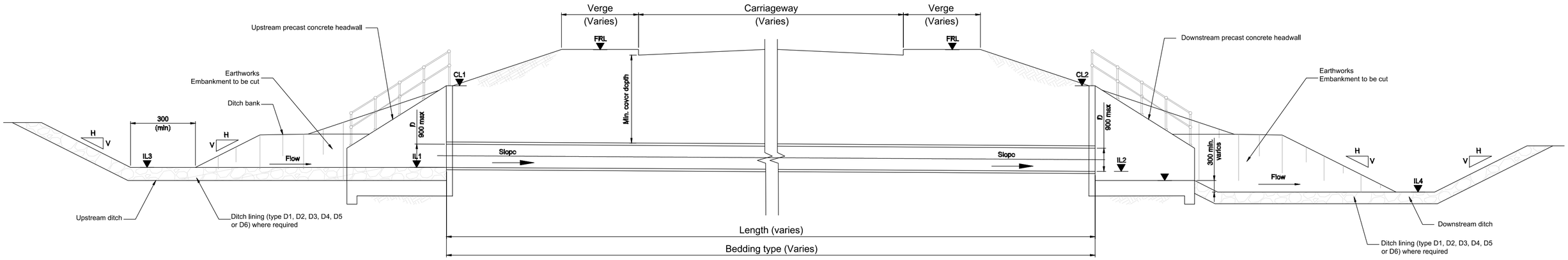
© COPYRIGHT RESERVED
The content of this document is privileged and confidential and may not be disclosed or reproduced without the express authorisation of the author, being "WSP GROUP AFRICA (PTY) LTD"

CESA

TEMPLATE VERSION MAY 2017



Plan
Culvert under highway/bridgeway and footpath
Scale 1:20



Section A-A

Plan and Profile

REV	DATE	BY	DESCRIPTION	CHK	APD
A	16-05-2025	JN	FOR INFORMATION	JN	DC

ARCHITECT: -

CLIENT: VAAL AEROZONE

DRAWING STATUS: INFORMATION

A signed version of construction drawings are available in electronic format at the WSP office of origin as well as at the WSP office of issue

WSP Group Africa (Pty) Ltd
Transportation and Infrastructure
The Pavilion, 1st Floor, Corner Portswood and Beach Road, Waterfront
Cape Town 8001, South Africa
PO Box 2613 Cape Town 8000
Tel: +27(0)21-481-8700 Fax: +27(0)21-481-8799 www.wsp.com

PROJECT: VAAL AEROTROPOLIS LAND PREPARATION PHASE

TITLE: STORMWATER TYPICAL DETAILS SHEET 5

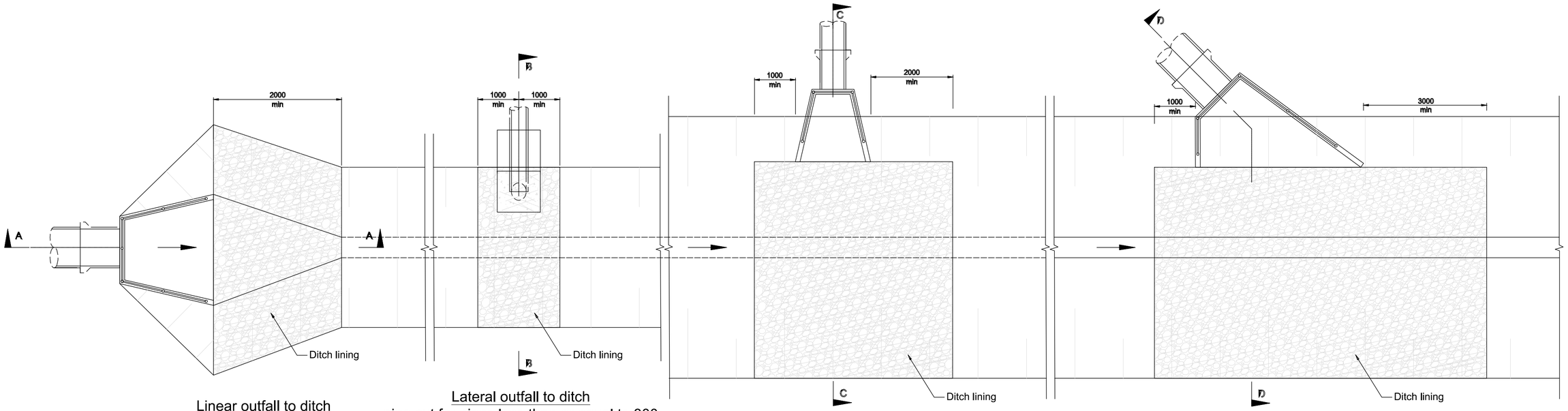
SCALE :	CHECKED:	APPROVED:
AS SHOWN	JN	DC
DESIGN: JN	DRAWN: JN	DATE: 2025/05/20
PROJECT No: 43103108	DRAWING No: 43103108-VAD-WSP-SW-ZZ-DR-SW-TD0005	REV: A

© COPYRIGHT RESERVED
The content of this document is privileged and confidential and may not be disclosed or reproduced without the express authorisation of the author, being "WSP GROUP AFRICA (PTY) LTD"

CESA

TEMPLATE VERSION MAY 2017

PLOT DATE: 2025/05/20 10:28:19



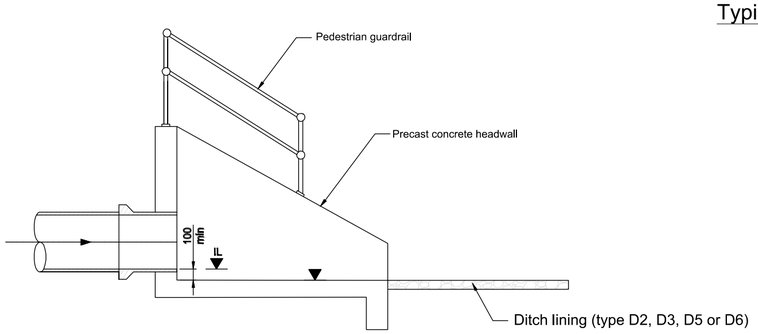
Linear outfall to ditch

Lateral outfall to ditch
pipe cut for pipes less than or equal to 300

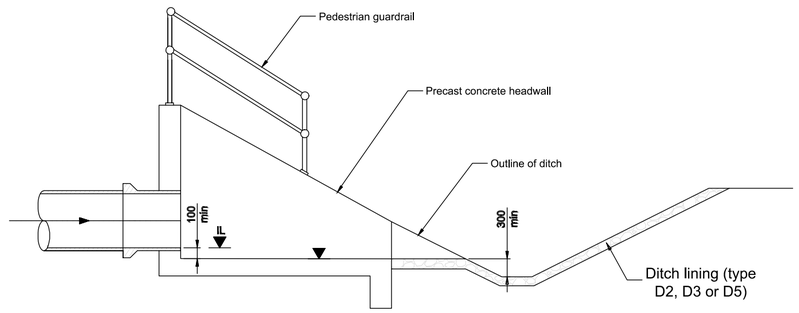
Lateral outfall to ditch
Perpendicular headwall

Lateral outfall to ditch
Skewed headwall

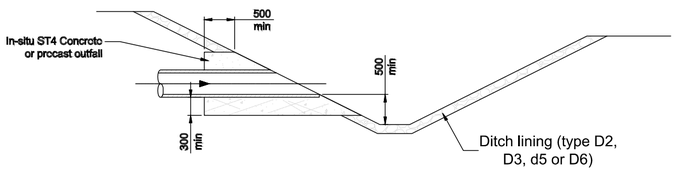
Plan
Typical ditch outfall
up to 900



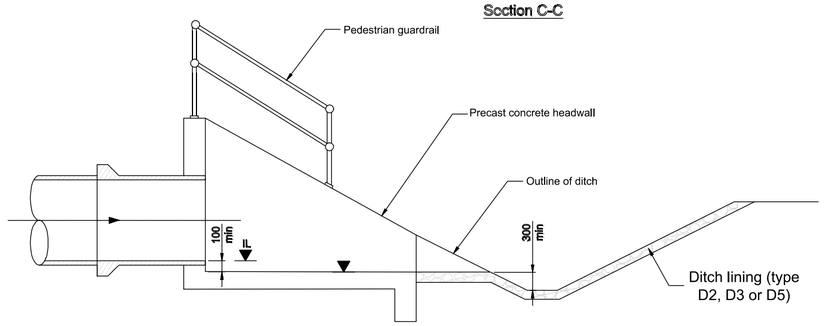
Section A-A



Section C-C



Section B-B



Section D-D

Typical ditch outfall
up to 900

REV	DATE	BY	DESCRIPTION	CHK	APD
A	16-05-2025	JN	FOR INFORMATION	JN	DC

ARCHITECT: -

CLIENT: VAAL AEROZONE

DRAWING STATUS: INFORMATION

A signed version of construction drawings are available in electronic format at the WSP office of origin as well as at the WSP office of issue

WSP Group Africa (Pty) Ltd
Transportation and Infrastructure
The Pavilion, 1st Floor, Corner Portswood and Beach Road, Waterfront
Cape Town 8001, South Africa
PO Box 2613 Cape Town 8000
Tel: +27(0)21-481-8700 Fax: +27(0)21-481-8799 www.wsp.com

PROJECT: VAAL AEROTROPOLIS LAND PREPARATION PHASE

TITLE: STORMWATER TYPICAL DETAILS SHEET 6

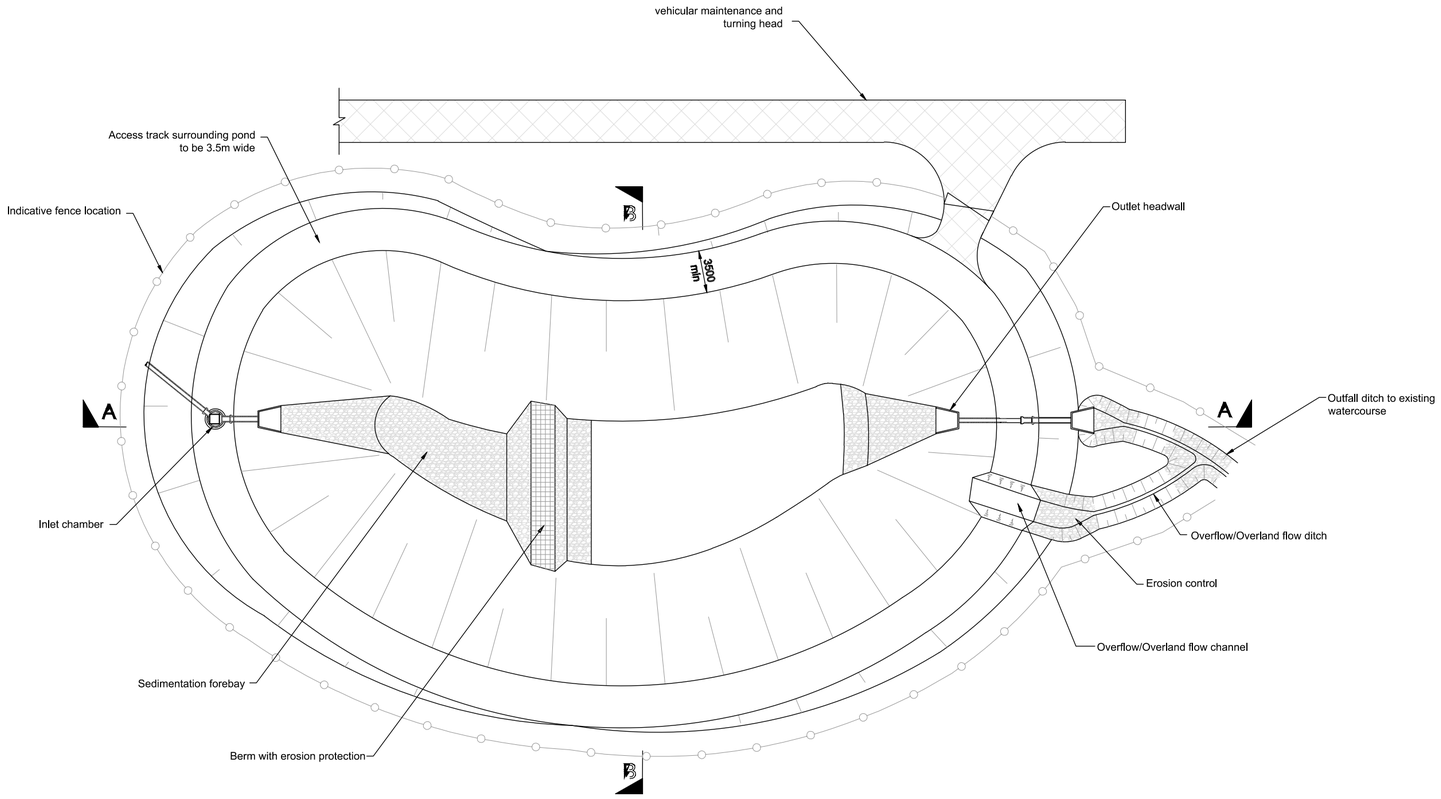
SCALE :	CHECKED:	APPROVED:
AS SHOWN	JN	DC
DESIGN: JN	DRAWN: JN	DATE: 2025/05/20
PROJECT No: 43103108	DRAWING No: 43103108-VAD-WSP-SW-ZZ-DR-SW-TD0006	REV: A

© COPYRIGHT RESERVED
The content of this document is privileged and confidential and may not be disclosed or reproduced without the express authorisation of the author, being "WSP GROUP AFRICA (PTY) LTD"

CESA

TEMPLATE VERSION MAY 2017

PLOT DATE: 2025/05/20 15:10:12



Attenuation pond typical layout

REV	DATE	BY	DESCRIPTION	CHK	APD
A	16-05-2025	JN	FOR INFORMATION	JN	DC

ARCHITECT: -

CLIENT: VAAL AEROZONE

DRAWING STATUS: INFORMATION

A signed version of construction drawings are available in electronic format at the WSP office of origin as well as at the WSP office of issue

WSP Group Africa (Pty) Ltd
Transportation and Infrastructure
The Pavilion, 1st Floor, Corner Portswood and Beach Road, Waterfront
Cape Town 8001, South Africa
PO Box 2613 Cape Town 8000
Tel: +27(0)21-481-8700 Fax: +27(0)21-481-8799 www.wsp.com

PROJECT: VAAL AEROTROPOLIS LAND PREPARATION PHASE

TITLE: STORMWATER TYPICAL DETAILS SHEET 7

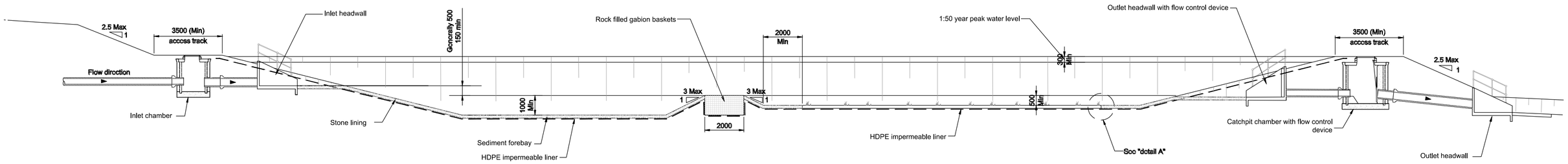
SCALE :	CHECKED:	APPROVED:
AS SHOWN	JN	DC
DESIGN: JN	DRAWN: JN	DATE: 2025/05/20
PROJECT No: 43103108	DRAWING No: 43103108-VAD-WSP-SW-ZZ-DR-SW-TD0007	REV: A

© COPYRIGHT RESERVED
The content of this document is privileged and confidential and may not be disclosed or reproduced without the express authorisation of the author, being "WSP GROUP AFRICA (PTY) LTD"

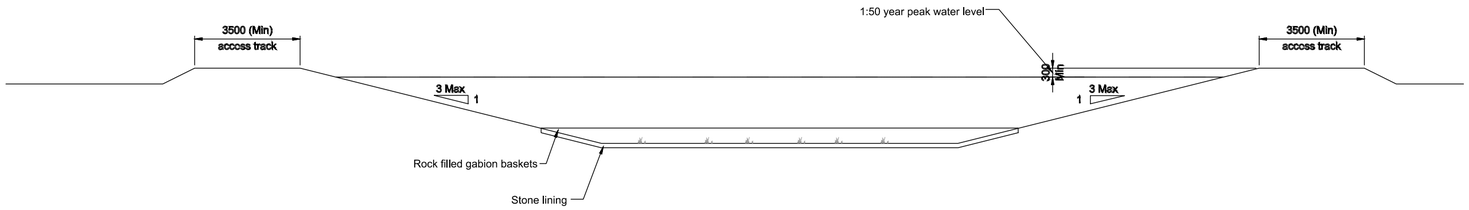
CESA

TEMPLATE VERSION MAY 2017

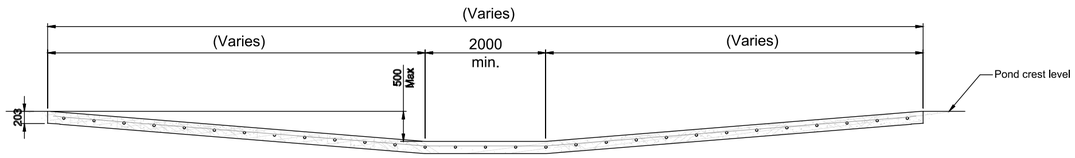
PLOT DATE: 2025/05/20 10:29:16



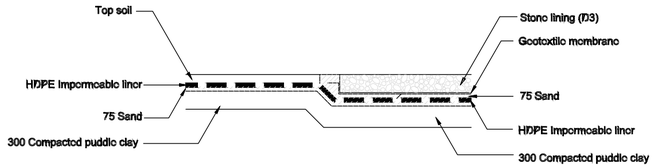
Section A-A
Attenuation pond
scale 1:100



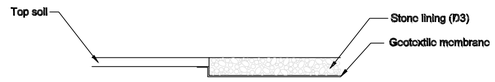
Section B-B
Attenuation pond
scale 1:100



Overflow/overland channel under
access maintenance track
scale 1:100



Detail A
impermeable liner
Scale 1:50



Detail A
permeable liner
Scale 1:50

Attenuation pond typical section details

REV	DATE	BY	DESCRIPTION	CHK	APD
A	16-05-2025	JN	FOR INFORMATION	JN	DC

ARCHITECT: -

CLIENT: VAAL AEROZONE

DRAWING STATUS: INFORMATION

A signed version of construction drawings are available in electronic format at the WSP office of origin as well as at the WSP office of issue

WSP Group Africa (Pty) Ltd
Transportation and Infrastructure
The Pavilion, 1st Floor, Corner Portswood and Beach Road, Waterfront
Cape Town 8001, South Africa
PO Box 2613 Cape Town 8000
Tel: +27(0)21-481-8700 Fax: +27(0)21-481-8799 www.wsp.com

PROJECT: VAAL AEROTROPOLIS LAND PREPARATION PHASE

TITLE: STORMWATER TYPICAL DETAILS SHEET 8

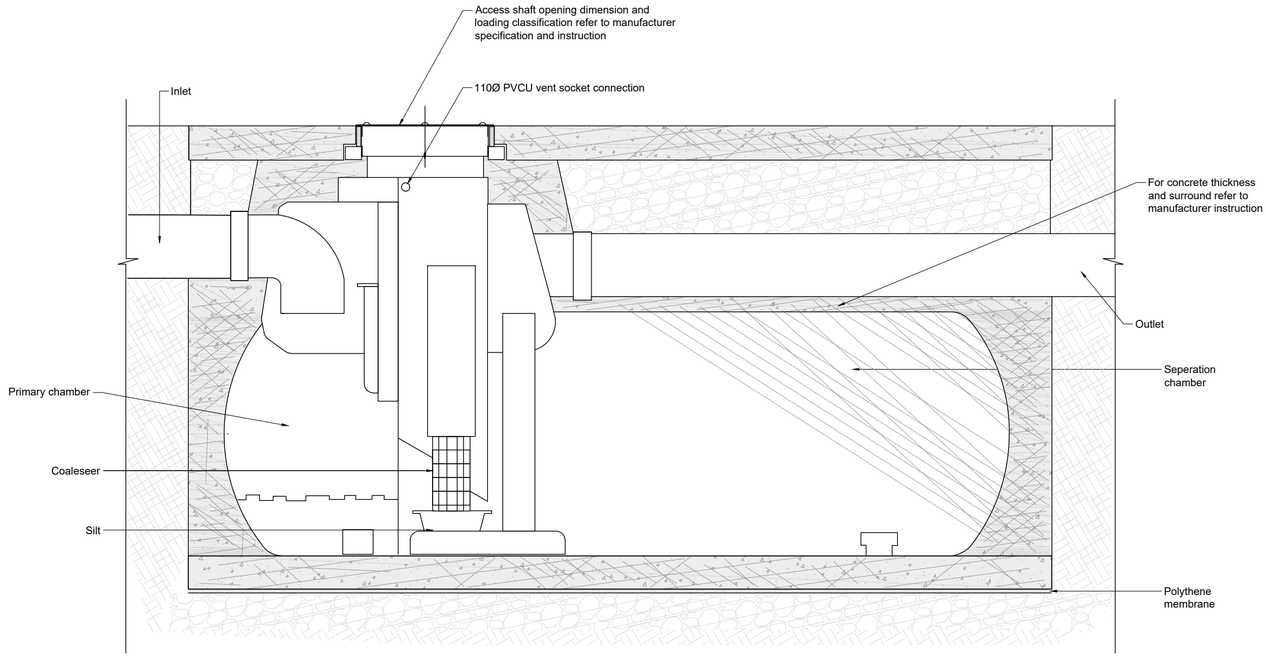
SCALE :	CHECKED:	APPROVED:
AS SHOWN	JN	DC
DESIGN: JN	DRAWN: JN	PR No: — DATE: 2025/05/20
PROJECT No: 43103108	DRAWING No: 43103108-VAD-WSP-SW-ZZ-DR-SW-TD0008	REV: A

© COPYRIGHT RESERVED
The content of this document is privileged and confidential and may not be disclosed or reproduced without the express authorisation of the author, being "WSP GROUP AFRICA (PTY) LTD"

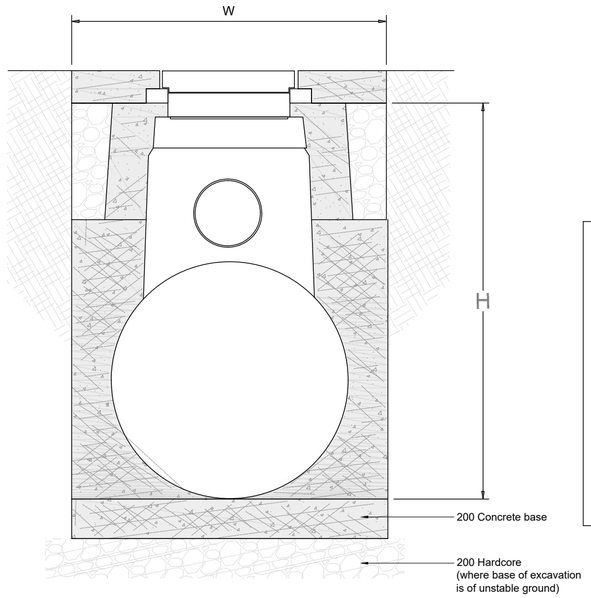
CESA

TEMPLATE VERSION MAY 2017

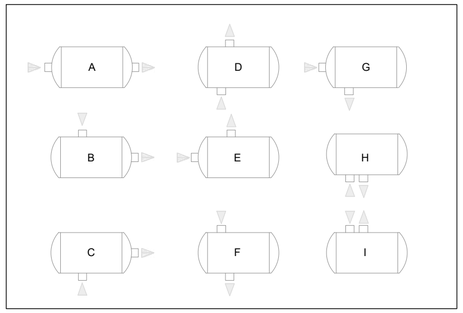
PLOT DATE: 2025/05/20 13:51:56



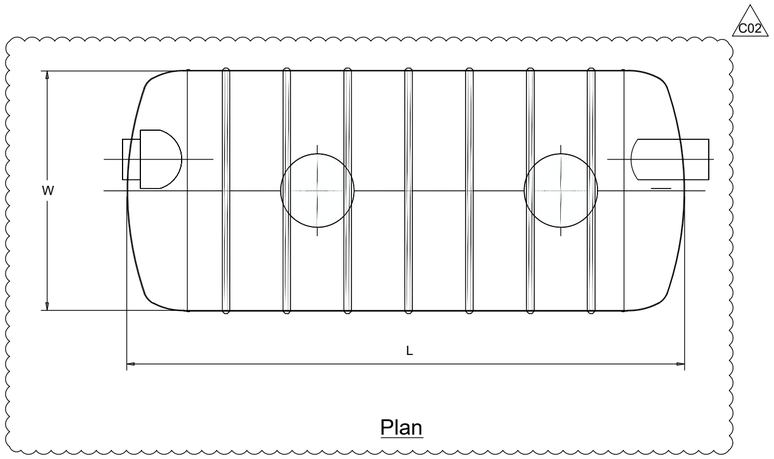
Class 1 by-pass separator typical elevation and section 2
Scale: 1:50



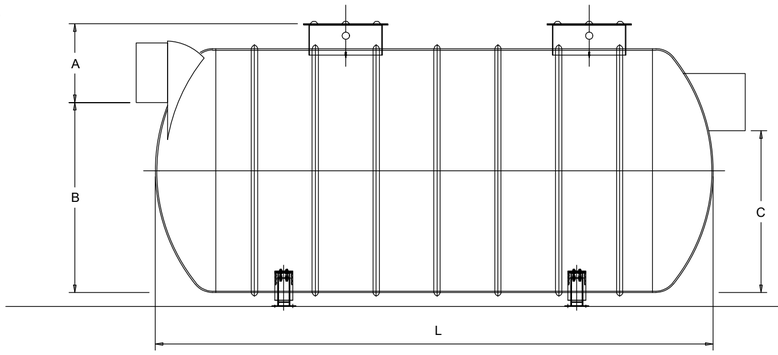
Section X-X
Scale: 1:50



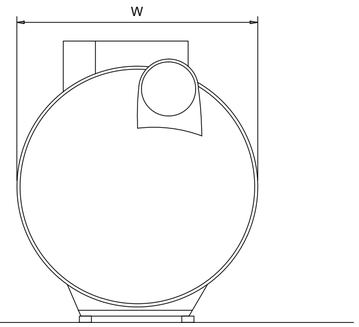
Choice of pipe connection orientation of inlet/outlet pipe connection
Scale: NTS



Plan



Class 1 by-pass separator typical elevation and section 1
Scale: 1:50



A : Inlet ivert depth
B : Base to inlet depth
C : Base to outlet invert depth
L : Overall length of the tank shell only
W : Overall width of the tank shell only

REV	DATE	BY	DESCRIPTION	CHK	APD
A	16-05-2025	JN	FOR INFORMATION	JN	DC

ARCHITECT: -

CLIENT: VAAL AEROZONE

DRAWING STATUS: INFORMATION

A signed version of construction drawings are available in electronic format at the WSP office of origin as well as at the WSP office of issue

WSP Group Africa (Pty) Ltd
Transportation and Infrastructure
The Pavilion, 1st Floor, Corner Portswood and Beach Road, Waterfront
Cape Town 8001, South Africa
PO Box 2613 Cape Town 8000
Tel: +27(0)21-481-8700 Fax: +27(0)21-481-8799 www.wsp.com

PROJECT: VAAL AEROTROPOLIS LAND PREPARATION PHASE

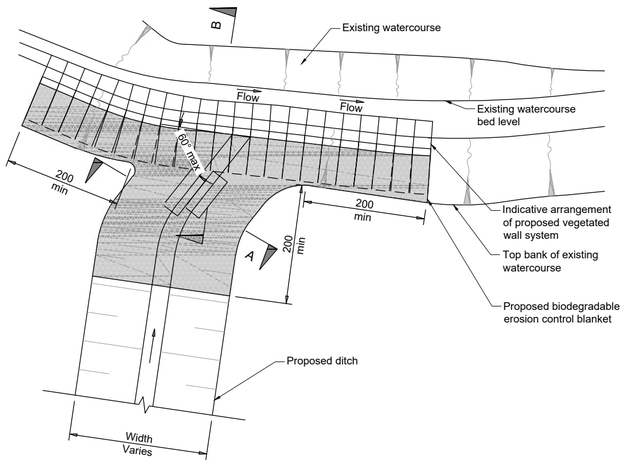
TITLE: STORMWATER TYPICAL DETAILS SHEET 9

SCALE :	CHECKED:	APPROVED:
AS SHOWN	JN	DC
DESIGN: JN	DRAWN: JN	PR No.: ---- DATE: 2025/05/20
PROJECT No: 43103108	DRAWING No: 43103108-VAD-WSP-SW-ZZ-DR-SW-TD009	REV: A

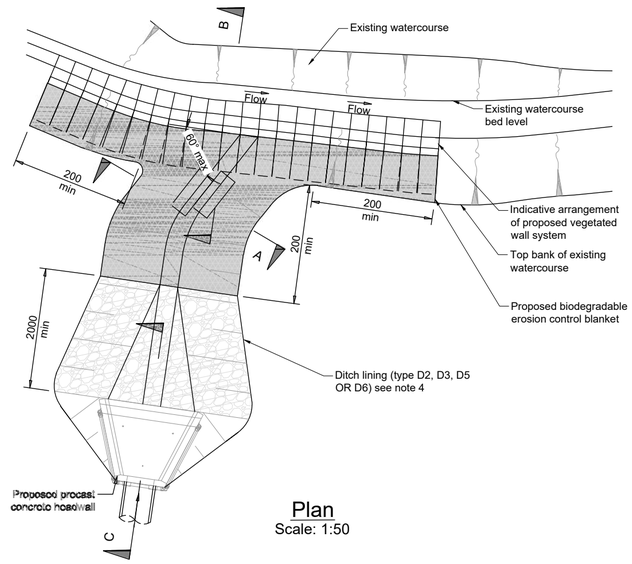
© COPYRIGHT RESERVED
The content of this document is privileged and confidential and may not be disclosed or reproduced without the express authorisation of the author, being "WSP GROUP AFRICA (PTY) LTD"

CESA

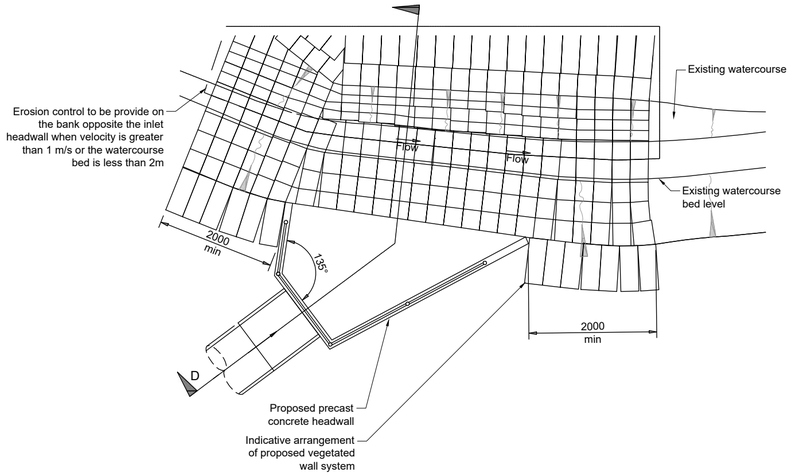
TEMPLATE VERSION MAY 2017



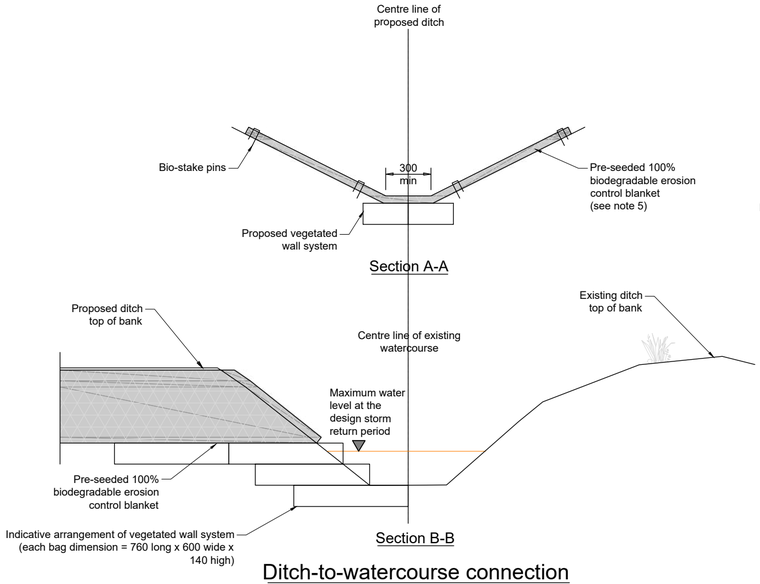
Plan
Scale: 1:50



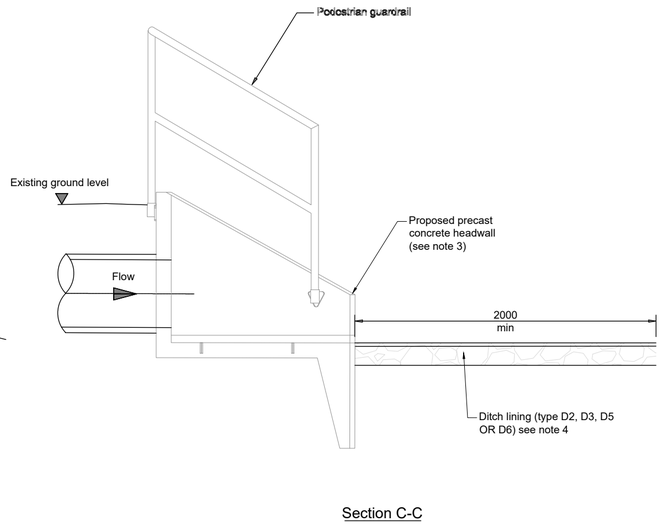
Plan
Scale: 1:50



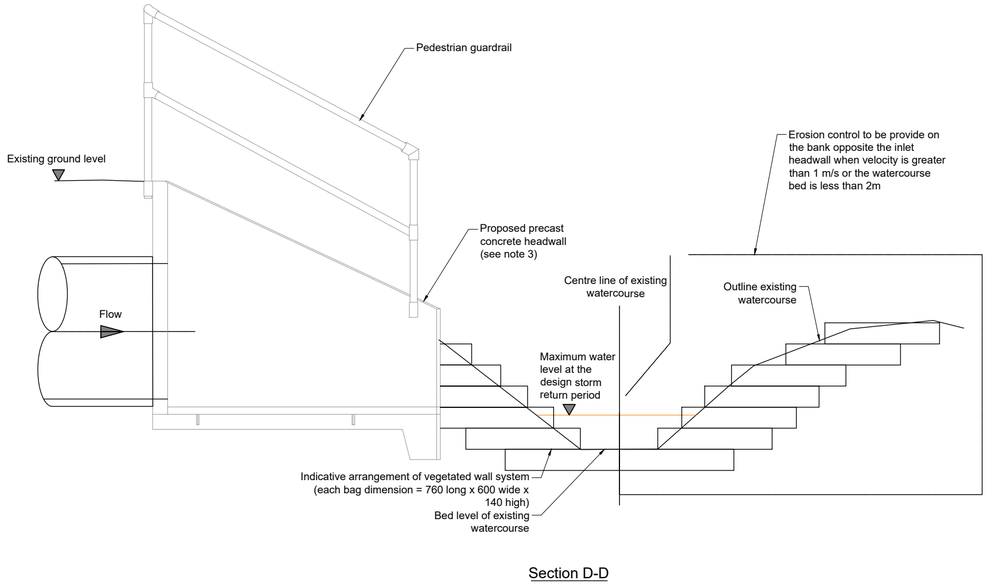
Plan
Scale: 1:50



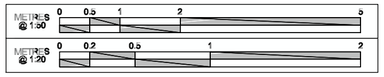
Ditch-to-watercourse connection
Scale: 1:20



Headwall-to-ditch-to-watercourse connection
Scale: 1:20



Headwall-to-watercourse connection
Scale: 1:20



REV	DATE	BY	DESCRIPTION	CHK	APD
A	16-05-2025	JN	FOR INFORMATION	JN	DC

ARCHITECT: -

CLIENT: VAAL AEROZONE

DRAWING STATUS: INFORMATION

A signed version of construction drawings are available in electronic format at the WSP office of origin as well as at the WSP office of issue

WSP Group Africa (Pty) Ltd
Transportation and Infrastructure
The Pavilion, 1st Floor, Corner Portswood and Beach Road, Waterfront
Cape Town 8001, South Africa
PO Box 2613 Cape Town 8000
Tel: +27(0)21-481-8700 Fax: +27(0)21-481-8799 www.wsp.com

PROJECT: VAAL AEROTROPOLIS LAND PREPARATION PHASE

TITLE: STORMWATER TYPICAL DETAILS SHEET 10

SCALE :	CHECKED:	APPROVED:
AS SHOWN	JN	DC
DESIGN: JN	DRAWN: JN	DATE: 2025/05/20
PROJECT No: 43103108	DRAWING No: 43103108-VAD-WSP-SW-ZZ-DR-SW-TD0010	REV: A

© COPYRIGHT RESERVED
The content of this document is privileged and confidential and may not be disclosed or reproduced without the express authorisation of the author, being "WSP GROUP AFRICA (PTY) LTD"

CESA

TEMPLATE VERSION MAY 2017

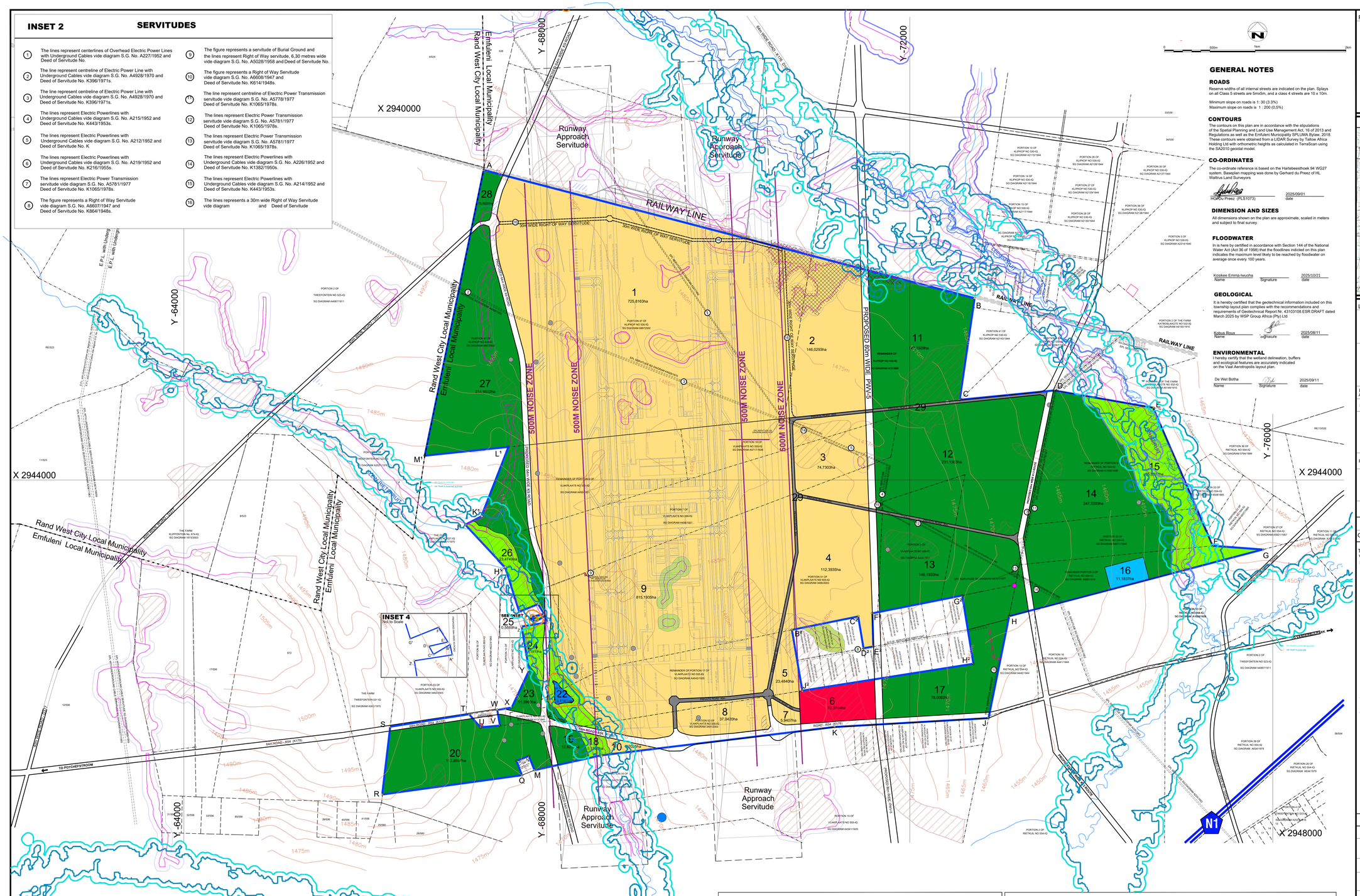
Appendix C

FLOODLINE DRAWING

CONFIDENTIAL

INSET 2 SERVITUDES

1. The lines represent centerlines of Overhead Electric Power Lines with Underground Cables vide diagram S.G. No. A227/1952 and Deed of Servitude No.
2. The line represent centreline of Electric Power Line with Underground Cables vide diagram S.G. No. A4928/1970 and Deed of Servitude No. K396/1971s.
3. The line represent centreline of Electric Power Line with Underground Cables vide diagram S.G. No. A4928/1970 and Deed of Servitude No. K396/1971s.
4. The lines represent Electric Powerlines with Underground Cables vide diagram S.G. No. A215/1952 and Deed of Servitude No. K443/1953s.
5. The lines represent Electric Powerlines with Underground Cables vide diagram S.G. No. A212/1952 and Deed of Servitude No. K
6. The lines represent Electric Powerlines with Underground Cables vide diagram S.G. No. A219/1952 and Deed of Servitude No. K216/1955s.
7. The lines represent Electric Power Transmission servitude vide diagram S.G. No. A5781/1977 Deed of Servitude No. K1065/1978s.
8. The figure represents a Right of Way Servitude vide diagram S.G. No. A8607/1947 and Deed of Servitude No. K884/1948s.
9. The figure represents a servitude of Burial Ground and the lines represent Right of Way servitude, 6,30 metres wide vide diagram S.G. No. A5028/1958 and Deed of Servitude No.
10. The figure represents a Right of Way Servitude vide diagram S.G. No. A6608/1947 and Deed of Servitude No. K614/1948s.
11. The line represent centreline of Electric Power Transmission servitude vide diagram S.G. No. A5778/1977 Deed of Servitude No. K1065/1978s.
12. The lines represent Electric Power Transmission servitude vide diagram S.G. No. A5781/1977 Deed of Servitude No. K1065/1978s.
13. The lines represent Electric Power Transmission servitude vide diagram S.G. No. A5781/1977 Deed of Servitude No. K1065/1978s.
14. The lines represent Electric Powerlines with Underground Cables vide diagram S.G. No. A226/1952 and Deed of Servitude No. K1382/1950s.
15. The lines represent Electric Powerlines with Underground Cables vide diagram S.G. No. A214/1952 and Deed of Servitude No. K443/1953s.
16. The lines represents a 30m wide Right of Way Servitude vide diagram and Deed of Servitude



GENERAL NOTES

ROADS

Reserve widths of all internal streets are indicated on the plan. Splays on all Class 5 streets are 5mx5m, and a class 4 streets are 10 x 10m.

Minimum slope on roads is 1: 30 (3.3%)
Maximum slope on roads is 1 : 200 (0,5%)

CONTOURS

The contours on this plan are in accordance with the stipulations of the Spatial Planning and Land Use Management Act, 16 of 2013 and Regulations as well as the Emfuleni Municipality SPLUMA Bylaw, 2018. These contours were obtained from a LIDAR Survey by Tallow Africa Holding Ltd with orthometric heights as calculated in TerraScan using the SA2010 geoidial model.

CO-ORDINATES

The co-ordinate reference is based on the Hartebeesthoek 94 WG27 system. Baseplan mapping was done by Gerhard du Preez of HL Waltrus Land Surveyors

HGDU Preez (PLS1073) 2025/09/01
Name Signature date

DIMENSION AND SIZES

All dimensions shown on the plan are approximate, scaled in meters and subject to final survey.

FLOODWATER

In is here by certified in accordance with Section 144 of the National Water Act (Act 36 of 1998) that the floodlines indicted on this plan indicates the maximum level likely to be reached by floodwater on average once every 100 years.

Kosikee Emma-Iwuoha 2025/10/21
Name Signature date

GEOLOGICAL

It is hereby certified that the geotechnical information included on this township layout plan complies with the recommendations and requirements of Geotechnical Report Nr. 43103108.ESR DRAFT dated March 2025 by WSP Group Africa (Pty) Ltd

Kobus Roux 2025/08/11
Name Signature date

ENVIRONMENTAL

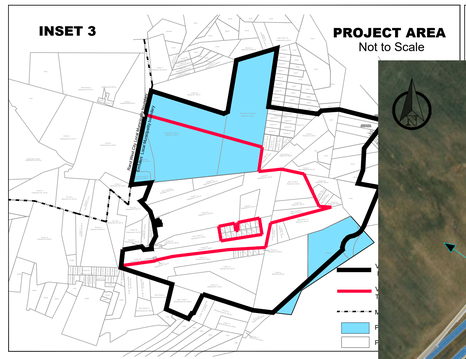
I hereby certify that the wetland delineation, buffers and ecological features are accurately indicated on the Vaal Aerotropolis layout plan.

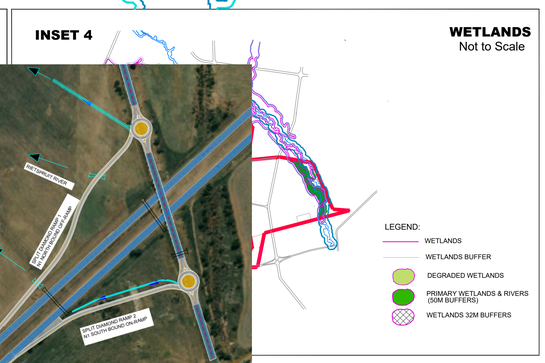
De Wet Botha 2025/09/11
Name Signature date

INSET 1

VAAL AEROTROPOLIS TOWNSHIP
SITUATED ON THE FOLLOWING FARM PORTIONS:

Property	SG Diagram
Remainder of the Farm Klipkop 530, IQ	472/1896
Portion 47 Klipkop 530 IQ	6897/2002
Remainder of Portion 9 of the Farm Rietkuil 554 IQ	A1058/1929
Portion 26 of the Farm Rietkuil 554 IQ	A6671/1956
Remaining Portion 3 of the Farm Rietkuil 554 IQ	A886/1916
Remainder of Portion 6 of the Farm Vlakplaats 555 IQ	A455/1921
Portion 18 of the Farm Vlakplaats 555 IQ	A4717/1926
Portion 7 of the Farm Vlakplaats 555 IQ	A456/1921
Portion 51 of the Farm Vlakplaats 555 IQ	3490/2003
Portion 20 of the Farm Vlakplaats 555 IQ	A13/1940
Remaining Portion 17 of the Farm Vlakplaats 555 IQ	A4543/1925
Portion 52 of the Farm Vlakplaats 555 IQ	3491/2003
Portion 5 of the Farm Vlakplaats 555 IQ	A454/1921





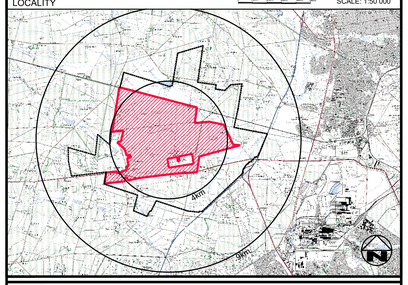
PROPOSED TOWNSHIP

VAAL AEROTROPOLIS TOWNSHIP

FOR COMPONENT PROPERTY DESCRIPTIONS – SEE INSET 1

Local Authority: Emfuleni Local Municipality
Land Use Scheme: Emfuleni LUS, 2023
District: Sedibeng District

LOCALITY — SCALE: 1:50 000



LAND USE TABLE

ZONING	PROPOSED LAND USE	ERF NUMBERS	No. OF STANDS	AREA OF STANDS& STREETS	% OF AREA
AERODROME	AERODROME WITH COMMERCIAL & BUSINESS USES, COMMUNICATION FACILITIES, PLACES OF REFRESHMENT, SHOPS, SPECIAL BUILDINGS, FILLING STATIONS, CONFERENCE FACILITIES AND ANCILLARY USES WITH CONSENT	1-5,7-10	9	1945,5803ha	54,92
PUBLIC SERVICES AND UTILITIES	WASTE WATER TREATMENT WORKS	16	1	11,1837ha	0,32
BUSINESS 1	AIRPORT CITY, INSTITUTIONAL, OFFICES	6	1	33,3164ha	0,94
AGRICULTURAL	AGRI ZONE INCLUDING AGRICULTURAL BUILDINGS, AGRICULTURAL LAND, AGRICULTURAL INDUSTRIES AND USES ANCILLARY TO AGRICULTURAL PRODUCTION WITH CONSENT	11-14,17,19-21, 23,27,28	11	1211,8843ha	34,21
PRIVATE OPEN SPACE	AS PER SCHEME (PARKS/CONSERVATION)	15,18,22,24-26	6	150,1874ha	4,24
EXISTING AND PROPOSED ROADS	PRIVATE STREET	29	1	33,4636ha	0,94
	STREETS			156,9958ha	4,43
TOTAL			29	3542,6115ha	100%

GENERAL NOTES

THE FIGURE ABCDEFGHJKLMNPQRSTUVWXYZA'B'C'D'E'F'G'H'J'K'L'M'N'P'Q'R'S'T'U' V'W'X'Y'Z'A'A. EXCLUDING B'C'D'E'F'G'H'J'B' REPRESENTS OUTSIDE BOUNDARY OF THE PROPOSED VAAL AEROTROPOLIS TOWNSHIP, BEING APPROXIMATELY 3542,6115ha IN EXTENT.

LEGEND

- OUTSIDE BOUNDARY OF TOWNSHIP
- CONTOURS
- FARM PORTIONS
- 500M NOISE ZONE
- 1 : 100 YEAR FLOODLINE
- 1 : 100 YEAR FLOODLINE WITH BUFFER
- RIVER / RIVER STREAMS
- 50m WETLANDS BUFFER
- 100m WETLANDS BUFFER
- RIVER / RIVER BUFFER
- DEGRADED WETLANDS
- WETLANDS WITH 32m BUFFERS
- SEEPAGE
- DAM

GEOTECNICAL AREAS

- FACET II - SEEPAGE
- FACET IV - DIGGING BORROWS

HERITAGE AREAS

- HERITAGE HIGH POLYGONS
- HERETAGE RUINS
- BROKEN DOWN FARMSTEAD
- HISTORICAL SHED
- HERITAGE HIGH POLIGONS
- BURIAL GROUND

REVISIONS

D1.	AMENDED OUTSIDE BOUNDARY.	J. PIENAAR	30/04/2025
D2.	ADDED LATEST CONTOUR DETAIL, WETLAND & AQUATICS INFO UPDATED ERF BOUNDARIES AFFECTED BY WETLANDS UPDATED FARM PORTIONS AS PER LATEST BASEPLAN INFO.	J. PIENAAR	11/09/2025
D3.	AMENDED PRIVATE ROADS ON THE SOUTHERN PART OF THE TOWNSHIP. UPDATED LAND USE TABLE.	J. PIENAAR	08/10/2025
D4.	ADDED INTERSECTION AND R.O.W. SERV OVER ERF 1 AND 2, REMOVED FARM PORTIONS ON ERF 27,IS PART OF PORTION 47. UPDATED LAND USE TABLE AND FARM PORTION TABLE.	J. PIENAAR	10/10/2025

CLIENT: VAAL AEROZONE

MUNICIPALITY: EMFULENI LOCAL MUNICIPALITY

TOWN PLANNER: Jon Busser, Pr. PLN : A/994/1997

COPYRIGHT RESERVED

SCALE: 1:15 000 (A0)

DRAWING REF: VAAL AEROTROPOLIS0Lay D4/2025.10.10

DRAWING STATUS: DRAFT

URBAN DYNAMICS
355 BEYERS NAUDE DRIVE
NORTHCLIFF
RANDBURG
2193
P.O. BOX 291803
MELVILLE
2109
CELL : 082 6534 155
E-MAIL: jon@urbandynamics.co.za

Building 1, Maxwell Office Park
Magwa Crescent West, Waterfall City
Midrand, 1685
South Africa

wsp.com

CONFIDENTIAL

ANNEXURE 0

VAAL AEROTROPOLIS DESIGN (PTY) LTD

NATIONAL FREEWAY N1-P24/1-D2459 SPLIT DIAMOND INTERCHANGE FATAL FLAW REPORT

SUPPORT DOCUMENT TO THE VAAL AEROTROPOLIS TRANSPORTATION IMPACT ASSESSMENT

43103146.FFREV1
MAY 2026

CONFIDENTIAL

VAAL AEROTROPOLIS DESIGN (PTY) LTD

NATIONAL FREEWAY N1-P24/1-D2459 SPLIT DIAMOND INTERCHANGE FATAL FLAW REPORT

SUPPORT DOCUMENT TO THE VAAL AEROTROPOLIS TRANSPORTATION IMPACT ASSESSMENT

TYPE OF DOCUMENT (REV 1) CONFIDENTIAL

PROJECT NO. 43103146

OUR REF. NO. 43103146.FFREV1

DATE: MAY 2026

WSP

Building 1, Maxwell Office Park
Magwa Crescent West, Waterfall City
Midrand, 1685
South Africa

Phone: +27 11 254 4800

WSP.com

QUALITY CONTROL

Issue/revision	First issue	Revision 1	Revision 2	Revision 3
Remarks	Final	Rev 1		
Date	5 March 2025	13 May 2026		
Prepared by	Tshepo Liholo PrTech Basetsana Kgatle	Christo Bredenhann PrEng Kiran Krishnan Benson Mathew		
Signature		Digitally signed by Christo Bredenhann Date: 14.05.2026		
Checked by	Christo Bredenhann PrEng	John Rammutla PrEng		
Signature		John Koketso Rammutla Digitally signed by John Koketso Rammutla DN: cn=John Koketso Rammutla, c=ZA, o=WSP Africa , ou=Transport & Infrastructure , email=koketso.rammutla@wsp.com Date: 2026.05.14 14:03:22 +02'00'		
Authorised by	John Rammutla PrEng	Sam Naidoo PrEng		
Signature				
Project number	43103146	43103146		
Report number	Version 01	Version 02		
File reference	\\corp.pbwan.net\za\Central_Data\Projects\43100xxx\43103108 - VAAL - LAND PREPARATION\43 H&T\43 HT\01-D&D Docs\03-Outputs\01-Reports\02 - Fatal Flaw Report	\\corp.pbwan.net\za\Central_Data\Projects\43100xxx\43103108 - VAAL - LAND PREPARATION\43 H&T\43 HT\01-D&D Docs\03-Outputs\01-Reports\02 - Fatal Flaw Report		

CONTENTS

EXECUTIVE SUMMARY

ABBREVIATIONS AND ACRONYMS 3

1 INTRODUCTION 5

2 SPATIAL AND TRANSPORT PLANNING INFORMANTS 9

3 THE NEED FOR AN ACCESS INTERCHANGE 15

4 EXISTING AND PLANNED HIGH-ORDER ROAD NETWORK 16

5 PROPOSED INTERCHANGE LAYOUT 21

6 COST ESTIMATE 43

7 TRAFFIC FLOW ASSESSMENT 44

8 IMPACT ON NEW AND EXISTING TOLL FACILITIES 50

9 ROAD SIGNAGE 55

10 ENVIRONMENTAL FATAL FLAW ASSESSMENT 62

11 SDI IMPLEMENTATION PLAN - PHASING 75

12 CONCLUSIONS AND RECOMMENDATIONS 76

TABLES

Table 5-1 – Existing N1 cross-section geometric details 25

Table 5-2 – Design Speed for interchange ramps – SANRAL Geometric Design Guideline 31

Table 5-3 – Horizontal Alignment Criteria for Ramps 34

Table 5-4 – Vertical Alignment Criteria for Ramps 35

Table 5-5 – Minimum Spacing between Rural Freeway Interchanges (TRH 26) 36
Table 5-6 – Minimum Spacing between successive ramp terminals 39
Table 6-1 – Cost estimate for the SDI 43
Table 7-1 – Vaal Aerotropolis Phase Development Trips (peak hours) 44
Table 10-1 – Proposed Development Area Environmental Sensitivity (N1/P24-1 & N1/D2459 SDI) 62
Table 10-2 – Development Area Environmental Sensitivity (N1/P24-1 & N1/D2459 SDI) 64
Table 10-3 – NEMA triggers 72
Table 10-4 – NWA triggers 74

FIGURES

Figure 1-1 – Layout of proposed N1 / K170 / K176 access interchange 6
Figure 1-2 – Layout of proposed N1 / P24/1 access interchange 7
Figure 2-1 - Macro Locality Plan 10
Figure 4-1 – Layout of the existing major road network 16
Figure 4-2 – N1-R57 Existing Partial Cloverleaf interchange 17
Figure 4-3 – Planned Gauteng Major Route Network (May 2010) 19
Figure 5-1 – SDI layout (Northern ramps) - N1 & P24/1 21
Figure 5-2 – SDI layout (Southern ramps) - N1 & D2459 22
Figure 5-3 – Existing cross-section details N1, P24/1, P155/1 ramps 24
Figure 5-4 – Proposed on-ramp connecting N1 northbound carriageway and P24/1 26
Figure 5-5 – Proposed off-ramp connecting N1 southbound carriageway and P24/1 27
Figure 5-6 – Proposed off-ramp connecting P155/1 on-ramp and P24/1 27
Figure 5-7 – Proposed eastern & western roundabout ramp terminals on P24/1 28
Figure 5-8 – Proposed on-ramp connecting D2459 to N1 southbound carriageway 29
Figure 5-9 – Proposed off-ramp from N1 northbound carriageway to D2459 29
Figure 5-10 – Proposed northern & southern roundabout ramp terminals on D2459 30
Figure 5-11 – Proposed single lane entrance ramp terminal: N1 off-ramp 31
Figure 5-12 – Proposed single lane exit ramp terminal: N1 on-ramp 32
Figure 5-13 – Typical cross-section of ramps – Single Lane 33

Figure 5-14 – Typical cross section of ramps - Two Lane 33
Figure 5-15 – Spacing from P155/1 northbound on-ramp & SDI northbound on-ramp from P24/1 to N1 36
Figure 5-16 – Spacing from SDI southbound off-ramp from N1 to P24/1 & P155/1 southbound off-ramp from N1 37
Figure 5-17 – Spacing from SDI southbound on-ramp from D2459 to N1 & P155/1 southbound off-ramp from N1 37
Figure 5-18 – Spacing from SDI northbound off-ramp from N1 to D2459 & P155/1 northbound on-ramp 38
Figure 5-19 – Measurement of SDI centre line spacing-P155/1 to P24/1 40
Figure 5-20 – Measurement of SDI centre line spacing-P155/1 to P24/1 prior to taper 41
Figure 7-1 - 2024 Background Traffic 46
Figure 7.2 Latent Development locations 47
Figure 7-3 N1 & P24-2033 background, latent and development traffic volumes 48
Figure 7-4 N1 & D2459-2033 background, latent and development traffic volumes 49
Figure 8-1 - Grasmere Toll Plaza layout 50
Figure 8-2 N1/P24 & Grasmere Toll Plaza location 51
Figure 8-3 – Vaal Toll Plaza layout 52
Figure 8-4 N1/D2459 & Vaal Toll Plaza locations 53
Figure 9-1 – Directional Signage Examples 56
Figure 9-2 – Regulatory signage examples 56
Figure 9-3 – Warning signage examples 57
Figure 9-4 – Warning signage examples 57
Figure 9-5 – Supplementary advance exit/through direction overhead sign GC3U 58
Figure 9-6 – Exit direction sign (GC4U) and through direction sign (GC6U) 58
Figure 9-7 – Gore exit sign (GA4) 59
Figure 9-8 – Dual carriageway freeway begins sign (R401) 59
Figure 9-9 – Two two-lane roadways join on a curve sign GS404 60
Figure 10-1 – Option 1 N1/P24-1 & N1/D2459 SDI Vegetation Map 66
Figure 10-2 – Option 1 N1/P24-1 & N1/D2459 SDI CBA & ESA Map 67
Figure 10-3 – Option 1 N1/P24-1 & N1/D2459 SDI Wetland Map 68
Figure 10-4 – Option 2 N1/P24-1 & N1/D2459 Split Diamond Interchange Vegetation Map 69

Figure 10-5 – Option 2 N1/P24-1 & N1/D2459 Split Diamond Interchange CBA & ESA Map 70

Figure 10-6 – Option 2 N1/P24-1 & N1/D2459 Split Diamond Interchange Wetland Map 71

APPENDICES

APPENDIX A

SANRAL COMMENTS ON PREVIOUS FATAL FLAW REPORT

APPENDIX B

GPDRT APPROVAL OF N1 / P24/1 / D2459 SDI

APPENDIX C

VAAL AEROTROPOLIS MASTERPLAN

APPENDIX D

ENVIRONMENTAL SCREENING REPORTS

EXECUTIVE SUMMARY

This N-P24/1-D2459 split diamond interchange (SDI) Fatal Flaw Report for access to the Vaal Aerotropolis Phase 1, serves as an application for in-principle approval of the SDI and support document to the Transportation Impact Assessment for the development of the Vaal Aerotropolis Airport (Phase 1). This report comprises of the sections which are in accordance with SANRAL's requirements pertaining to Step 1 of the process for a new interchange application.

This Fatal Flaw Report comprises of the following sections:

1. Background
2. Previous Studies & Reports
3. Motivation for the new interchanges
4. Existing road layout
5. Proposed new layout
6. Cost Estimates of Interchange proposals
7. Traffic and Traffic Flows
8. Impact on new and existing toll facilities with respect to toll diversion
9. Road signage
10. Environmental fatal flaws identified
11. Implementation plan (phasing)
12. Conclusions and Recommendations

The previous Vaal Aerotropolis N1 Fatal Flaw Report applied for 2 interchange options:

- Interchange Option 1: N1 & R541 at the R57 interchange – Rejected by SANRAL
- Interchange Option 2: N1 & K1701/K176 – Approved in principle by SANRAL

SANRAL rejected the Option 1 interchange, supported Option 2, and proposed a third interchange option. This split diamond interchange with the National Freeway N1 will consist of northern ramps at the P24/1 (R541) overpass, and southern ramps at the D2459 overpass.

SANRAL stated that this interchange option is merely a concept idea that could provide an acceptable solution, and was not rigorously evaluated.

THE SDI was conceptually designed, assessed and presented to the Gauteng Department of Roads and Transport, with 3 sub-options of an associated grade separated junction of the D2459 and the P24/1. Province has provided in-principle approval for the interchange with Option 3 of the D2459 / P24/1 grade separated junction.

This revised report present this interchange option to SANRAL for consideration.

This report also consolidates the preliminary data, previous studies, and financial projections to provide a comprehensive understanding of the project's feasibility and challenges. While certain sections, such as detailed cost estimates and phasing, require further elaboration, this document establishes a foundation for informed decision-making by stakeholders and regulatory authorities.

The findings emphasize the transformative potential of the Vaal Aerotropolis as a central node for regional and international connectivity, fostering economic and social development in the Vaal region.

Contact name John Rammutla

Contact details +27 74 048 1207 | koketso.rammutla@wsp.com

ABBREVIATIONS AND ACRONYMS

DN	Do Nothing
EIA	Environmental Impact Assessment
GLA	Gross Leasable Area
IDZ	Industrial Development Zone
SEZ	Special Economic Zone
TIA	Transportation Impact Assessment
TMP	Transport Master Plan
ISRDP	Integrated Sustainable Development Strategy
NDP	National Development Plan
SPLUMA	Spatial Planning and Land Use Management Act
RSDF	Regional Spatial Development Framework (RSDF)
CBA	Critical Biodiversity Area
DFP	Development Framework Plan
DDM	District Development Model
ESA	Ecological Support Area
EMPr	Environmental Management Programme
ELM	Emfuleni Local Municipality
ELUS	Emfuleni Land Use Scheme of 2023
EMP	Environmental Management Plan
GPEMF	Gauteng Province Environmental Management Framework
IDP	Integrated Development Plan
LSDF	Local Spatial Development Framework
LTDF	Long Term Development Framework
MSCP	Multi Storey Car Park (“Parkades”)
MPPA	Million passengers per annum
NEMA	National Environmental Management Act, 1998 (Act No. 107 of 1998)
NHRA	National Heritage Resources Act, 1999 (Act No. 25 of 1999)
NWA	National Water Act, 1999 (Act No. 36 of 1998)
Pax	Passenger
SANRAL	South African National Roads Agency SOC Ltd
SDF	Spatial Development Framework

SDI	Split Diamond Interchange
SDP	Site Development Plan
SDM	Sedibeng District Municipality
sqm	square metre
VA	Vaal Aerotropolis
VAZ	Vaal Aero Zone
VRRSDF	Vaal River Regional Spatial Development Framework

1 INTRODUCTION

1.1 BACKGROUND

The Vaal Aerotropolis project will feature a new international airport with passenger terminals, a secure cargo terminal, a strategically located Trade Zone, surrounding Agri zones and an Airport City business park. The Aerotropolis will offer facilities featuring environmentally sustainable practices and various incentives to attract international airlines and freight carriers.

The Vaal Aerotropolis will be located in the Sedibeng District Municipality, west of National Road N1 and directly adjacent to Provincial Route P24/1 (R541, and will comprise of:

- An International Airport with a 4,2km runway to accommodate any size of aircraft, with a second parallel runway of 4.2 km in to be constructed in a future phase, with a central apron link.
- Ultimately, three passenger and various cargo terminals including all supporting facilities
- The terminals and runways will be implemented in three phases
- Agri-zones and holding areas for produce being air freighted across the world
- External provincial road network upgrades with direct access to the N1 at a new access interchange
- Commercial, residential, retail and medical facilities.
- Passenger and Cargo terminals and all supporting facilities.
- Trade port with logistics and distribution facilities and general and cold warehousing and other commercial and industrial opportunities.
- Agri-zones and holding areas for produce being air freighted across the world.
- Airport City with offices, a hotel, conference, retail and medical facilities.

1.2 VAAL AEROTROPOLIS N1 INTERCHANGE FATAL FLAW REPORT

WSP submitted an initial Fatal Flaw Report to SANRAL, Reference No. 43103146.FF, dated March 2025. This report presented various N1 interchange options to serve Phase 1 of the Aerotropolis. Refer to SANRAL's response letter, dated 3 June 2025, in Appendix A.

Two interchange options were presented in the report for in-principle approval by SANRAL.

- N1 & K170/K176 Access Interchange

A partial cloverleaf layout with two roundabout terminals (as required by SANRAL), facilitating connectivity between the K170/K176 and the N1. The interchange provides connectivity between Sebokeng (east of the N1), the Aerotropolis (west of the N1), and the broader regional road network. Refer to Figure 1-1 for the layout.

SANRAL supported this interchange in principle:

"This is a currently planned interchange and provides linkages to the second order road network to the east and west. There are no issues with access spacing. From a transport planning perspective and the promotion of a balanced road hierarchy, this option is supported."

The developer is not in favour of the N1/K170/K176 access interchange to serve Phase 1 of the airport due to the its location, the long route to the airport's terminals and Airport City precinct, and major infrastructure upgardes to the Provincial road network (new and upgraded roads).

This interchange option was not pursued further, but could be considered for future phases of the Aerotropolis.

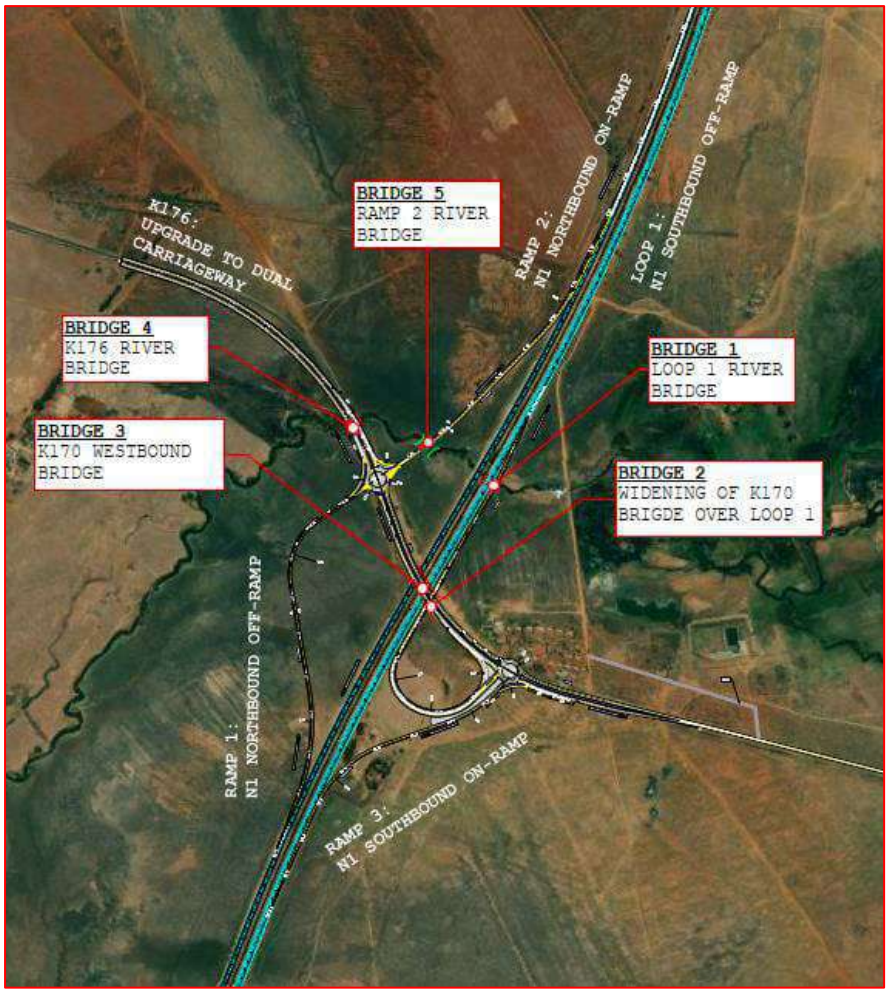


Figure 1-1 – Layout of proposed N1 / K170 / K176 access interchange

- N1 & P/24/1 Access Interchange

An access interchange of the N1 located at the R57 partial interchange, to link to the P24/1 (R5411). The fully directional interchange shown in Figure 1-2 integrates with the existing R57

partial cloverleaf that provides access between the N1 northbound and areas to the east, such as Sebokeng, as well as from the east to the N1 northbound. Additionally, the layout includes a potential layout of the future system interchange of the N1 and the PWV20.

<u>This interchange was rejected by SANRAL:</u>

"The lack of all movements, particularly east-west at the N1/R57 interchange and the connection to the R541 does not promote a balanced road network and is geared at providing direct access to the airport from the N1 only." This interchange option was not pursued further.

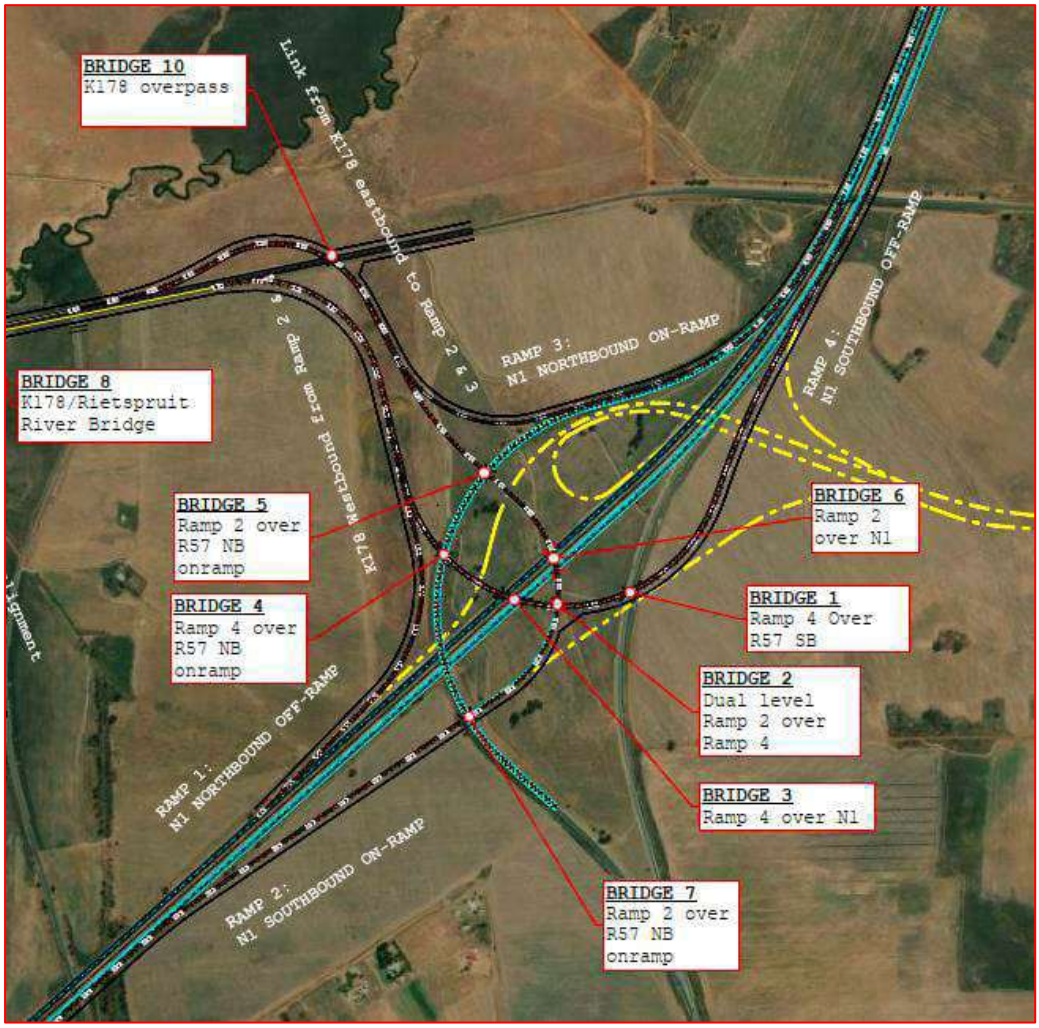


Figure 1-2 – Layout of proposed N1 / P24/1 access interchange

Additional interchange options were also developed, presented and subsequently discarded, mainly due to interchange access spacing standards not being met.

1.3 N1 ACCESS INTECHANGE PROPOSAL: THIS REPORT

SANRAL proposed another inetrchnange option, namely a Split DImaond Interchange (SDI) of the N1 with the P24/1 and the D2459. The P24/1 and the D2459 are existing Provincial roads with overpasses over the N1. This revised Fatal Flaw Report is for this SDI, and presented to SANRAL for consideration.

The N1 / P24/1 / D2459 Split Diamond Interchange was conceptually developed, including the upgrade of the P24/1, and a grade separated junction of the D2459 and the P24/1 (with 3 location options). This interchange was presented to the Gauteng Provincial Department of Roads and Transport (GPDRT). The interchange was approved in principle subject to various conditions. Refer to the GPDRT response in Appendix B.

2 SPATIAL AND TRANSPORT PLANNING INFORMANTS

2.1 EMFULENI LOCAL MUNICIPALITY DRAFT SPATIAL DEVELOPMENT FRAMEWORK VISION 2035

The Emfuleni Local Municipality Draft Spatial Development Framework Vision 2035 refers. In terms of the Rural Development Framework, the following is stated:

"Large parts of the Emfuleni LM are rural, and activities in this area relate to agriculture. Therefore, leveraging these activities to promote economic development in the area is essential. This should be done by improving access to basic services and infrastructure while protecting high-potential agricultural land. In addition, the nature of rural development in the area also creates the opportunity for new agriculture-related industries.

Rural development framework strategic approach:

Objective: To promote sustainable and equitable rural development in the municipality by enhancing economic opportunities and improving all residents' access to basic services and infrastructure, focusing on empowering rural communities and promoting inclusive growth."

As part of this strategy, an airport with supportive industries such as a agri-zones and logistics hubs are included in the planning. The location for the proposed airport and support land-uses is shown on Map 28 of the report, west of the N1.

The Vaal Aerozone is in-line with the Spatial Development Framework in terms of its planned land-uses, function and location within Emfuleni.

2.2 VAAL AERORPOLIS LOCAL SPATIAL DEVELOPMENT FRAMEWORK

The Local Spatial Development Framework (LSDF) report was prepared by a team of professional consultants including, WSP Group Africa (Pty) Ltd, and was submitted to the Emfuleni Local Municipality on behalf of the Vaal Aerotropolis Management Company, the developer of the proposed Vaal Aerotropolis.

This LSDF was submitted to the relevant local authorities (Sedibeng and Emfuleni) to be incorporated into their respective Spatial Development Frameworks (SDF). This will allow them to plan and budget, to obtain approval and proceed with the project. This will also create certainty for all the future relevant rights and zonings that will be granted through township establishment procedure and that engineering services can be provided as outlined in the LSDF.

The LSDF shows that the proposed project as it is planned, complies with all current legislation and policies, be it local, provincial or national, and that it is in line with current policy including Land Uses Schemes, Spatial Development Frameworks, etc. The LSDF also shows that all necessary due diligence and background research have been done in relation to the environmental impact, transport and road networks and the provision of engineering and bulk services infrastructure to the site.

It is also intended that the Vaal Aerotropolis will be part of a Special Economic Zone (SEZ) to attract investment and stimulate growth and to manage and regulate the overall development, as described in the LSDF.

Refer to Figure 2-1 for the Macro locality plan of the Vaal Aerotropolis.

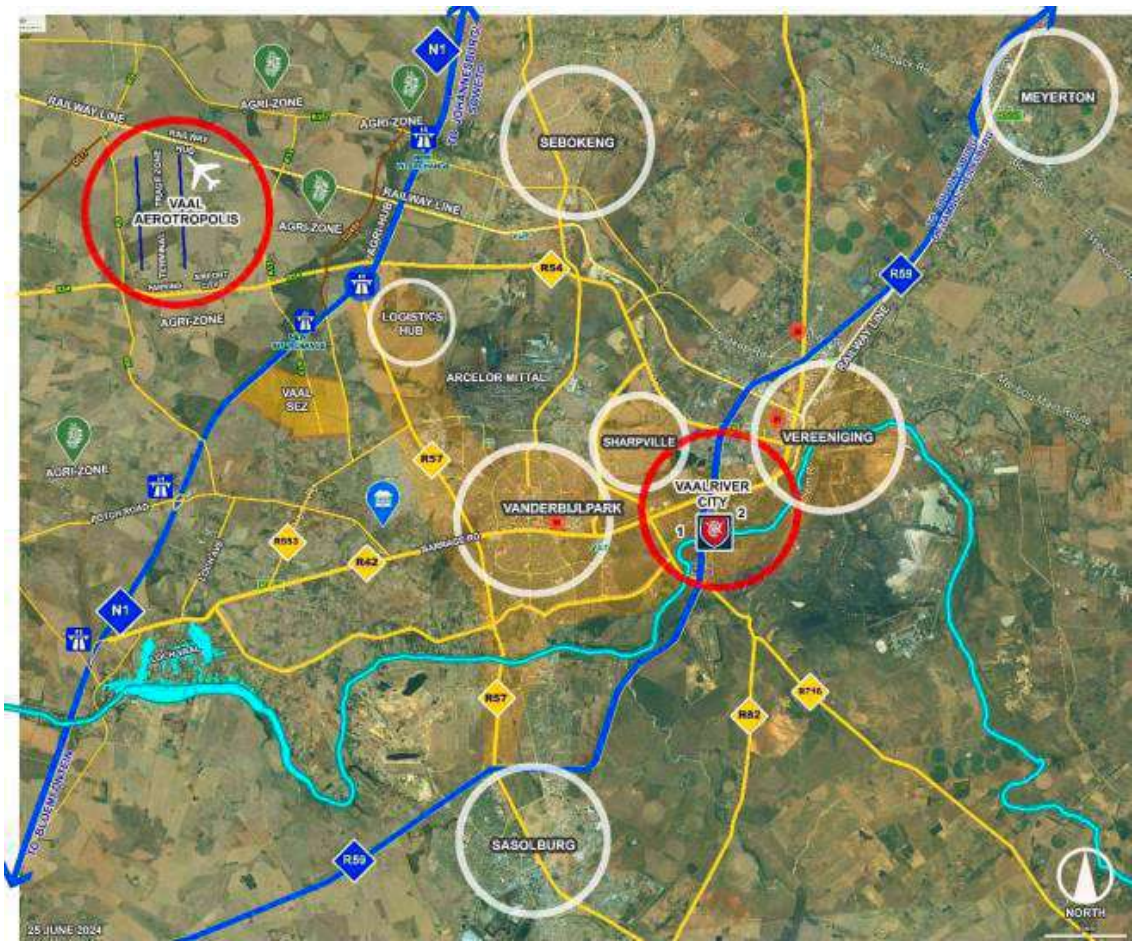


Figure 2-1 - Macro Locality Plan

The development of the Vaal Aerotropolis in Emfuleni is an initiative that will promote economic development within the Emfuleni and Sedibeng municipal areas. It is intended to help generate employment opportunities in Emfuleni and to reduce the need for Emfuleni residents to migrate or to commute over long distances to access economic opportunities in other parts of Gauteng.

The Emfuleni Local Municipality envisages an aerotropolis that will encompass the International Airport, the Logistical Hub and the Agricultural Hub. Typical of any other aerotropolis, the Vaal Aerotropolis will have an International Airport as the multimodal commercial central core, with rings of other developments permeating outwards. By nature, an airport is a powerful engine for local economic growth which attracts many aviation-linked businesses.

The Vaal Aerotropolis will, in time, develop to form clusters and corridors of airport linked commercial, high-tech, and advanced manufacturing or industrial clusters as well as logistics facilities complemented by retail, entertainment, hotels, conferences, and exhibition centres. The aim of the proposed airport as part of the Aerotropolis is to supplement the proposed Logistics Hub and to relieve the OR Tambo and Lanseria International airports and Rand Airport from the growth constraints they are experiencing. Estimates show that the OR Tambo International and Lanseria Airports are experiencing cargo and passenger growth rates that are unlikely to be satisfied by the future expansion plans of these airports. These expansion plans cannot be amended due to land and infrastructural constraints surrounding these airports. These constraints present an opportunity for the development of an international airport in Emfuleni to capture some of the growth potential experienced by the abovementioned airports.

The airport in Emfuleni is expected to provide infrastructural support and enhance business viability to the proposed Logistical Hub, which will be established immediately south of the proposed airport. In addition, the airport will impact on the land use pattern of the areas immediately surrounding the airport. These will include the Arcelor Mittal Industrial Hub, Sebokeng and Orange Farm residential areas, and Vanderbijlpark. In particular, the strip of land along the P155 (R57) will benefit from the regional airport and the proposed Logistical Hub. The newly proposed logistics hub location is within the 5.0 km radius from the proposed airport site, west of the N1 Freeway.

The proposed Vaal Logistical Hub is expected to provide O.R. Tambo with a suitable regional logistic facility to the mutual benefit of both Emfuleni and Ekurhuleni Municipalities. In addition, the logistical hub will contribute to improving burdening transport costs and traffic congestions, make Emfuleni more attractive to local and foreign investments, and create employment opportunities which may have otherwise not been realized.

The Department of Rural Development and Land Reform (DRDLR) elaborates that “Agri-hubs (AH) are located in central places in a district, preferably places with sufficient physical and social infrastructure to accommodate storage/warehousing facilities; Agri-processing facilities; packaging facilities; logistics hubs); agricultural technology demonstration parks; accommodation for extension support training; housing and recreational facilities for labourers.

AH receive primary inputs from FPSUs for processing, value adding and packaging, which is through-put into the Rural Urban Market Centres or exported directly to markets". Concepts on Agri-park, Agri- hubs and FPSUs will be comprehensively detailed in the relevant precinct plan being formulated and to be approved in due course.

The potential benefits of the Vaal Aerotropolis are:

- It will attract new investment and have a positive impact on the socio-economic development of the Vaal region.
- It will diversify and grow the Vaal economy.
- It will create job opportunities that will address unemployment in the Vaal region.
- It will afford local people the opportunity to participate in the economy through business partnering, business establishment, training, and skills development.
- It will create a greater demand for Arcelor Mittal's manufacturing output.
- The location of the Logistics Hub at Arcelor Mittal will help minimize transport cost of materials.
- It will create various opportunities for BBBEEE and SMME's within the Vaal region; and
- Kick-start downstream manufacturing in Emfuleni.
- Reduce transport costs of goods from areas surrounding the airport and enhance tourism opportunities within the Vaal region.

APPROVAL OF THE VAAL AEROTROPOLIS LSDF

The LSDF was approved by the Emfuleni Council and gazetted on 18 March 2026, local Authority Notice 252 of 2026.

2.3 GAUTENG PLANNING

The Gauteng Province approved the *"Growing Gauteng Together through Smart Mobility 2030"* transport policy under the World Class Air Transport section which mentions the following:

- Requirement for a dedicated cargo airport in the Gauteng Province
- Future airports must be designed according to international status
- A third airport needs to be designed and located in the Gauteng Province as a port of entry into South Africa.

The recently approved Gauteng Twenty-Five Year Integrated Transport Master Plan (ITMP25) also includes the development of the Vaal Aerotropolis.

2.4 VAAL SPECIAL ECONOMIC ZONE

The development of a new international airport in South Africa is guided by the South African Ministry of Transport. The South African Ministry of Transport has released a Revised Strategic Plan for the 2020-2025 period which defines the method in which future international airports within South Africa are to be developed. The principles included in the design of an aerotropolis developments, Special Economic Zones (SEZ's) and economic hubs are supported and promoted by the South African National Department of Transport.

The Vaal Aerotropolis is intended to form part of the Vaal Special Economic Zone (SEZ). The Vall SEZ is a separate planned development to be located east of the N1 in Emfuleni Local Municipality. The intention to designate the Vaal SEZ was published for comment on 3 March 2026.

2.5 VAAL AERORPOLIS DEVELOPMENT DESCRIPTION

The proposed Vaal Aerotropolis development centres around the creation of a new international airport and its associated infrastructure to drive economic growth and connectivity within the Emfuleni region. This transformative project is planned in phases, with Phase 1 focusing on establishing the airport and its initial operational infrastructure.

The development encompasses a variety of land-use components designed to serve specific economic and logistical purposes, including:

- Airport City: A vibrant urban hub supporting aviation and business-related activities.
- Agri-Zones: Agricultural processing hubs aimed at enhancing value chains in the region.
- Cargo Terminals: Facilities to support efficient logistics and freight operations.
- Trade Zones: Commercial areas catering to retail, trade, and business activities.

At the heart of the development, the airport precinct is envisioned to alleviate capacity constraints at existing regional airports, such as OR Tambo, Lanseria, and Rand Airports. Additionally, the Vaal Aerotropolis is designed to function as a logistics hub with direct access to the N1 freeway, ensuring seamless connectivity for freight and passenger traffic. Surrounding land uses will include advanced manufacturing zones, agricultural processing hubs, and commercial facilities, enhancing the airport's functionality and economic impact. The three phases of development are summarized below, these phases span 60 years, ensuring gradual and scalable development.

2.5.1. Phase 1: Initial Development

The first phase focuses on constructing the Vaal International Airport with a 4.2 km runway, supporting 7.2 million passengers per annum and 150,000 tons of cargo annually. It also includes the creation of the Agri-Zone, Africa's largest high-tech agricultural cluster, and a Trade

Zone for logistics and warehousing. Airport City will see the development of offices, retail, and hospitality spaces.

2.5.2. Phase 2: Expansion

In this phase, the airport's capacity will grow to handle 25 million passengers per annum and expanded cargo volumes. Infrastructure will also be upgraded, including passenger facilities and parking. The Agri-Zone and Trade Zone will be expanded to accommodate increased agricultural and logistical operations.

2.5.3. Phase 3: Full Operationalization

The final phase focuses on reaching full airport capacity, including a second runway and terminal expansion to handle 45 million passengers per annum. The completion of Airport City with additional commercial, residential, and leisure spaces will occur, alongside the full operationalization of the Special Economic Zone (SEZ) to attract investments and drive industrial growth.

2.6 PHASE 1 INFRASTRUCTURE AND ACCESS

Phase 1 infrastructure focuses on establishing the essential components to support airport operations and connectivity. Key developments include:

- Airport Infrastructure: Construction of the international airport with a runway for both passenger and cargo aircraft, a passenger terminal with a capacity of 7.2 million passengers per year, and a cargo terminal designed to handle 150,000 tons of cargo annually.
- Access and Connectivity: Development of a dedicated access interchange connecting the airport to the N1 highway and integration with the regional road network to facilitate smooth logistics and passenger movement.
- Land Use Development: Establishment of the Agri-Zone with 48 hectares of climate-controlled agricultural areas and cold storage, along with the initial setup of the Trade Zone linked to the cargo terminal for logistics and manufacturing.
- Supporting Infrastructure: Provision of bulk services (water, sewer, electricity) and foundational urban infrastructure for Airport City, including roadways and utility connections.

This phase is crucial for laying the groundwork for future expansion of the Aerotropolis, with the N1 interchange being vital for ensuring safe and efficient access to the airport.

3 THE NEED FOR AN ACCESS INTERCHANGE

3.1 CURRENT AND PLANNED ACCESSES

The successful development of the Vaal Aerotropolis hinges on seamless connectivity to the surrounding Class 1 and Class 2 road network, ensuring efficient access for both passengers and freight. This chapter outlines the need for a new interchange to support Phase 1 of the Aerotropolis.

There is no suitable direct access to the N1 freeway to serve the Vaal Aerotropolis. There is a planned interchange of the existing K170/K176 with the N1, contained in the Gauteng Department of Road and Transport's Strategic Major Road Network plan (May 2010). The future implementation timeframe of the interchange has not been determined by Gauteng Department of Road and Transport.

This interchange was approved in principle by SANRAL to support Phase 1 of the Vaal Aerotropolis. Refer to Section 1.2.

This interchange is not ideal to serve Phase 1 of the airport due to the its location, the long route to the airport's terminals and Airport City precinct, and major infrastructure upgardes to the Provincial road network (new and upgraded roads).

An alternative access option to the N1 was therefore required.

3.2 PROPOSED N1 SPLIT DIAMOND ACCESS INTERCHANGE

The N1 / P24/1 / D2459 Split Diamond Interchange was conceptually developed, including the upgrade of the P24/1, and a grade separated junction of the D2459 and the P24/1 (with 3 location options).

This Fatal Flaw Report evaluates this interchange option only.

This interchange is essential to facilitate the movement of goods, services, and people from the Class 1 road network, thereby driving the economic objectives of the Vaal Aerotropolis development while addressing Phase 1 operational requirements.

Appendix C contains the current Masterplan for the Vaal Aerotropolis which reflects the potential N1 access interchange option and required lower order Provincial road networks to provide access to the Vaal Aerotropolis.

4 EXISTING AND PLANNED HIGH-ORDER ROAD NETWORK

This chapter covers both existing and planned major road network. These routes are illustrated in Figure 4-1 and discussed in detail under Sections 4.1 and 4.2.

- Section 4.1 Existing Key Infrastructure – A review of the current road network.
- Section 4.2 Planned Major Road Network – An outline of future road developments.

4.1 EXISTING KEY TRANSPORT INFRASTRUCTURE

The N1 highway within the project area is a critical transportation route facilitating local and regional connectivity. This includes the R57 partial cloverleaf interchange, two overpasses (R541 and K170), and a rail underpass as shown in Figure 4-1.

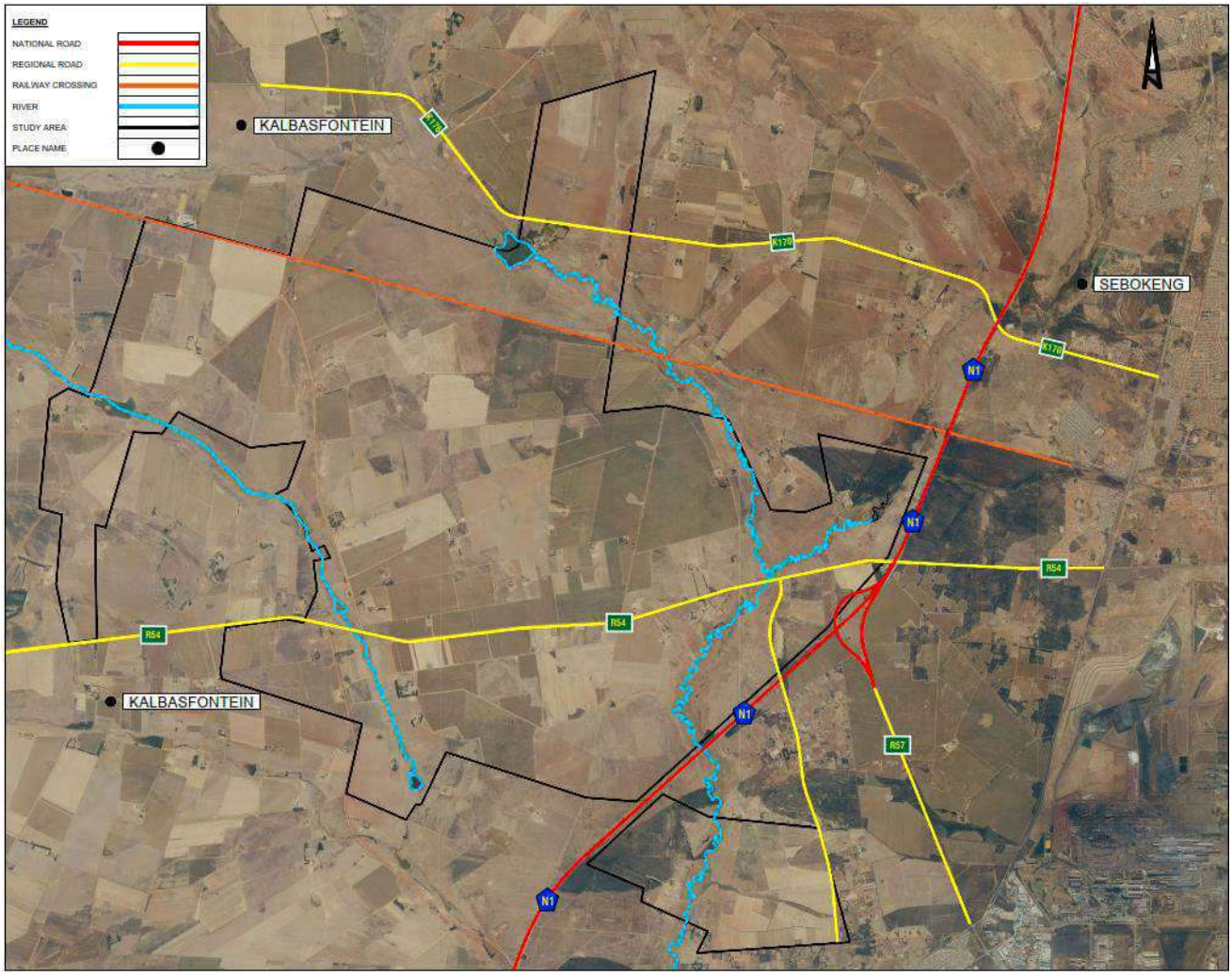


Figure 4-1 – Layout of the existing major road network

4.1.1. N1/R57 Partial Cloverleaf Interchange

Design and Functionality:

The R57 interchange is the only existing interchange on this section of the N1. The configuration is a partial cloverleaf design. Refer to Figure 4-2.

- East-to-North Movement: A northbound loop, overpass and on-ramp carries traffic on the R57 westbound from Vanderbijlpark to the N1. The loop merges with the northbound carriageway of the N1, facilitating movement towards Johannesburg.
- North-to-East Movement. A southbound off-ramp carries vehicles traveling south on the N1 to the R57 eastbound to Vanderbijlpark.
- Key Role: The interchange is pivotal for directing traffic efficiently between the N1, Sebokeng, and Vanderbijlpark (located east of the N1), enabling uninterrupted north-south and east-west flows.

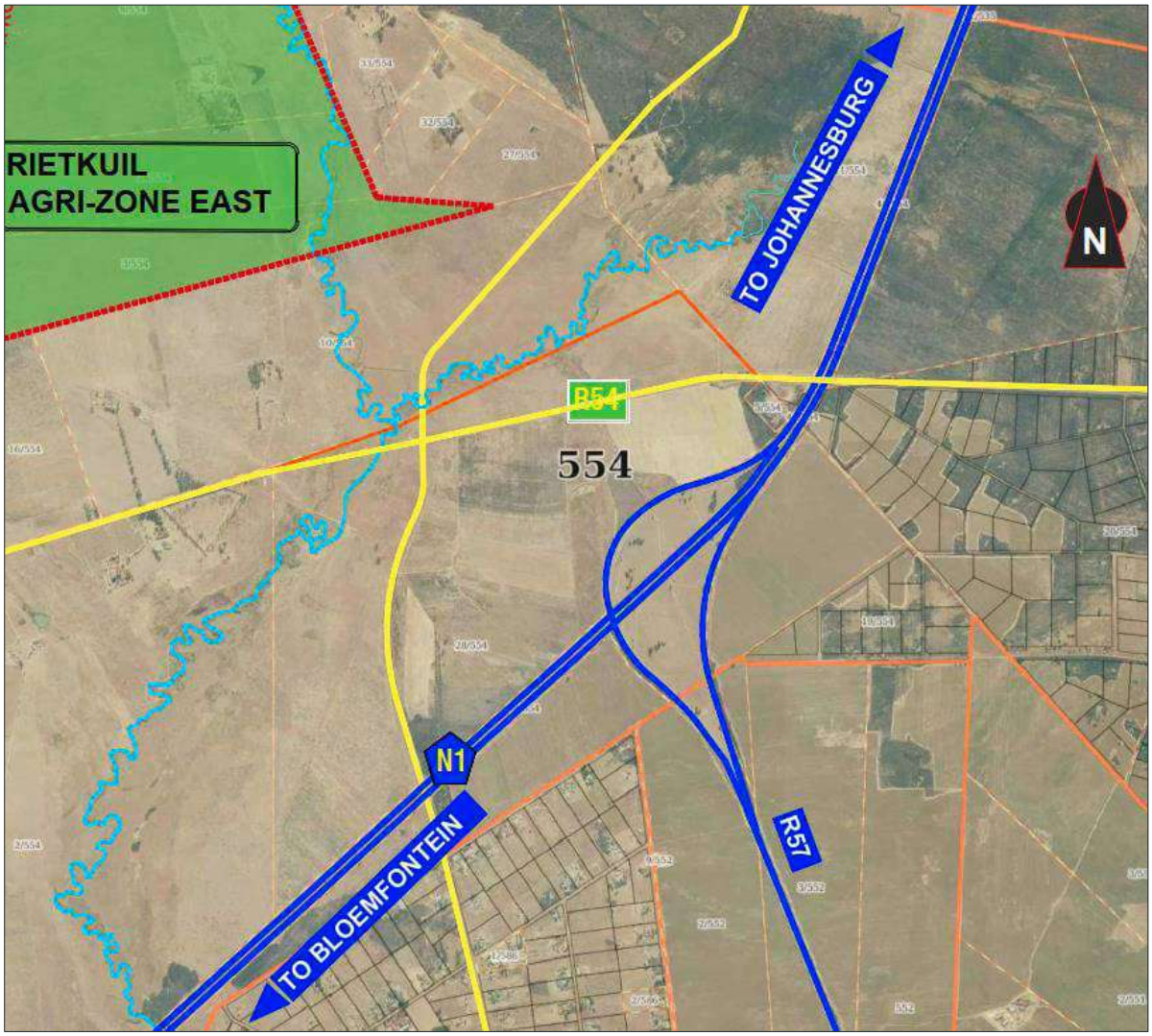


Figure 4-2 – N1-R57 Existing Partial Cloverleaf interchange

4.1.2. N1 - K178 (R541) Overpass

Location and Functionality:
The R541 overpass is situated 0.25km north of the N1/R57 northbound on-ramp. It serves as an east-west connecter between Vanderbijlpark and Sebokeng to the east and Potchefstroom in North-West Province to the west.

Key Role: This overpass ensures uninterrupted movement for east-west traffic across the N1, supporting both local commuters and regional connectivity.

4.1.3. N1 - K170/K176 Overpass

Location and Functionality:
The K170/K176 overpass is located approximately 4.5 km north of the R541 overpass, it connects Fochville to the west with Sebokeng, east of the N1.

Key Role: This overpass serves as a secondary east-west link, primarily catering to local traffic, and supports movement between peri-urban and urban zones without affecting the N1's primary traffic flow.

4.1.4. N1 Rail Underpass

Description:
It is located approximately 2.2 km north of the R541 overpass, the N1 crosses over the dual electrified railway line via a rail underpass.

4.2 PLANNED MAJOR ROAD NETWORK

This chapter discusses the planned road network, including the major routes proposed by Gauteng Department of Roads and Transport, and supporting district roads. The planned road network consists of:

- PWV Routes – High-capacity Class 1 roads designed for provincial and inter-provincial connectivity.
- K-Routes – Class 2 roads to connect to the Class 1 network to enhance regional access and integration with major corridors.
- Access and System interchanges to facilitate movements between the national and Provincial Class 1 and Class 2 routes.

These planned routes are shown in Figure 4-3 and detailed thereafter.

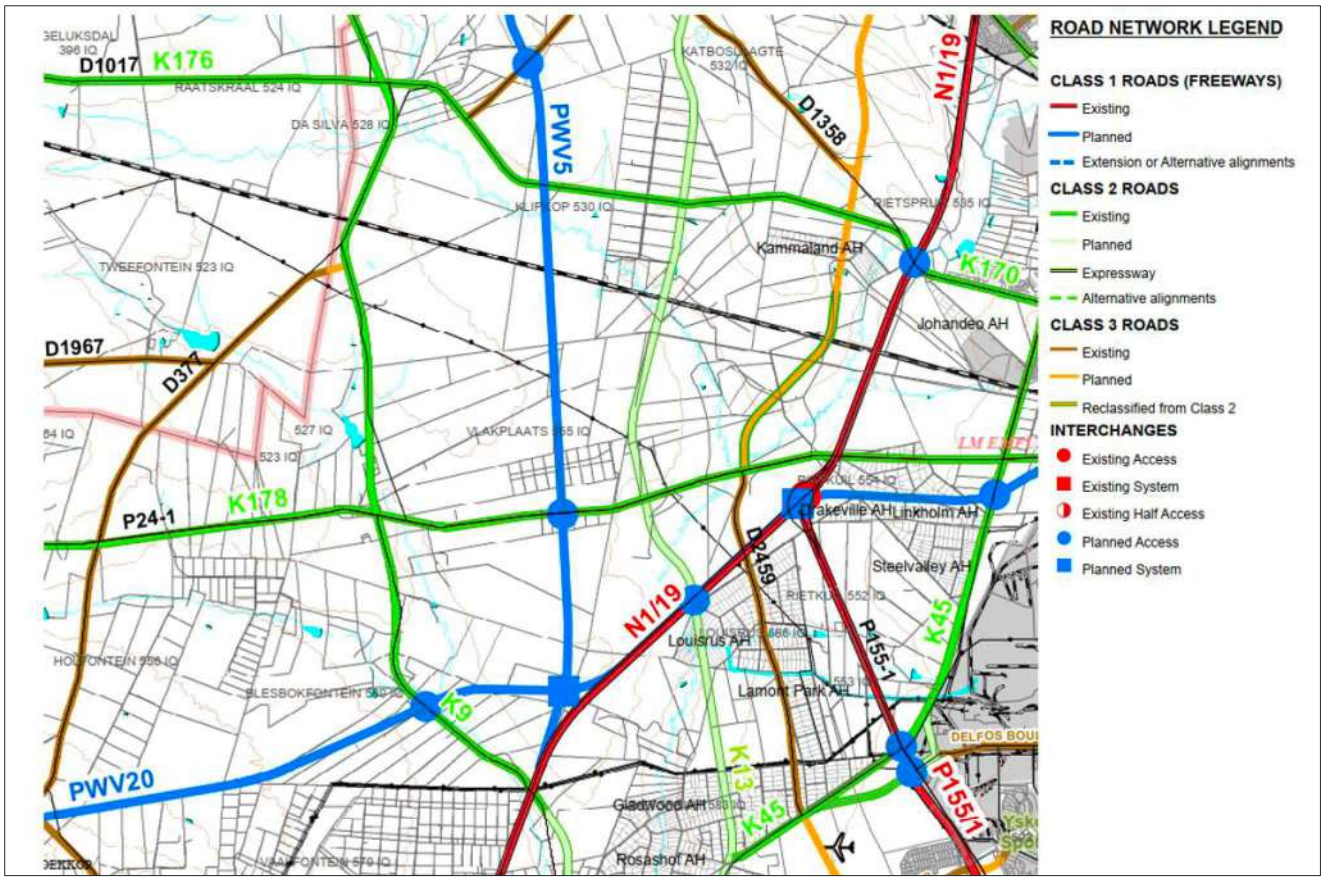


Figure 4-3 – Planned Gauteng Major Route Network (May 2010)

4.2.1. PWV Routes: Major Connecting Roads Proposed by Gautrans

<u>PWV5</u>

- The PWV5 is a planned north-south freeway that will serve as a major mobility corridor.
- It is planned to connect with the N1 and PWV20, forming a major systems interchange.
- The PWV5 will have an access interchange with the K178 route, located north of the proposed PWV20 interchange.

<u>PWV20</u>

- The PWV20 is a planned east-west freeway that will support cross-regional connectivity.
- It is designed to integrate with the N1 through system interchanges at the PWV5 and at the P55/1 (R57), facilitating seamless traffic flow between national and provincial roads.
- This freeway will enhance access to Sebokeng, Louisrus AH, and surrounding areas.

4.2.2. K-Routes: Supporting Regional Connectivity

K13 Route

- The K13 is a planned north-south Class 2 road designed to support urban and regional mobility.
- It is planned to feature three major interchanges:
  - N1 Interchange – Connecting the route to the national freeway.
  - K178 Interchange – Providing access to the Class 2 network.
  - K170 Interchange – Providing access to the Class 2 network.

K178 Route

- This is an existing route which overpasses the N1, it will serve as the primary connection to the Vaal Aerotropolis with the eastern areas such as Sebokeng and Vanderbijlpark.

D2459 Route

- A Class 3 road, partially constructed south from the R541 to the K45, a connector for local movement.

- SANRAL Geometric Design Guideline
- AASHTO 2016 6th Edition of a policy on Geometric Design of Highways and Streets.

5 PROPOSED INTERCHANGE LAYOUT

The proposed grade-separated split diamond access interchange is described below:

- Northern ramps: Interchange to connect the P24/1 Provincial road to the N1 National highway, shown in Figure 5-1.
- Southern ramps: Interchange to connect the D2459 road to N1 National highway, shown in Figure 5-2.

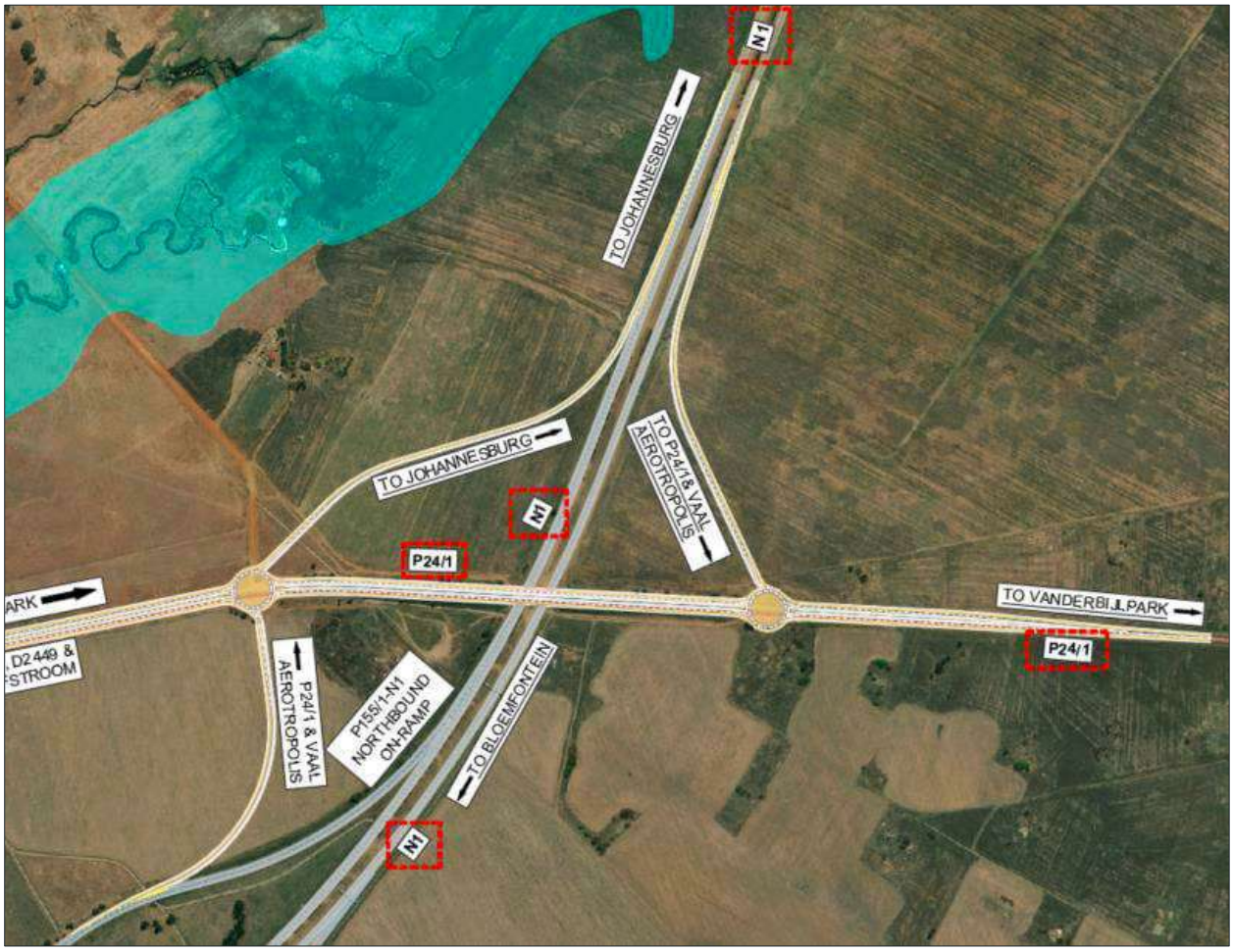


Figure 5-1 – SDI layout (Northern ramps) - N1 & P24/1

Figure 5-2 – SDI layout (Southern ramps) - N1 & D2459

5.1 AVAILABLE DATA

The following available data have been used to develop the proposed design.

- **Aerial mapping / Imagery**: In the absence of a topographical survey at this stage, the proposed alignment and cross-sections have been developed using available aerial maps and imagery.
- **SRTM exported elevation data** have been used to generate a high-level existing ground surface, as no ground survey or LiDAR data are currently available to validate the proposed vertical profile and tie-ins.
- **The National Wetland Map (Version 6)** has been referenced to identify and consider existing wetland extents within the study area.

The design will be further developed in the next stage of design following the availability of the latest and more accurate survey information, and once the in-principle approval has been obtained from SANRAL.

5.2 GEOMETRIC DESIGN STANDARDS

The following standards have been used to develop the proposed design

- Geometric Design Guidelines – National Road Agency
- TRH 17 – Geometric Design of Rural Roads
- TRH 26 – South African Road Classification and Access Management Manual
- CD 116 – Geometric Design of Roundabouts, DMRB, UK
- CD 112 – Geometric Design of Grade Separated Junctions, DMRB, UK
- A policy on Geometric Design of Highway Streets, 7th Edition, 2018, AASHTO, US

5.3 EVALUATION OF EXISTING GEOMETRICS

5.3.1. EXISTING MAINLINE

The existing N1 National highway is a dual carriageway with a north and southbound carriageway; each comprises of two lanes per direction with an inner and outer surfaced shoulder. The normal surfaced width is 10.7m and varies at ramp terminals. The two carriageways are separated by a 20m wide median that forms a shallow V-shaped drainage canal. The existing P24/1, P155/1 and D2459 is a two-lane single carriageway road, with one lane in each direction, and comprises outer surfaced shoulders. The P24/1 and D2459 runs over the N1 via a bridge, while the P155/1 connects to the N1 through the associated ramps as mentioned below.

- Off-ramp from the N1 southbound carriageway to the P155/1
- On-ramp from P155/1 to the N1 northbound carriageway

5.3.2. EXISTING CROSS SECTION

The existing cross-section details of the N1, P24/1, P155/1, D2459 and interchange ramps are shown in Figure 5-3, and the parameters are shown in Table 5-1.

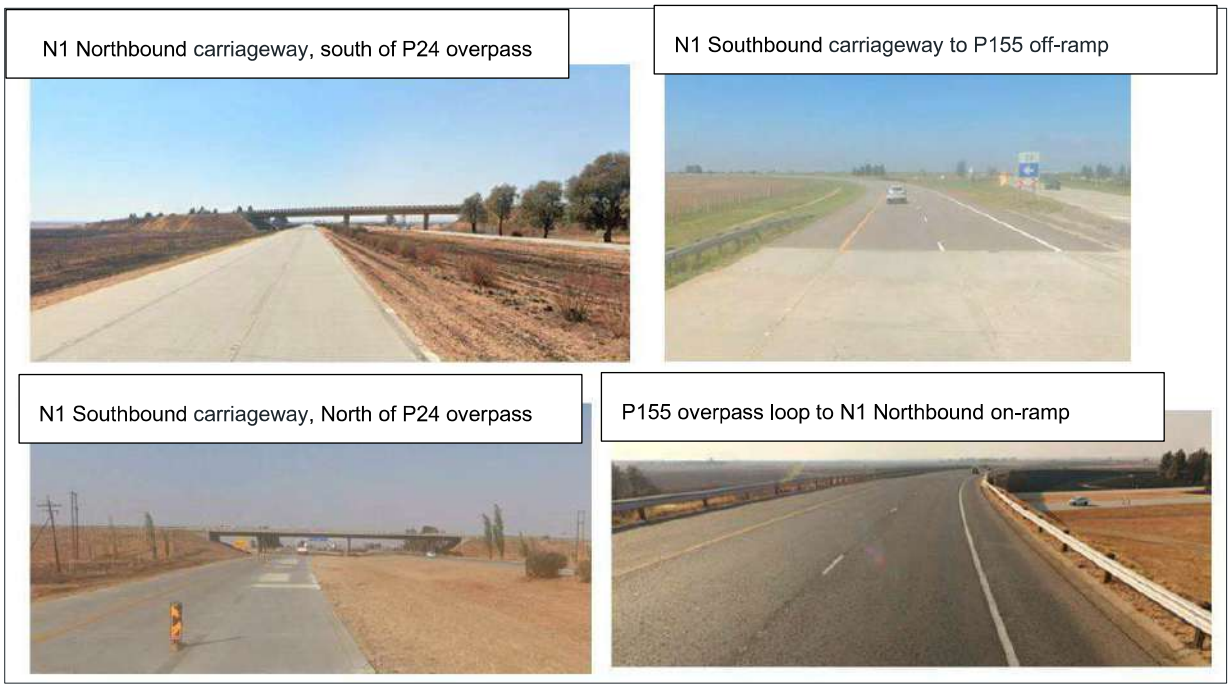


Figure 5-3 – Existing cross-section details N1, P24/1, P155/1 ramps

Table 5-1 – Existing N1 cross-section geometric details

Existing N1 Cross-section element width		
Northbound Carriageway		
Outer Shoulder Width	**Lande Widths**	**Inner Shoulder Width**
3m	3.7m x 2 normal carriageway and 3.7m x 3 at ramp terminals	Varies between 0.3m and 0.5m
South Bound Carriageway		
Outer Shoulder Width	**Lane Widths**	**Inner Shoulder Width**
3m	3.7m x 2 normal carriageway and 3.7m x 3 at ramp terminals	Varies between 0.3m and 0.5m
N1 Southbound Off Ramp		
2m	3.7m x 2 normal carriageway	1m
P155/1 Northbound Overpass Loop Ramp		
2m	3.7m x 2 normal carriageway	1m
Existing P24/1 Cross-section element width		
3m	3.7m x 2 normal carriageway	N/A
Existing P155/1 Cross-section element width		
2.8m	3.5m x 2 normal carriageway	N/A
Existing D2459 Cross-section element width		
2m	3.7m x 2 normal carriageway	N/A

5.3.3. HORIZONTAL AND VERTICAL ALIGNMENT

As built and survey information is currently unavailable. Consequently, a detailed analysis of the horizontal and vertical alignment, including parameters such as sight distance, superelevation, etc. could not be conducted. However, the design criteria for the N1 and the interchange ramps, based on the posted speed limit, is set at 120km/h. The vertical alignment of the N1 and interchange ramps is expected to conform to these standards. Detailed analysis of the existing design criteria is to be explored in detail in the next stage of design.

5.4 PROPOSED DESIGN

PROPOSED LAYOUT OF THE N1 AND P24/1 SDI

A grade-separated interchange option is proposed to connect the P24/1 Provincial road to the N1 National highway. The interchange include:

1. An on-ramp connecting the N1 Northbound carriageway and P24/1 with a proposed roundabout ramp terminal on the P24/1, shown in Figure 5-4.
2. An off-ramp connecting the N1 Southbound carriageway and P24/1 with a proposed roundabout ramp terminal on the P24/1, shown in Figure 5-5.
3. An off-ramp connecting the P155/1 on-ramp and P24/1 at a proposed roundabout ramp terminal on the P24/1, shown in Figure 5-6.

Note: The roundabout terminals are required by SANRAL as signalisation may not be effective due to the remote location, potential theft and/or vandalism and unavailability of electricity.

Figure 5-4 – Proposed on-ramp connecting N1 northbound carriageway and P24/1

Figure 5-5 – Proposed off-ramp connecting N1 southbound carriageway and P24/1

Figure 5-6 – Proposed off-ramp connecting P155/1 on-ramp and P24/1

The N1 National highway and the existing P155 on and off ramps will be retained, and do not require horizontal and vertical changes.

The proposed ramps enter and exit the P24/1 via the proposed eastern and western roundabouts, each with an inscribed circle diameter (ICD) of 75m. The new roundabouts are proposed with a two-lane circulatory carriageway having a width of 9.6m. The proposed off-ramps enter the roundabouts with an entry width of 9 m and an entry radius of 30m, while the proposed on-ramps exit the roundabouts with an exit width of 10m and an exit radius of 50m. The eastern and western roundabouts are spaced approximately 850m apart, and the existing P24/1 is proposed to be upgraded to a dual carriageway, with a new bridge constructed over the N1 highway. Refer to Figure 5-7.

Figure 5-7 – Proposed eastern & western roundabout ramp terminals on P24/1

PROPOSED LAYOUT OF THE N1 AND D2459 SDI

A grade-separated interchange option is proposed to connect the D2459 road to the N1 National highway. The interchange include:

1. An on-ramp connecting N1 southbound carriageway and D2459 with a proposed roundabout ramp terminal on the D2459, shown in Figure 5-8.
2. An off-ramp connecting N1 northbound carriageway and D2459 with a proposed roundabout ramp terminal on the D2459, shown in Figure 5-9.

Note: The roundabout terminals are required by SANRAL as signalisation may not be effective due to the remote location, potential theft and/or vandalism and unavailability of electricity.

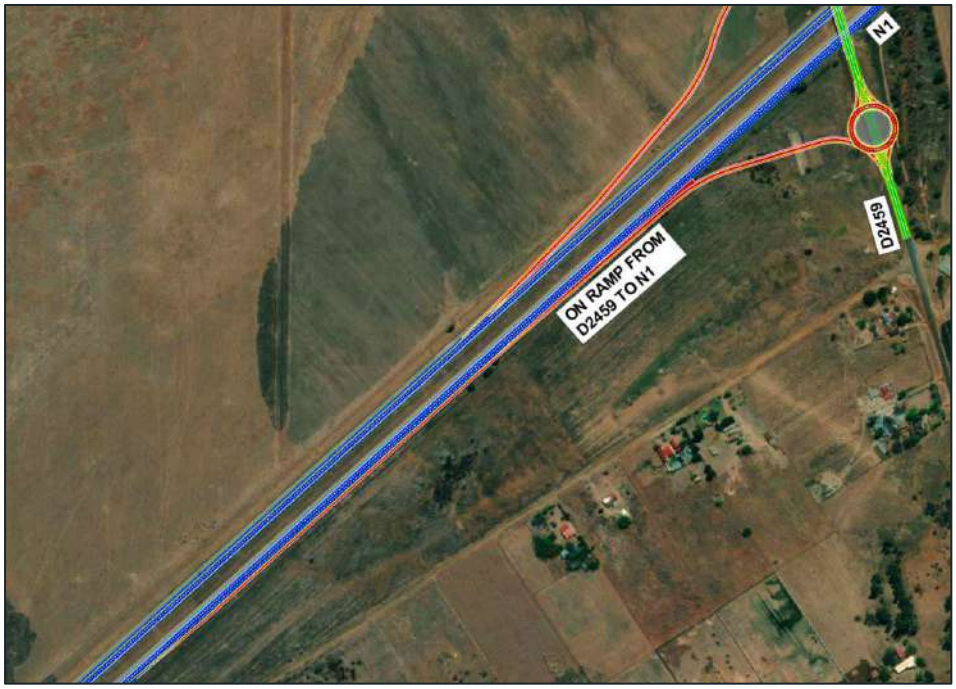


Figure 5-8 – Proposed on-ramp connecting D2459 to N1 southbound carriageway

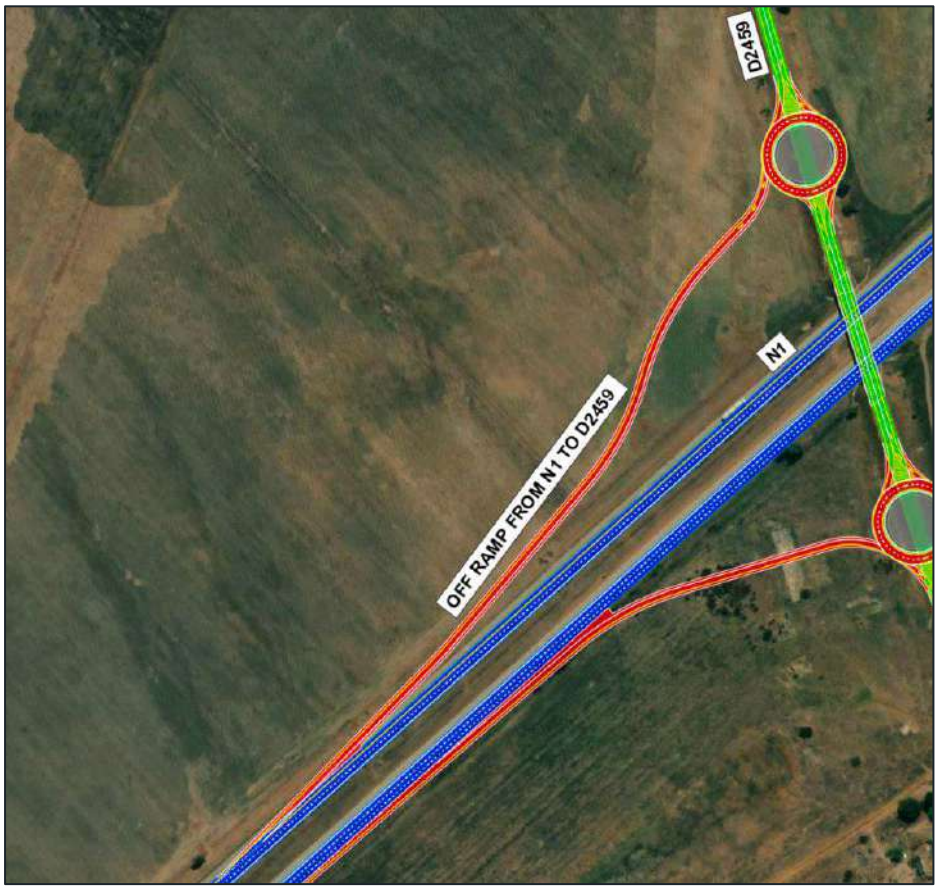


Figure 5-9 – Proposed off-ramp from N1 northbound carriageway to D2459

The proposed ramps enter and exit the D2459 via the proposed northern and southern roundabouts, each with an inscribed circle diameter (ICD) of 65m. The new roundabouts are proposed with a two-lane circulatory carriageway having a width of 7.4m. The proposed off-ramp enters the roundabouts with an entry width of 4m and an entry radius of 60m, while the proposed on-ramp exit the roundabouts with an exit width of 4m and an exit radius of 60m. The northern and southern roundabouts are spaced approximately 230m apart. Refer to Figure 5-10.

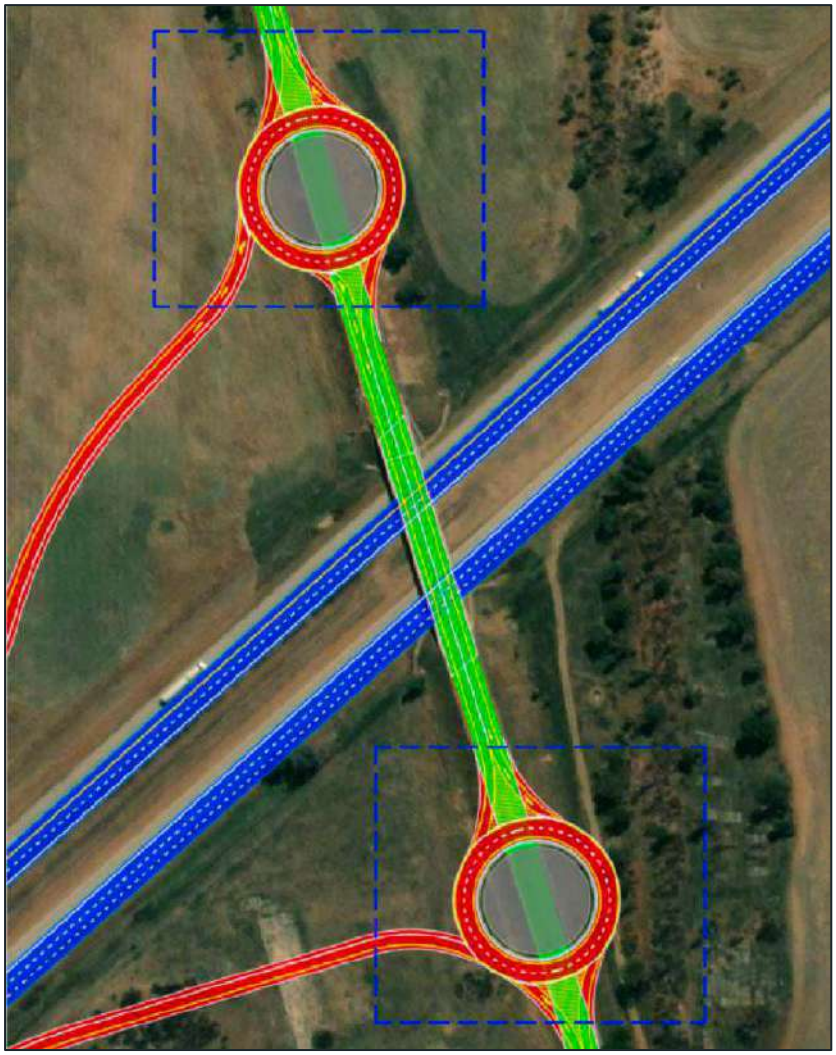


Figure 5-10 – Proposed northern & southern roundabout ramp terminals on D2459

5.4.1. DESIGN SPEED

The ramp design speed is considered as 60 to 110 km/h against the through road speed of 120 km/h as per table 7.2 of the "Geometric Design Guide (2003)".

Table 5-2 – Design Speed for interchange ramps – SANRAL Geometric Design Guideline

Table 7.2: Ramp design speed	
Roadway design speed (km/h)	Ramp Design Speed Domain (km/h)
60	40 – 50
70	40 – 60
80	40 – 70
90	50 – 80
100	50 – 90
110	60 – 100
120	60 – 110
130	70 - 110

5.4.2. CROSS-SECTION

A single-lane entrance and exit ramp terminal is proposed at the N1, in line with Figures 10.11(b) and 10.11(c) of TRH 17. The ramp interfaces with the P24/1 and D2459 carriageway through the proposed roundabouts.

Figure 5-11 – Proposed single lane entrance ramp terminal: N1 off-ramp

Figure 5-12 – Proposed single lane exit ramp terminal: N1 on-ramp

The cross-sectional dimensions were adopted based on Cl 10.10, Figures 10.11(b) and 10.11(c) of TRH 17 and Cl 7.8.6, Figures 7.14 to 7.17 of Geometric Design Guide (2003). The number of lanes and shoulder requirements for interchange ramps are dictated by traffic volumes and are particularly influenced by conditions at ramp terminals and lane merge/diverge points. Each ramp is proposed as a single lane at its entry to or exit from the N1 highway, widening to two lanes at the entry to or exit from the proposed roundabouts on P24/1 for the proposed split diamond interchange between the N1 and P24/1.

However, for the proposed split diamond interchange between the N1 and D2459, the ramps remain as single lanes at their entry to or exit from the proposed roundabouts on the D2459.The length of the dual-lane section is proposed to range from approximately 160 m to 300 m and will be optimised at the detailed design stage based on traffic volume requirements. Refer to the typical sections in Figure 5-13 and Figure 5-14 for details.

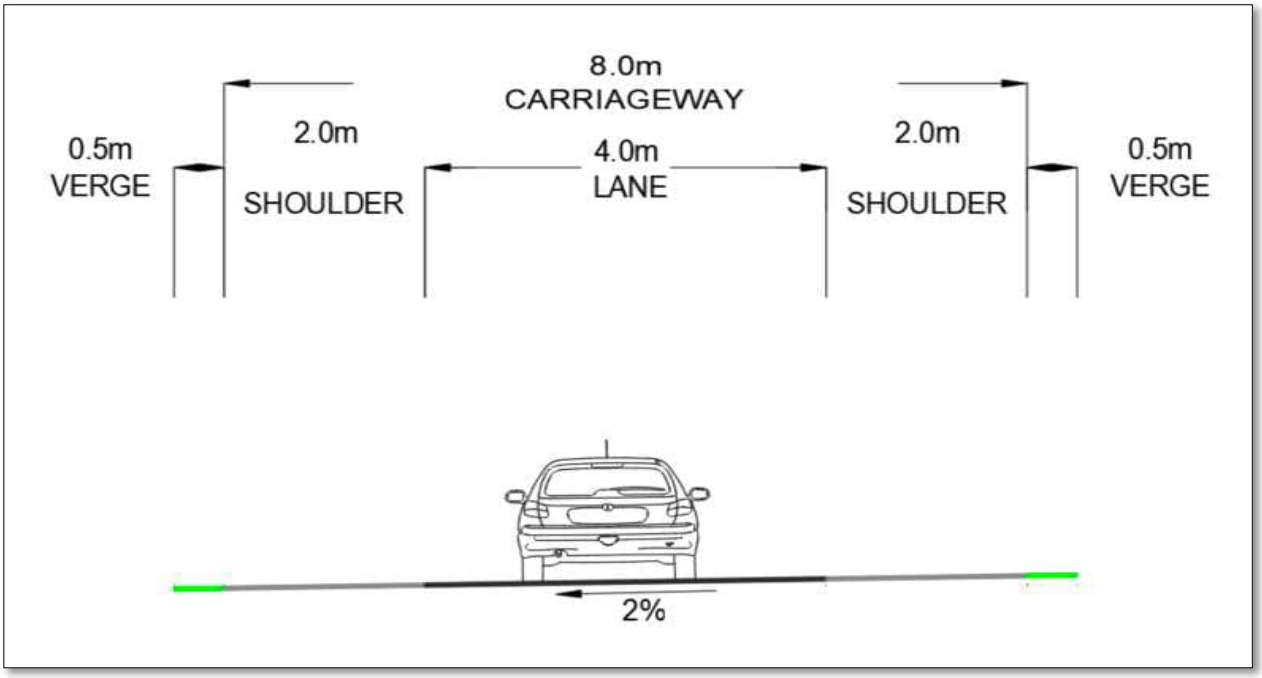


Figure 5-13 – Typical cross-section of ramps – Single Lane

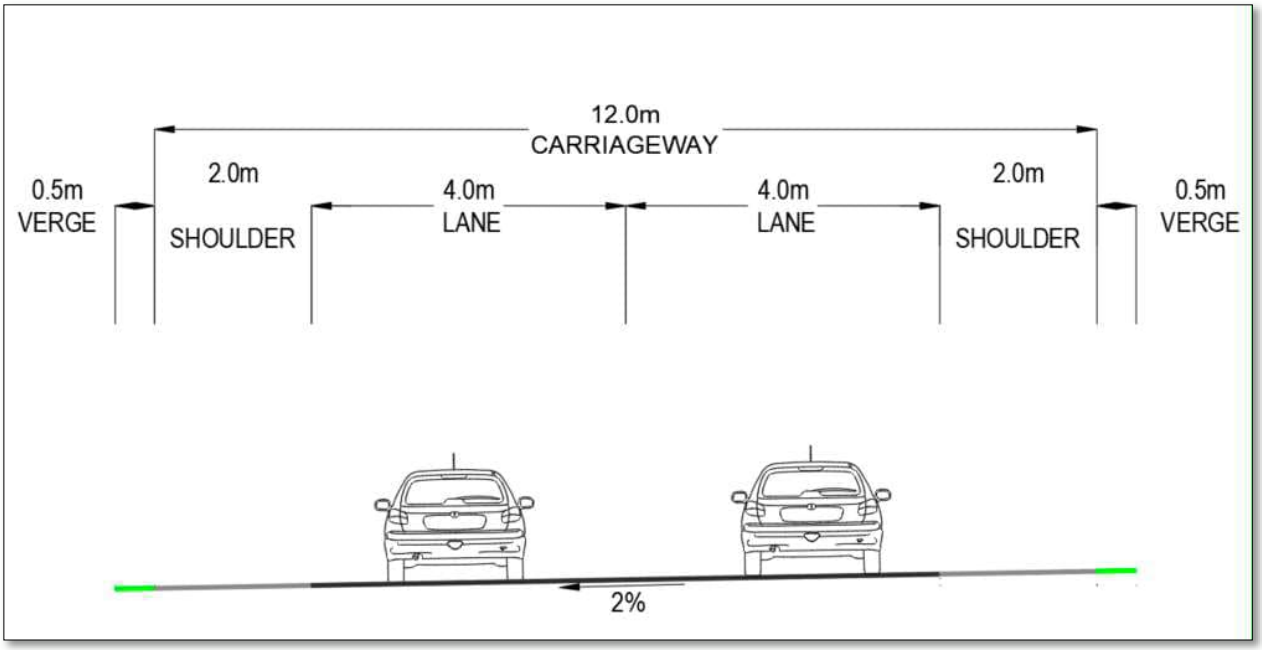


Figure 5-14 – Typical cross section of ramps - Two Lane

5.4.3. HORIZONTAL ALIGNMENT

The standard values for various horizontal alignment parameters, as per the Geometric Design Guide (2023), along with the corresponding values achieved in the proposed design, are presented in Table 5-3.

Table 5-3 – Horizontal Alignment Criteria for Ramps

Design Element	110 km/h	60 km/h	Achieved Value				
			On-ramp N1 north & P24/1	Off-ramp N1 south and P24/1	On-ramp P155/1 on-ramp and P24/1	On-ramp D2459 and N1 south	Off-ramp N1 north and D2459
Maximum Superelevation - emax Table 4.2 Geometric Design Guide (2023)	8% to 10%		Will be checked at the detailed design stage				
Minimum Curve Radius - emax=8%, Table 4.2 Geometric Design Guide (2023)	530 m	120 m	300 metres			220 meters	

Horizontal alignment parameters such as superelevation and sight distance will be checked and achieved during the detailed design stage upon receipt of the detailed topographical survey.

Achieving a higher curve radius can also be considered during the detailed design stage; however, this may result in additional land take.

5.4.4. VERTICAL ALIGNMENT

The standard values for various vertical alignment parameters, as per the Geometric Design Guide (2023) and TRH17, along with the corresponding values achieved in the proposed design, are presented in Table 5-4.

Table 5-4 – Vertical Alignment Criteria for Ramps

Design Element	110 km/h	60 km/h	Achieved Value				
			On-ramp N1 north and P24/1	Off-ramp N1 south and P24/1	On-ramp P155/1 on-ramp and P24/1	On-ramp D2459 and N1 south	Off-ramp N1 north and D2459
Maximum Gradient - Table 4.11, Geometric Design Guide (2023)	3% (Flat terrain)	6% (Flat terrain)	1.50%	1.00%	1.50%	1.50%	1.00%
Minimum Gradient - Cl 4.3.2, Geometric Design Guide (2023)	0.50%		0.50%	0.50%	0.50%	0.75%	0.50%
Crest Curves (K value - Table 4.12, Geometric Design Guide (2023)	K = 250 (object height 0m)	K = 40 (object height 0m)	K=250	N/A	K=250	K=250	K=250
Sag Curves (K value) - Table 4.14, Geometric Design Guide (2023)	K = 60 (headlight sight distance)	K = 20 (headlight sight distance)	K=60	K=160	N/A	K=150	K=160
Minimum Vertical Curve Length - Table 10.9.1(b), TRH 17	80 meters	40 meters	120 meters	80 meters	500 meters	80 meters	80 meters

The vertical alignment parameters will need to be revisited during the detailed design stage once the topographical survey information is available.

5.4.5. INTERCHANGE SPACING

The SANRAL Planning Guidelines, SANRAL Geometric Design guidelines and the TRH26 Guidelines establishes standards for the spacing and design of interchanges and accesses on roads to ensure safety, operational efficiency, and uninterrupted traffic flow. These guidelines are particularly relevant when evaluating the proposed options for interchange configurations along the national highway to facilitate access to the airport.

Table 5-5 presents the interchange spacing requirements in accordance with TRH 26.

Table 5-5 – Minimum Spacing between Rural Freeway Interchanges (TRH 26)

Interchange Type	YLBP Spacing (m)*	Centre Line Spacing (km)
Access to access	**2,170**	**2.8 km (absolute min. 2.4 km)**
Access to systems	3,270	4.2 km (absolute min. 3.6 km)
Systems to access	2,170	2.8 km (absolute min. 2.4 km)

*YLBP refers to the yellow line break point, which is the final point where the on ramp ends or the first point where the off-ramp starts. All road signing and weaving ideally take place between YLBPs.

The spacing between the proposed ramps and existing ramp is measured as follows:

- Spacing between the existing P155/1 northbound on-ramp and the proposed split diamond northbound on-ramp from P24/1 to the N1 is approximately **900m**, shown in Figure 5-15.
- Spacing between the proposed split diamond southbound off-ramp from N1 to P24/1 and the existing P155/1 southbound off-ramp from the N1 is around **1350m**, shown in Figure 5-16.
- Spacing between the proposed split diamond southbound on-ramp from D2459 to N1 and the existing P155/1 southbound off-ramp from the N1 is around **2370m**, shown in Figure 5-17.
- Spacing between the proposed split diamond northbound off-ramp from N1 to D2459 and the existing P155/1 northbound on-ramp is around **2830m**, shown in Figure 5-18.

Figure 5-15 – Spacing from P155/1 northbound on-ramp & SDI northbound on-ramp from P24/1 to N1

Figure 5-16 – Spacing from SDI southbound off-ramp from N1 to P24/1 & P155/1 southbound off-ramp from N1

Figure 5-17 – Spacing from SDI southbound on-ramp from D2459 to N1 & P155/1 southbound off-ramp from N1

Figure 5-18 – Spacing from SDI northbound off-ramp from N1 to D2459 & P155/1 northbound on-ramp

When assessed against the YLBP spacing requirements outlined in Table 5-5, the current N1–P24/1 interchange layout appears to be substandard, whereas the N1–D2459 interchange layout is compliant with the standard. However, it is noted that the YLBP spacing criteria primarily relate to on-ramp to off-ramp spacing associated with weaving sections. As the proposed configuration does not strictly constitute a conventional weaving condition, the applicability of YLBP spacing as the primary assessment criterion for this proposal may be limited.

A review of TRH 17, Section 10.11 (Ramp Terminals) indicates that a spacing of approximately 300 m between successive freeway ramp terminals may be considered adequate.

In addition, a review of UK standards, specifically DMRB CD 122, Clause 3.36, defines the minimum spacing between the tips of noses of successive merges or successive diverges as 3.75V (metres), where *V* is the design speed. For the N1, with a design speed of 120 km/h, this equates to a minimum spacing of approximately 450m.

Furthermore, a review of U.S. standards, specifically the AASHTO *Policy on Geometric Design of Highways and Streets* (7th Edition, 2018), Clause 10.9.6.4.5, indicates typical distances between successive ramp terminals, with a spacing of approximately 300 m noted as adequate for the proposed scenario.

Overall, the proposed layout is compliant with successive ramp terminal spacing requirements when assessed against multiple international design standards as shown in Table 5-6.

Table 5-6 – Minimum Spacing between successive ramp terminals

	As per TRH 17, section 10.11	As per DMRB CD 122, Clause 3.36	AASHTO Policy on Geometric Design of Highways & Streets - 7th Edition, 2018, Clause 10.9.6.4.5	Achieved Value			
				Between existing P155/1 northbound on-ramp and proposed split diamond northbound on-ramp from P24/1 to the N1	Between proposed split diamond southbound off-ramp from N1 to P24/1 and existing P155/1 southbound off-ramp from the N1	Between proposed split diamond southbound on-ramp from D2459 to N1 and existing P155/1 southbound off-ramp from the N1	Between proposed split diamond northbound off-ramp from N1 to D2459 and existing P155/1 northbound on-ramp
Spacing requirement between successive ramp terminal	**300m**	**450m**	**300m**	**900m**	**1350m**	**2370m**	**2830m**

Moreover, in assessing interchange spacing, centreline spacing can be adopted as the primary assessment criterion for the N1-P24/1 interchange, as YLBP spacing was considered not wholly applicable to the proposed scenario, as discussed above. Figure 5-19 illustrates the measurement of interchange centre line spacing between P155/1 and P24/1, the close proximity and skewed crossing angles of the P155/1 and P24/1 over the N1 result in a measured centreline spacing of approximately 1300 m, which is below the values indicated in Table 5-5.

However, when the centreline spacing is measured immediately prior to the taper of the P155/1, the spacing increases to approximately 2400 m, which complies with the absolute minimum spacing requirements specified in Table 5-5 for an access-to-access type interchange (refer to Figure 5-20).

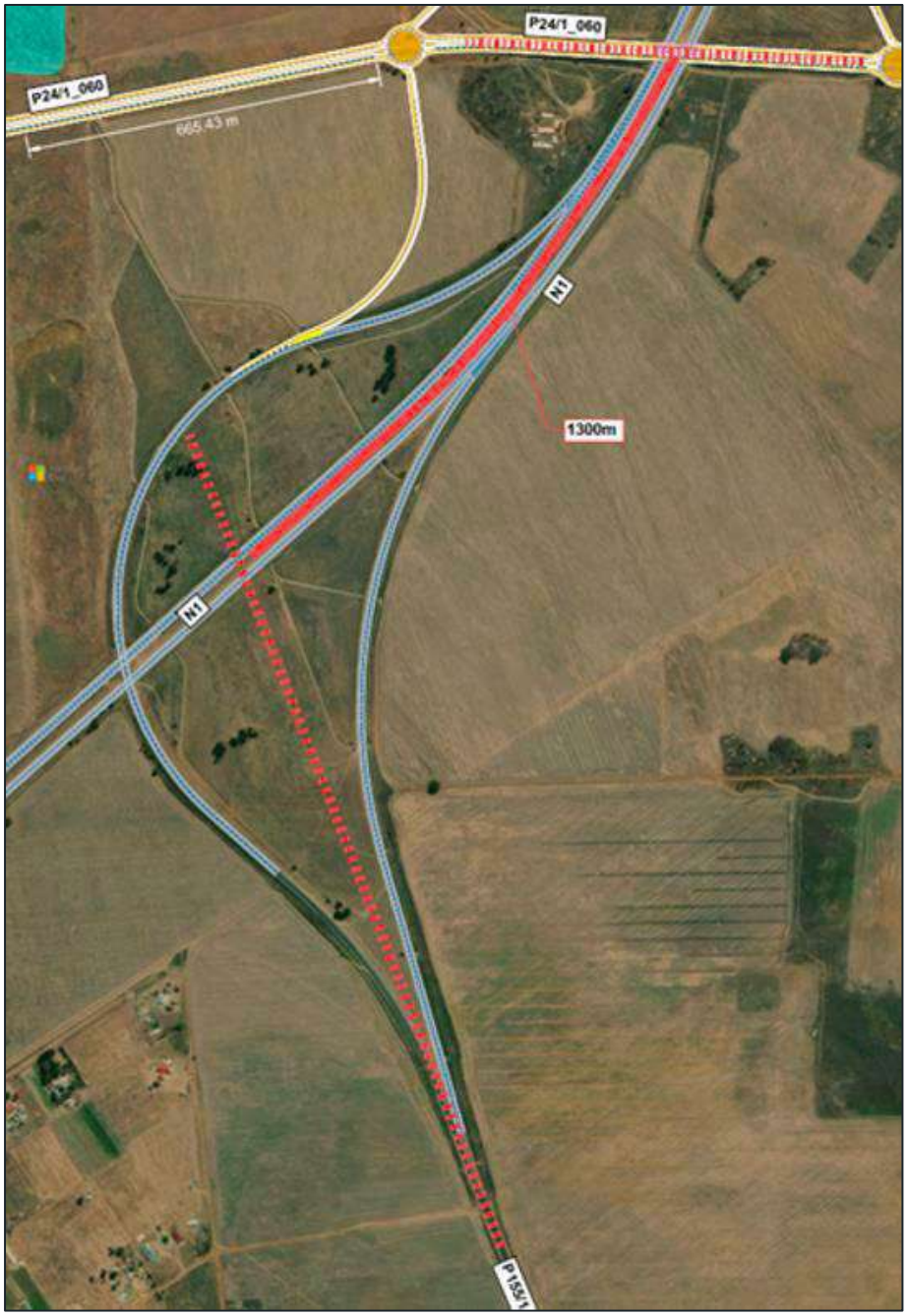


Figure 5-19 – Measurement of SDI centre line spacing-P155/1 to P24/1

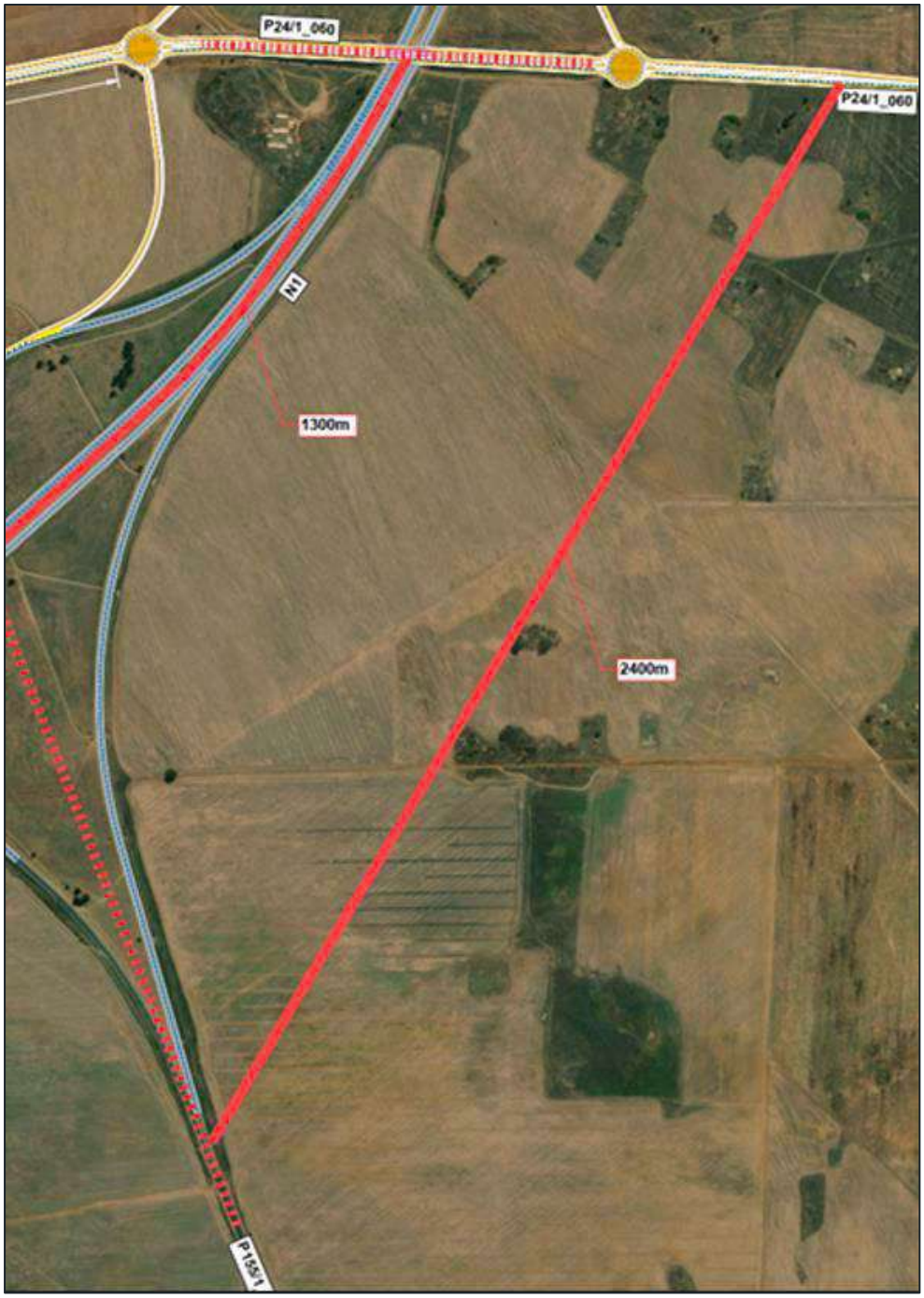


Figure 5-20 – Measurement of SDI centre line spacing-P155/1 to P24/1 prior to taper

This assessment demonstrates that any apparent shortfall in interchange spacing is largely influenced by existing alignment constraints, while overall compliance is achieved when assessed using a robust and justifiable centreline spacing interpretation.

5.5 TRAFFIC MOVEMENTS

NORTHERN PORTION OF THE SDI

N1 Movements:

Vehicles traveling southbound on the N1 can exit via the southbound off-ramp, to access the P24/1 at the eastern roundabout. This roundabout acts as a decision point, directing traffic either east towards Vanderbijlpark or west toward the airport.

Vehicles exiting the northbound off-ramp from P155/1 can connect directly to the western roundabout. This roundabout provides access to Vanderbijlpark and the airport.

The northbound on-ramp, originating from the western roundabout, allows traffic from Vanderbijlpark and the airport to merge onto the N1 north toward Johannesburg.

P24/1 Movements:

The P24/1 will be upgraded from a single carriageway (two lanes, bidirectional) to a dual carriageway with 2 lanes per direction for increased capacity and safety.

The western roundabout will connect the P24/1 to the N1 northern on-ramp, and the eastern roundabout will link to the N1 off-ramp.

The western roundabout will also connect the P155/1 on-ramp to the P24/1.

These roundabouts ensure smooth traffic distribution, allowing vehicles to safely access either direction of the N1 or continue between Vanderbijlpark and the airport.

SOUTHERN PORTION OF THE SDI

Vehicles traveling northbound on the N1 can exit via the northbound off-ramp and access the D2459 at a roundabout terminal. This roundabout acts as a decision point, directing traffic either North-east towards Vanderbijlpark or South-west toward Vanderbijlpark.

Vehicles traveling Southbound on the D2459 can exit via the southern roundabout and on ramp to the N1 southbound, or continue to Vanderbijlpark

Vehicles traveling Northbound on the D2459 can also exit via the southern roundabout and on ramp to the N1 southbound or continue to the P24/1.

Bridge Infrastructure:

The P24/1 overpass over the N1 will be upgraded from a single carriageway (two lanes, bidirectional) to a dual carriageway with 2 lanes per direction.

The D2459 overpass over the N1 will be retained as is.

6 COST ESTIMATE

This section presents a preliminary cost estimate for the split diamond interchange, including the four ramps, the 4 roundabout ramp terminals and the dualling of the P24 from East and West of the ramp terminals. The estimates are based on road infrastructure and bridge construction costs, evaluated against applicable unit rates. These estimates account for design, construction, and associated infrastructure costs.

Note: This is a high-level estimate only, and excludes major earthworks, services relocation, or additional cost due to geotechnical conditions. These estimates will assist in budget planning and may be refined as the project progresses. The key cost components for each option include roadworks and bridge structures. Refer to Table 6-1 for the itemised cost estimate.

Table 6-1 – Cost estimate for the SDI

No.	Description	Surface Area (m^2)	Rate (R)	Indicative Cost (R)
Ramps - Surfaced Carriageway				
1	On-ramp from P24/1 to N1 northbound	9 870	R950.00	R9 376 500
2	Off-ramp from N1 southbound to P24/1	8 410	R950.00	R7 989 500
3	Off-ramp from P155/1 on-ramp to P24/1	7 320	R950.00	R6 954 000
4	On-ramp from D2459 to N1	4 265	R950.00	R4 051 750
5	Off-ramp from N1 to D2459	4 085	R950.00	R3 880 750
Sub-Total		**33 950**		**R32 252 500**
Roundabouts - Surfaced Carriageway				
1	Western roundabout (Northern SDI)	1975	R950.00	R1 876 250
2	Eastern roundabout (Northern SDI)	1975	R950.00	R1 876 250
3	Western roundabout (Southern SDI)	3270	R950.00	R3 106 500
4	Eastern roundabout (Southern SDI)	4375	R950.00	R4 156 250
Sub-Total		**11 595**		**R11 015 250**
1	P24/1 - Additional carriageway	9510	R950.00	R9 034 500
2	P24/1 - Additional bridge deck	1 465	R25 000.00	R36 625 000
Sub-Total		**21 105**		**R20 049 750**
Total				**R63 317 500**
Professional Fees: Provisional Allowance of 7% on construction cost				R4 432 225
Project Management Fee: Provisional Allowance of 1.2% on construction cost				R759 810
Construction Cost (Excluding VAT)				**R68 509 535**
Provisional project contingences of 5% on works				R3 425 476.75
Construction Cost (Excluding VAT)				**R71 935 011.75**
VAT				R10 790 251.76
Full Construction Cost (Including VAT)				**R82 725 263.51**

7 TRAFFIC FLOW ASSESSMENT

7.1 BACKGROUND

WSP has prepared a full Transportation Impact Assessment (TIA) for the Vaal Aerotropolis Phase 1 development. The report is available on request. The report will be submitted to Emfuleni Local Municipality in due course in support of the land-use application for the Phase 1 development.

The TIA assesses the Phase 1 traffic generation and impact on the road network for both the N1 access interchange options.

7.2 AIRPORT TRIP GENERATION

The following table shows the trip summary of each land use for Phase 1 of the Airport and surrounding development.

Table 7-1 – Vaal Aerotropolis Phase Development Trips (peak hours)

LAND USE	WEEKDAY AM PEAK			WEEKDAY PM PEAK		
	IN	OUT	TOT	IN	OUT	TOT
PASSENGER & CARGO TERMINALS	1989	1654	**3643**	1791	1944	**3735**
TRADE ZONE	591	324	**915**	359	556	**915**
AIRPORT CITY	54	19	**73**	120	140	**260**
AGRIZONE	85	15	**100**	15	85	**100**
TOTAL	**2720**	**2012**	**4731**	**2285**	**2725**	**5010**

Table 7-1shows that the proposed Phase 1 development will generate approximately 5111 vehicle trips during the weekday AM peak hour and 5199 vehicle trips during the weekday PM peak hour.

7.3 NETWORK EFFECT ON TRAFFIC FLOWS WITH NEW INTERCHANGES

The SDI will have an impact on National Road N1 and the local provincial road network, described per portion.

N1/P24/1 – NORTHERN PORTION OF THE SDI

The Northern portion of the SDI will serve the Aerotropolis and the rural areas West of the N1 to Potchefstroom in the North West Province, and East of the N1 to Sebokeng and Vanderbijlpark.

The northern portion of the SDI will also provide direct access from the R57 (Westbound ramp to the N1) to the P24/1. Access between the P24/1 and the N1 will be directional (to the North and from the South).

N1/D2459 – SOUTHERN PORTION OF THE SDI

The Southern portion of the SDI will serve the Aerotropolis and the rural areas West of the N1 via the P24/1, and directly South-east of the N1 to Louisrus AH, Bophelong and the West of Vanderbijlpark. Access between the D2459 and the N1 will be directional (from the North and to the South only).

7.4 TRAFFIC VOLUMES

CURRENT TRAFFIC VOLUMES

Classified traffic surveys were undertaken from 6:00 to 18:00 on Tuesday 22 October 2024. Below is a summary of the current (2024) traffic volumes on the major roads. Refer to Figure 7-1.

- N1 between the R28 (future K170) overpass and the R57 access interchange: Weekday peak hours traffic volumes are 502 veh/hr (AM) and 572 veh/hr (PM) – northbound, and 612 veh/hr (AM) and 490 veh/hr (PM) – southbound.
- D1017 West of the N1: Weekday peak hours traffic volumes are 25 veh/hr (AM) and 36 veh/hr (PM) Westbound. Weekday peak hours traffic volumes are 24 veh/hr (AM) and 32 veh/hr (PM) Eastbound.
- R57 weekday peak hours traffic volumes are 356 veh/hr (AM) and 333 veh/hr (PM) to the N1 Northbound, and 355 veh/hr (AM) and 309 veh/hr (PM) from the N1 Eastbound.
- P24/1 weekday peak hours traffic volumes are 59 veh/hr (AM) and 63 veh/hr (PM) Eastbound, and 51 veh/hr (AM) and 46 veh/hr (PM) Westbound.
- D2459 south of the P24/1 T-junction was not surveyed for the TIA, as it was not known that it will be part of an interchange configuration. GDRT undertook a 12-hour count from 2:00 AM on 24 April 2024, a total of 234 vehicles were counted. The number of vehicles during the AM peak hour was not specified, therefore an estimate was done. The estimate is based on a GDRT survey on the P24 (undertaken on 24 April 2024), compared to the weekday AM and PM count undertaken as part of the TIA. The ADT was 1765 veh, and the AM and PM peak volumes were 121 for each peak. The peak traffic volumes were therefore 7% of the ADT. The AM and PM peak traffic on the D2459 is estimated as 33 veh/hr during both peaks.

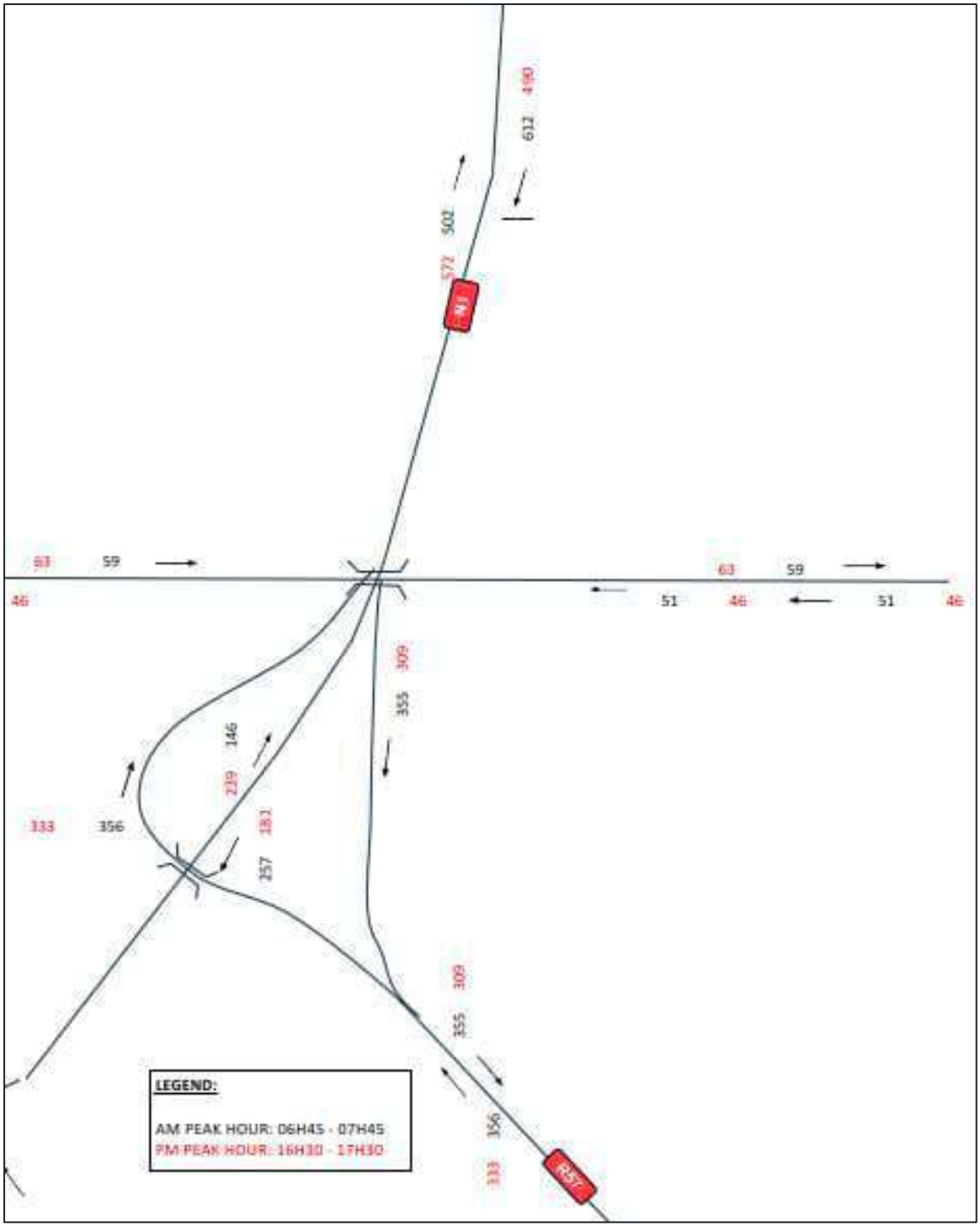


Figure 7-1 - 2024 Background Traffic

FUTURE TRAFFIC VOLUMES

Future traffic volumes for the opening year in 2033 were calculated for the Aerotropolis Phase 1, latent developments and background traffic. Refer to Figure 7-3 and Figure 7-4 for an extract of the weekday peak hour vehicle volume diagrams.

- Background traffic: A 2% per annum low traffic growth was assumed given the agricultural nature of the area, except the planned Aerotropolis.
- Latent development traffic: Latent development traffic of various housing developments were sourced from Emfuleni Council. These include the Johandeo Phase 2, Lethabong, Sebokeng Extension 33and Extension 28 mixed use township development. They are all located East of the N1. Refer to Figure 7.2 for the locations.

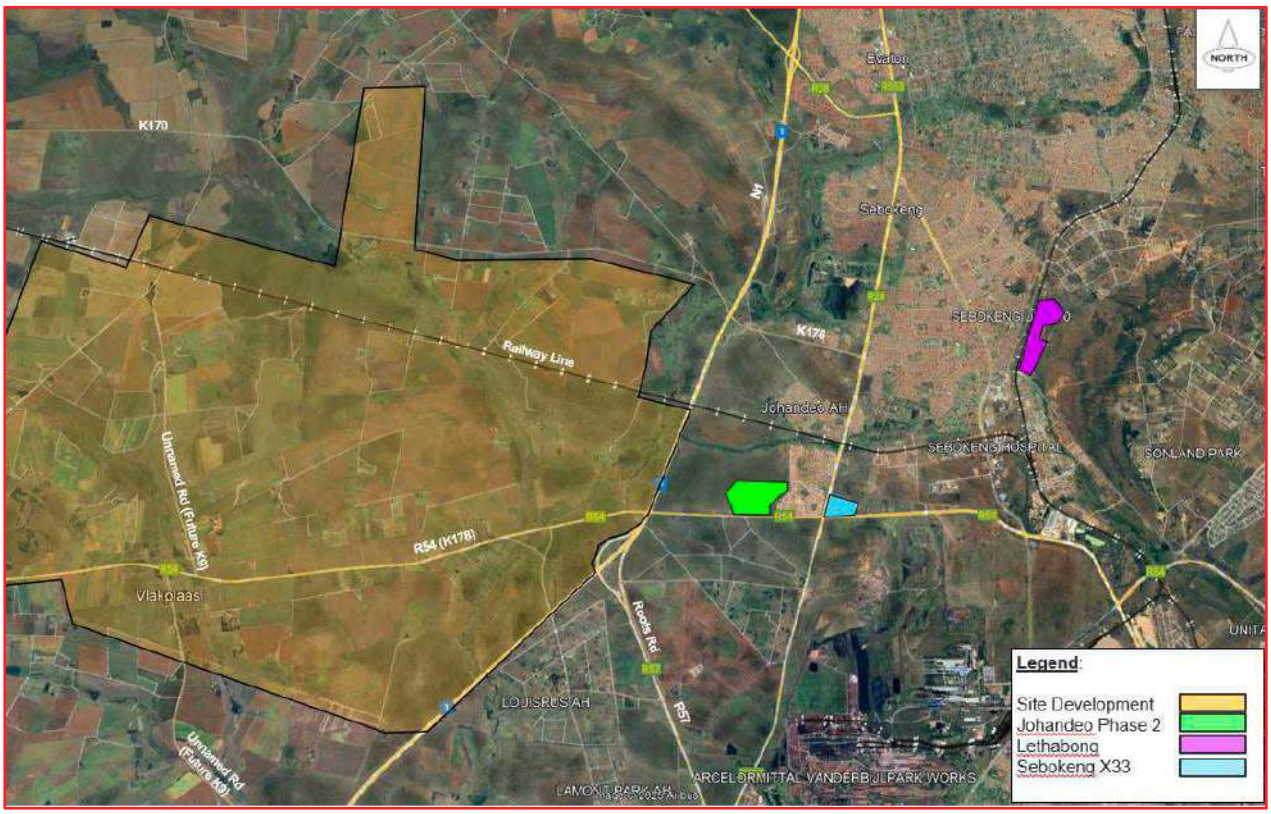


Figure 7.2 Latent Development locations

- Latent traffic due to the SDI: Some background traffic on the P24 and the D2459 was redistributed to and from the N1 due to the proposed SDI.
- Development traffic: Phase 1 Vaal Aerotropolis traffic

2033 Calculated Traffic Volumes (Background, latent & Phase 1 Aerotropolis traffic)

- N1 North of the P24 overpass: Northbound: 1657 veh/hr AM and 2098 veh/hr PM peak, Southbound: 2142 veh/hr AM and 1780 veh/hr PM peak
- N1 between the D2459 and P24 overpasses: Northbound: 174veh/hr AM & 286veh/hr PM peak, Southbound: 307veh/hr AM & 216 veh/hr PM peak
- N1 South of the D2459 overpass: Northbound: 694veh/hr AM & 727veh/hr PM peak, Southbound: 236veh/hr AM & 307veh/hr PM peak
- P24/1 West of the SDI: Eastbound weekday peak hours traffic volumes will be 1469 veh/hr (AM) and 1951 veh/hr (PM). Westbound peak hour traffic volume will be 1983 veh/hr (AM) and 1709 veh/hr (PM).
- R57 East of the N1: South-eastbound weekday peak hour traffic volumes will be 424veh/hr (AM) and 369 veh/hr (PM). North-westbound will be 611veh/hr (AM) & 562 veh/hr (PM).
- D2459 South of the P24/1 interchange: Northbound: 596veh/hr AM & 508veh/hr PM peak, Southbound: 478veh/hr AM & 620 veh/hr PM peak

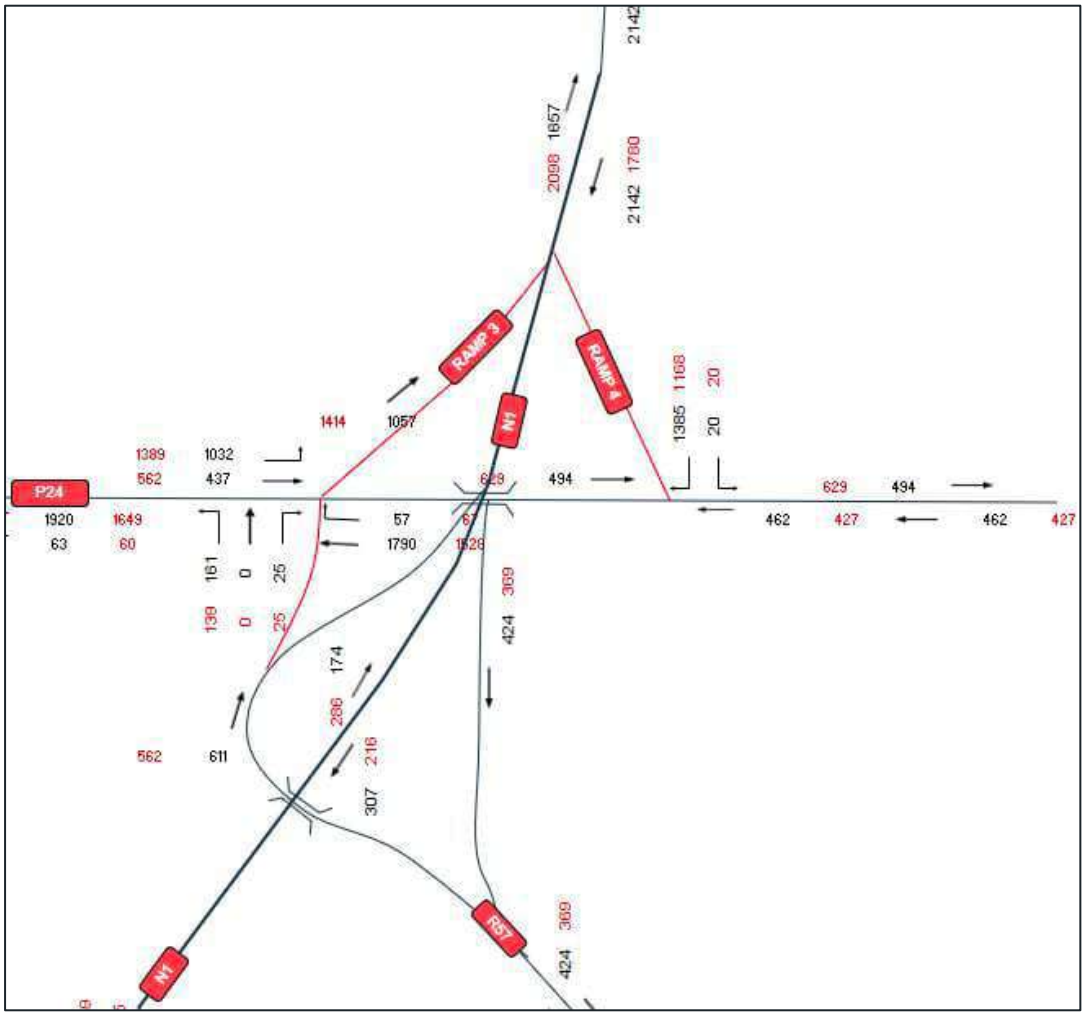


Figure 7-3 N1 & P24-2033 background, latent and development traffic volumes

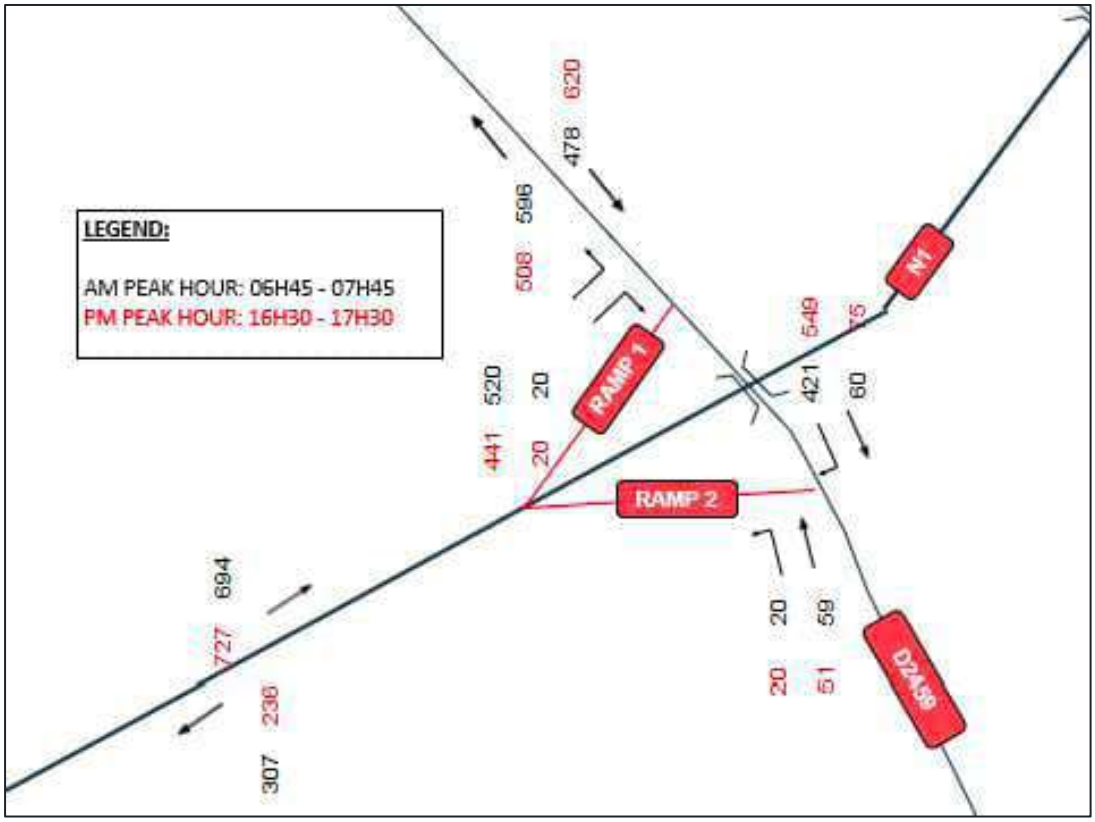


Figure 7-4 N1 & D2459-2033 background, latent and development traffic volumes

8 IMPACT ON NEW AND EXISTING TOLL FACILITIES

The impact of the proposed interchange and the Vaal Aerotropolis Phase 1 development traffic in terms of toll diversion is assessed herewith.

The Grasmere Toll Plaza on the N1 is located approximately 25km north of the future N1/P24/1 interchange northern ramps. The Grasmere toll plaza has 5 toll gates per direction serving the N1 mainline, and additional gates serving the R558 Walkerville/Ennerdale on-ramps and off-ramps. Figure 8-1 is an image of the layout of the toll plaza, and Figure 8-2 is the location in relation to the Northern portion of the SDI.

Figure 8-1 - Grasmere Toll Plaza layout

Figure 8-2 N1/P24 & Grasmere Toll Plaza location

The Vaal Toll Plaza on the N1 is located approximately 27km south of the proposed N1/D2459 interchange ramps. The toll plaza has 5 toll gates per direction serving the N1 mainline. Figure 8-3 is an image of the layout of the toll plaza, and Figure 8-4 is the location of the Southern portion of the SDI in relation to the Vaal Toll Plaza.

Figure 8-3 – Vaal Toll Plaza layout

Figure 8-4 N1/D2459 & Vaal Toll Plaza locations

The additional 2033 weekday peak development traffic on the N1 North of the SDI that will use the Grasmere toll plaza will be approximately:

- Weekday AM 1006 veh/hr (Northbound) and 1360 veh/hr (Southbound)
- Weekday PM 1363 veh/hr (Northbound) and 1143 veh/hr (Southbound)

The additional traffic South of the SDI that can use the Vaal Plaza, unless they exit or enter the N1 at the Potchefstroom Road or R59 interchanges between the toll plaza and the SDI, will be approximately:

- Weekday AM 490 veh/hr (Northbound) and 362 veh/hr (Southbound)
- Weekday PM 411 veh/hr (Northbound) and 491 veh/hr (Southbound)

Findings

- Should SANRAL require it, a capacity analysis can be undertaken to gauge the expected queue lengths with the 2033 development traffic at the Plazas. Recent traffic data will be requested from SANRAL, and peak hour surveys will be undertaken if required.
- To note, both toll plazas has centre toll lanes that can be used in either direction to provide additional capacity for directional peak volumes.
- The Vaal Aerotropolis will not result in any toll diversions on this section of the N1 Freeway.
- There are no known planned toll facilities on the N1 in the study area that may be impacted by the Vaal Aerotropolis.

9 ROAD SIGNAGE

Road signage plays a critical role in ensuring safe and efficient navigation between the highway, interchange ramps, and access roads to and from the Provincial roads and the Vaal Aerotropolis. The design and placement of signage for the proposed split diamond interchange must align with SANRAL's typical standards for road signs and markings, the South African Road Traffic Signs Manual (SARTSM), and the South African Road Federation (SARF) Traffic Safety Guidelines. This ensures that all signage complies with national safety and operational standards while promoting consistency, safety and ease of navigation for all road users.

9.1 DESIGN STANDARDS

- All signage will strictly adhere to SANRAL typical standards for road signs and markings.
- The South African Road Traffic Signs Manual (SARTSM) will guide the detailed specifications, including fonts, symbols, and colours.
- The SARF Traffic Safety Guidelines will inform additional safety considerations, particularly for temporary signage during construction and high-risk areas.
- Reflective materials will be used for visibility during night and adverse weather conditions.

9.2 OBJECTIVES OF THE SIGNAGE PLAN

The primary objectives of the signage plan for the Vaal Aerotropolis interchanges are:

- Safety: Minimize confusion and ensure safe decision-making for all road users.
- Traffic Efficiency: Support smooth traffic flow by providing timely and clear information.
- Compliance: Ensure adherence to SANRAL standards, SARTSM, and the SARF Traffic Safety Guidelines.
- Adaptability: Allow for updates and additions as the development progresses.

9.3 SIGNAGE REQUIREMENTS

The signage requirements for interchange advance direction signs on the N1 within the study area adhere to the SADC Road Traffic Signs Manual (SARTSM) Volume 1.

DESIGN CONSIDERATIONS

- 1 km Advance Direction Signs (ADS): Mandatory signage providing essential information on upcoming interchanges.
- 2 km Optional Signage: Additional early warning or guidance signs, currently not implemented on the N1.
- 400m Decision Sight Distance: Ensuring optimal visibility and sufficient reaction time for drivers.
- Key signage requirements for the Vaal Aerotropolis N1 interchanges include:

DIRECTIONAL SIGNAGE

To guide vehicles to and from the airport, trade zones, and other destinations along the highway, ramps and access roads. Examples of this signage is provided in Figure 9-1.

Figure 9-1 – Directional Signage Examples

REGULATORY SIGNAGE

To enforce traffic laws, including speed limits, lane usage, and restrictions. Examples of this signage is provided in Figure 9-2.

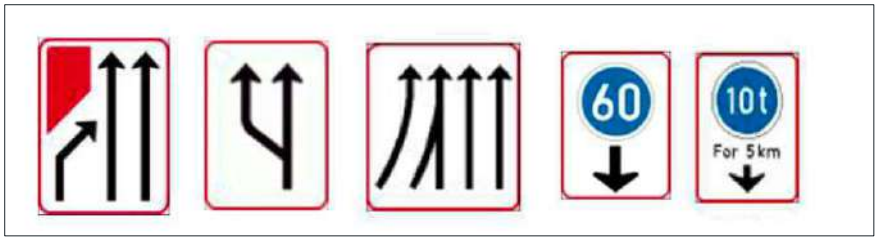


Figure 9-2 – Regulatory signage examples

WARNING SIGNAGE

To alert road users to potential hazards such as sharp curves, merging lanes, or reduced visibility. Examples of these signage is provided in Figure 9-3.

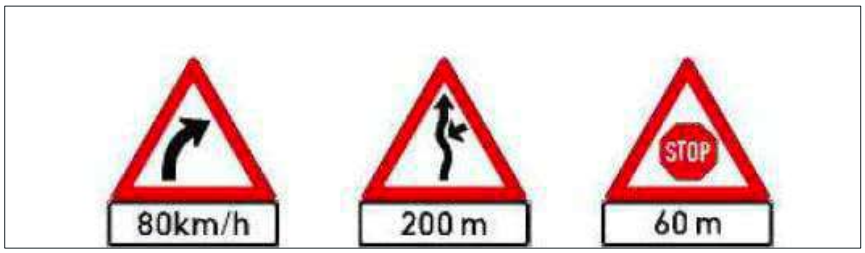


Figure 9-3 – Warning signage examples

9.4 EXISTING SIGNAGE LAYOUT

9.4.1 EXISTING N1 SOUTHBOUND P155/1 OFF-RAMP SIGNAGE LAYOUT

The existing signage layout includes combination of ground mounted and overhead signs. The signage layout initiate with ground mounted advance exit direction sign GA2 which is situated 1.5 km from the existing off ramp, shown in Figure 9-4.

Figure 9-4 – Warning signage examples

Ground mounted advance exit direction sign GA2

This sign will need to be relocated approximately 500m closer to the existing off-ramp, considering the proposed new southbound off-ramp to the P24/1. This is particularly important given that the spacing between the two successive off-ramps from the N1 is approximately 1,350m, and the relocation would help minimise potential confusion for road users. This adjustment will reduce the sign spacing to approximately 1.0 km, which is considered acceptable in accordance with SADC-RTSM Volume 1, Section 4.9.11. Following this, a supplementary advance exit/through direction overhead sign (GC3U) is provided, located approximately 400m in advance of the existing off-ramp, shown in Figure 9-5.

Figure 9-5 – Supplementary advance exit/through direction overhead sign GC3U

This is followed by an overhead exit direction sign (GC4U) and through direction sign (GC6U) located in close proximity to the off-ramp, shown Figure 9-6.

Figure 9-6 – Exit direction sign (GC4U) and through direction sign (GC6U)

A ground-mounted gore exit sign (GA4) is provided at the gore area, shown in Figure 9-7.

Figure 9-7 – Gore exit sign (GA4)

9.4.1 EXISTING P155/1 – N1 NORTHBOUND ON RAMP SIGNAGE LAYOUT

A dual carriageway freeway begins sign (R401) is provided on both sides of the dual carriageway on ramp before the on ramp joins the N1 highway, shown in Figure 9-8.

Figure 9-8 – Dual carriageway freeway begins sign (R401)

A “two two-lane roadways join on a curve” sign (GS404) is installed at the merging section of the on ramp with the N1 highway (Refer to Figure 9-8).

Figure 9-9 – Two two-lane roadways join on a curve sign GS404

9.5 PROPOSED SIGNAGE LAYOUT

To maintain consistency with the existing layout, a similar signage strategy will be adopted for the proposed layout, incorporating a combination of ground-mounted and overhead signs in accordance with SADC–RTSM Volume 1, Figures 4.64 and 4.66.

9.5.1 PROPOSED N1 SOUTHBOUND – P24/1 OFF-RAMP, P155/1 NORTHBOUND ON RAMP – P24/1 OFF-RAMP AND N1 NORTHBOUND – D2459 OFF-RAMP SIGNAGE LAYOUT

The proposed signage strategy for the off-ramps is outlined as follows.

- Pre-Interchange Signage: An advance ground-mounted exit direction sign (GA2) will be provided approximately 1 km in advance of the start of the off-ramp. This will be followed by a supplementary overhead advance exit/through direction sign (GC3U), installed about 400 m from the off-ramp. In addition, countdown signs IN1, IN2, and IN3 will be provided at 100m, 200m and 300 m respectively in advance of the off-ramp, to inform drivers of upcoming exits and any required lane changes.
- Interchange Signage: An overhead exit direction sign (GC4U) and through direction sign (GC6U) will be installed at the start of the off-ramp. This will be followed by a gore exit sign positioned within the gore area to confirm destinations and facilitate correct lane usage.
- Post-Interchange Signage: The proposed off ramps will be entering the proposed roundabouts before moving to the required destination, map type advanced direction traffic circle sign GD8 will be mounted to direct traffic to local destinations like Vanderbijlpark, the Airport City, and Agri-Zones.

9.5.2 PROPOSED P24/1 – N1 NORTHBOUND ON RAMP AND D2459 - N1 SOUTHBOUND ON-RAMP

The proposed signage strategy for the on ramp is outlined as follows.

- A dual carriageway freeway begins sign (R401) is provided on the left side of on ramp before the on ramp joins the N1 highway
- A GS400-series lane merge sign will be installed at the location where the on-ramp merges with the N1 highway.

An effective signage strategy is integral to the safety of either of the N1 interchanges. By prioritizing safety, efficiency, and compliance with **SANRAL standards**, the **SARTSM**, and the **SARF Traffic Safety Guidelines**, the proposed signage will enhance user experience and support the broader objectives of the development. Further detailed design will be undertaken during the detailed design stage to refine the signage layout, identify the appropriate SARTSM volume for implementation, and ensure compliance with SARF guidelines.

10 ENVIRONMENTAL FATAL FLAW ASSESSMENT

10.1 SCREENING TOOL REPORT

SCREENING REPORT - OPTION 1 N1/P24-1 & N1/D2459 SPLIT DIAMOND INTERCHANGE

A Screening Report for an environmental authorisation as required by the 2017 EIA regulations was conducted to determine the site environmental sensitivity.

Application Category: Infrastructure | Transport Services | Roads | Public

The following sections contain a summary of any development incentives, restrictions, exclusions or prohibitions that apply to the proposed development site as well as the most environmental sensitive features on the site based on the site sensitivity screening results for the application classification that was selected.

The following summary of the development site environmental sensitivities is identified. Only the highest environmental sensitivity is indicated. The footprint environmental sensitivities for the proposed development footprint as identified, are indicative only and must be verified on site by a suitably qualified person before the specialist assessments identified below can be confirmed.

Table 10-1 – Proposed Development Area Environmental Sensitivity (N1/P24-1 & N1/D2459 SDI)

Theme	Very High Sensitivity	High Sensitivity	Medium Sensitivity	Low Sensitivity
Agriculture Theme	X			
Animal Species Theme		X		
Aquatic Biodiversity Theme	X			
Archaeological and Cultural Heritage Theme				X
Civil Aviation Theme		X		
Defence Theme				X
Palaeontology Theme			X	
Plant Species Theme			X	
Terrestrial Biodiversity Theme	X			

Refer to the attached Option 1 N1/P24-1 & N1/D2459 Split Diamond Interchange Screening Report in Appendix D.

Animal Species Theme

The High Sensitivity to be noted in the Animal Species Theme shows the presence of *Aves-Typo capensis* (African Grass Owl). The species has an IUCN status of Vulnerable (VU) (an estimated, observed, suspected population decrease of 30% over the last 10 years).

Aquatic Biodiversity Theme

The Very High Sensitivity to be noted in the Aquatic Biodiversity Theme, shows the area to have '*Wetlands_Channelled valley-bottom*' and *'rivers'*, which indicates a channelled valley-bottom wetland ecosystem situated within the area. The sensitivity map also indicates the river that runs nearby to the project.

Terrestrial Biodiversity Theme

The Very High Sensitivity represented in the sensitivity map regarding the Terrestrial Biodiversity Theme indicates the area of land to be in the '*National Protected Area Expansion Strategy'* (NPAES) area. It is a DFFE project that sets targets for protected area expansion, provides maps of the most important areas for protected area expansion, and makes recommendations on mechanisms for protected area expansion. The next area of sensitivity is the '*VU_Soweto Highveld Grassland'*, it is a vegetation type in South Africa that is considered vulnerable (VU) and is listed as a threatened ecosystem. The area also indicated as being in a CBA1, CBA2, ESA1 and ESA2 based on the vulnerable vegetation unit being the *Soweto Highveld Grassland*.

SCREENING REPORT - OPTION 2 N1/P24-1 & N1/D2459 SPLIT DIAMOND INTERCHANGE

A Screening Report for an environmental authorization as required by the 2017 EIA regulations was conducted to determine the site environmental sensitivity.

Application Category: Infrastructure | Transport Services | Roads | Public

The following sections contain a summary of any development incentives, restrictions, exclusions or prohibitions that apply to the proposed development site as well as the most environmental sensitive features on the site based on the site sensitivity screening results for the application classification that was selected.

The following summary of the development site environmental sensitivities is identified. Only the highest environmental sensitivity is indicated. The footprint environmental sensitivities for the proposed development footprint as identified, are indicative only and must be verified on site by a suitably qualified person before the specialist assessments identified below can be confirmed.

Table 10-2 – Development Area Environmental Sensitivity (N1/P24-1 & N1/D2459 SDI)

Theme	Very High Sensitivity	High Sensitivity	Medium Sensitivity	Low Sensitivity
Agriculture Theme	X			
Animal Species Theme		X		
Aquatic Biodiversity Theme	X			
Archaeological and Cultural Heritage Theme				X
Civil Aviation Theme		X		
Defence Theme				X
Palaeontology Theme			X	
Plant Species Theme			X	
Terrestrial Biodiversity Theme	X			

Refer to the attached Option 2 N1/P24-1 & N1/D2459 Split Diamond Interchange Screening Report in Appendix D.

Animal Species Theme

The High Sensitivity to be noted in the Animal Species Theme shows the presence of *Aves-Typo capensis* (African Grass Owl). The species has an IUCN status of Vulnerable (VU) (an estimated, observed, suspected population decrease of 30% over the last 10 years).

Aquatic Biodiversity Theme

The Very High Sensitivity to be noted in the Aquatic Biodiversity Theme, shows the area to have '*Wetlands_Mesic Highveld Grassland Bioregion (Floodplain)*', which indicates a wetland ecosystem situated within the Mesic Highveld Grassland – a bioregion of South Africa, specifically located in areas that are prone to flooding due to their position on a river floodplain; essentially, a wetland area within the Highveld grassland that experiences regular inundation from nearby rivers. The sensitivity map also depicts a '*Wetlands_Mesic Highveld Grassland Bioregion (Valley-bottom)*', a wetland ecosystem within the low-lying region of the Mesic Highveld Grassland Bioregion. Characterised by moderate moisture levels and typically found in the plains between hills, where water naturally collects due to the topography. The sensitivity map also indicates the river that runs nearby to the project.

Terrestrial Biodiversity Theme

The Very High Sensitivity represented in the sensitivity map regarding the Terrestrial Biodiversity Theme indicates the area of land to be in the '*National Protected Area Expansion Strategy'* (NPAES) area. It is a DFFE project that sets targets for protected area expansion, provides maps of the most important areas for protected area expansion, and makes recommendations on mechanisms for protected area expansion. The next area of sensitivity is the '*VU_Soweto Highveld Grassland'*, it is a vegetation type in South Africa that is considered vulnerable (VU) and is listed as a threatened ecosystem.

10.2 DESKTOP STUDY

DESKTOP STUDY - OPTION 1 N1/P24-1 & N1/D2459 SPLIT DIAMOND INTERCHANGE

From a terrestrial biodiversity perspective, the receiving environment is characterised by a sensitive and threatened grassland ecosystem. The proposed interchange on the Option 1 N1/P24-1 & N1/D2459 will entirely be located within the *Soweto Highveld Grassland* (refer to Figure 10-1), a vegetation type that is formally listed as *Vulnerable* in terms of the national vegetation classification. This vegetation type has experienced extensive historical transformation across its range, primarily because of agricultural cultivation, grazing, urban expansion and associated infrastructure development.

Within the study area, it is anticipated that past agricultural activities may have resulted in varying levels of disturbance, with portions of the vegetation potentially being degraded or no

longer fully representative of the intact *Soweto Highveld Grassland* community. Nevertheless, despite possible disturbance, the presence of a *Vulnerable* vegetation type indicates a level of underlying conservation importance. Any remaining natural or semi-natural grassland elements may still contribute to ecological connectivity and ecosystem functioning and therefore warrant careful consideration during the planning and impact assessment process.

Figure 10-1 – Option 1 N1/P24-1 & N1/D2459 SDI Vegetation Map

The study site is located within areas classified as Critical Biodiversity Area 1 (CBA 1), Critical Biodiversity Area 2 (CBA 2), Ecological Support Area 1 (ESA 1) and Ecological Support Area 2 (ESA 2), as identified in the relevant Conservation Plan version 4 (refer to Figure 10-2). These designations indicate that the site forms part of a highly sensitive ecological landscape that is important for meeting biodiversity conservation targets and for maintaining essential ecosystem processes. CBA 1 and CBA 2 areas are considered priorities for conservation and should preferably remain in a natural or near-natural state to ensure the long-term persistence of biodiversity, while ESA 1 and ESA 2 areas play a critical role in supporting ecological functioning, including habitat connectivity, ecosystem service provision and the protection of adjacent conservation areas.

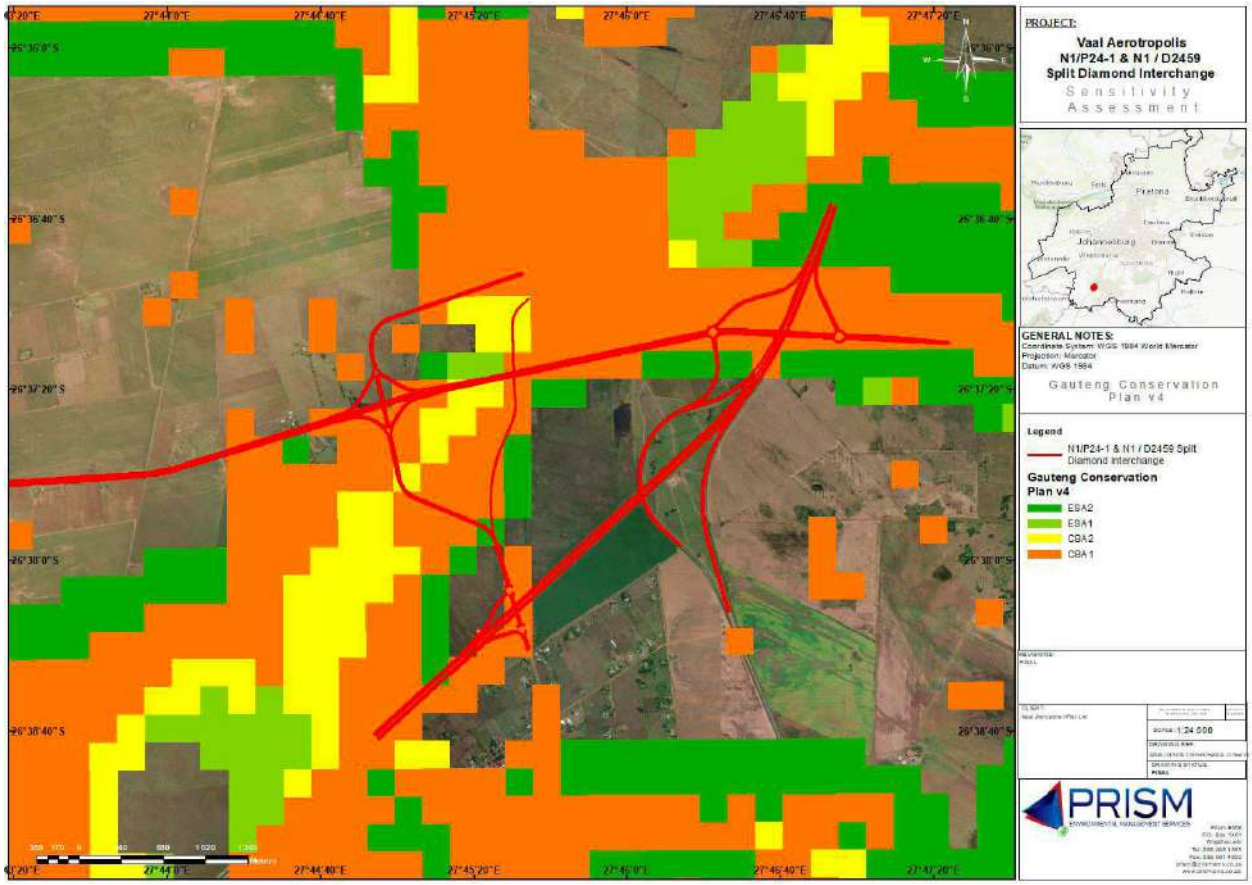


Figure 10-2 – Option 1 N1/P24-1 & N1/D2459 SDI CBA & ESA Map

The proposed intersection and road upgrade at the Option 1 N1/P24-1 & N1/D2459 Split Diamond Interchange cross a river and an associated wetland system, as indicated in Figure 10-3.

These aquatic features form part of a hydrologically connected ecological system that provides ecosystem services, including flood attenuation, water purification, sediment trapping and habitat provision for aquatic and semi-aquatic species. The proximity of the proposed infrastructure to the watercourse and wetland increases the potential for direct and indirect impacts, such as alteration of flow regimes, modification of channel and bank morphology, loss of wetland habitat, and changes to water quality during both the construction and operational phases, all of which can be mitigated against.

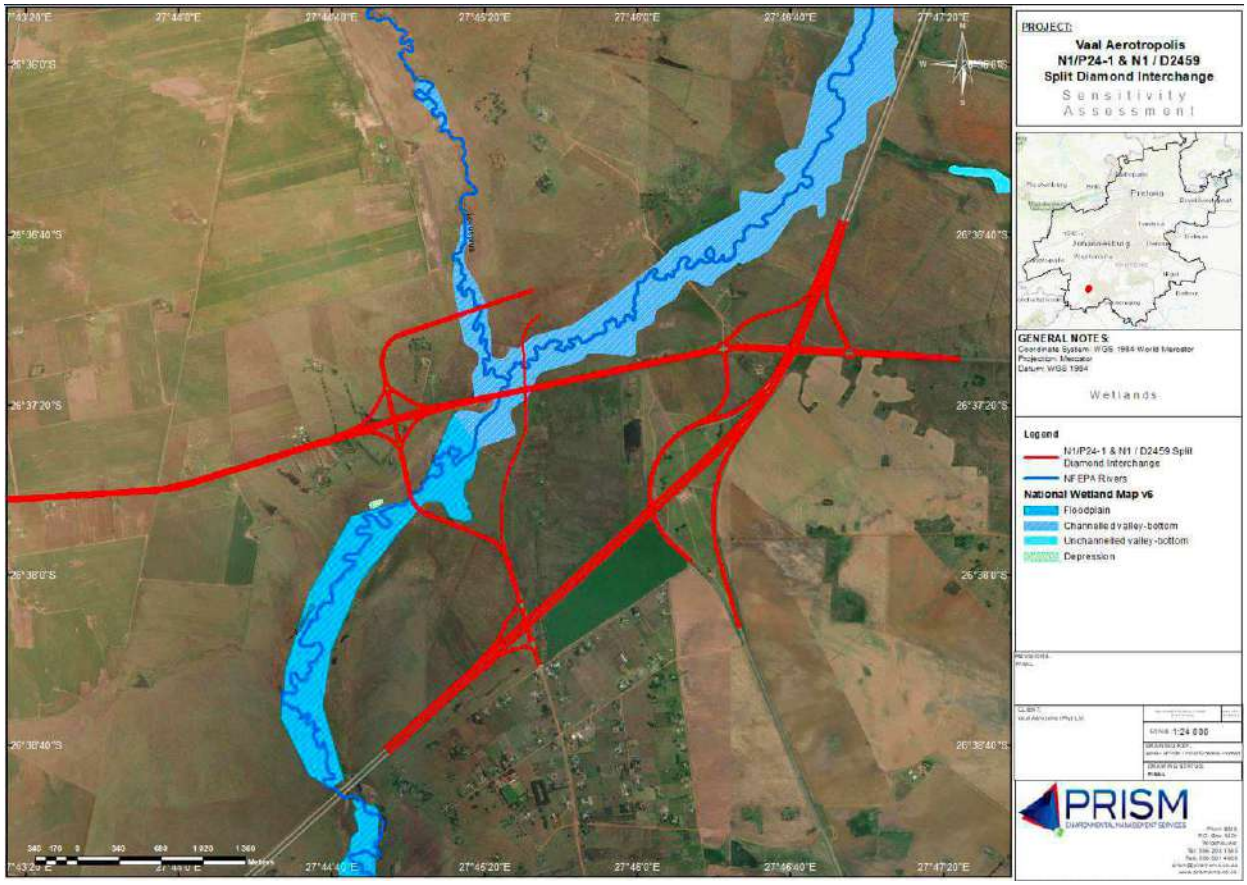


Figure 10-3 – Option 1 N1/P24-1 & N1/D2459 SDI Wetland Map

DESKTOP STUDY - OPTION 2 N1/P24-1 & N1/D2459 SPLIT DIAMOND INTERCHANGE

From a terrestrial biodiversity perspective, the receiving environment for the proposed development is characterised by a sensitive and highly threatened grassland ecosystem. The proposed interchange on the Option 2 N1/P24-1 & N1/D2459 Split Diamond Interchange will entirely be located within the *Soweto Highveld Grassland* (refer to Figure 10-4). This vegetation type is formally listed as Vulnerable in terms of the national vegetation classification, reflecting significant historical loss and fragmentation across its distribution range. The transformation of this vegetation type has primarily been driven by agricultural activities, grazing pressure, urban expansion and associated linear infrastructure development.

Within the study area, it is anticipated that historical agricultural practices may have resulted in varying levels of disturbance, with portions of the vegetation potentially being degraded and no longer fully representative of an intact *Soweto Highveld Grassland* community. However, notwithstanding these disturbances, the presence of a *Vulnerable* vegetation type confers a level of ecological sensitivity to the site.

Figure 10-4 – Option 2 N1/P24-1 & N1/D2459 Split Diamond Interchange Vegetation Map

The study site for Option 2 is located within areas classified as Critical Biodiversity Area 1 (CBA 1), Critical Biodiversity Area 2 (CBA 2), Ecological Support Area 1 (ESA 1) and Ecological Support Area 2 (ESA 2), as illustrated in Figure 10-5. These biodiversity planning designations indicate that the site forms part of a highly sensitive ecological landscape that is important for achieving provincial and regional biodiversity conservation targets. CBA 1 and CBA 2 areas are regarded as priority conservation areas and are intended to remain in a natural or near-natural state to secure the long-term persistence of biodiversity and associated ecological processes.

ESA 1 and ESA 2 areas, while not always requiring full conservation, play a critical supporting role in maintaining ecological functioning across the landscape, including habitat connectivity, ecological resilience and the provision of essential ecosystem services. Development within these areas is therefore subject to strict planning controls and requires that potential impacts be carefully assessed and mitigated.

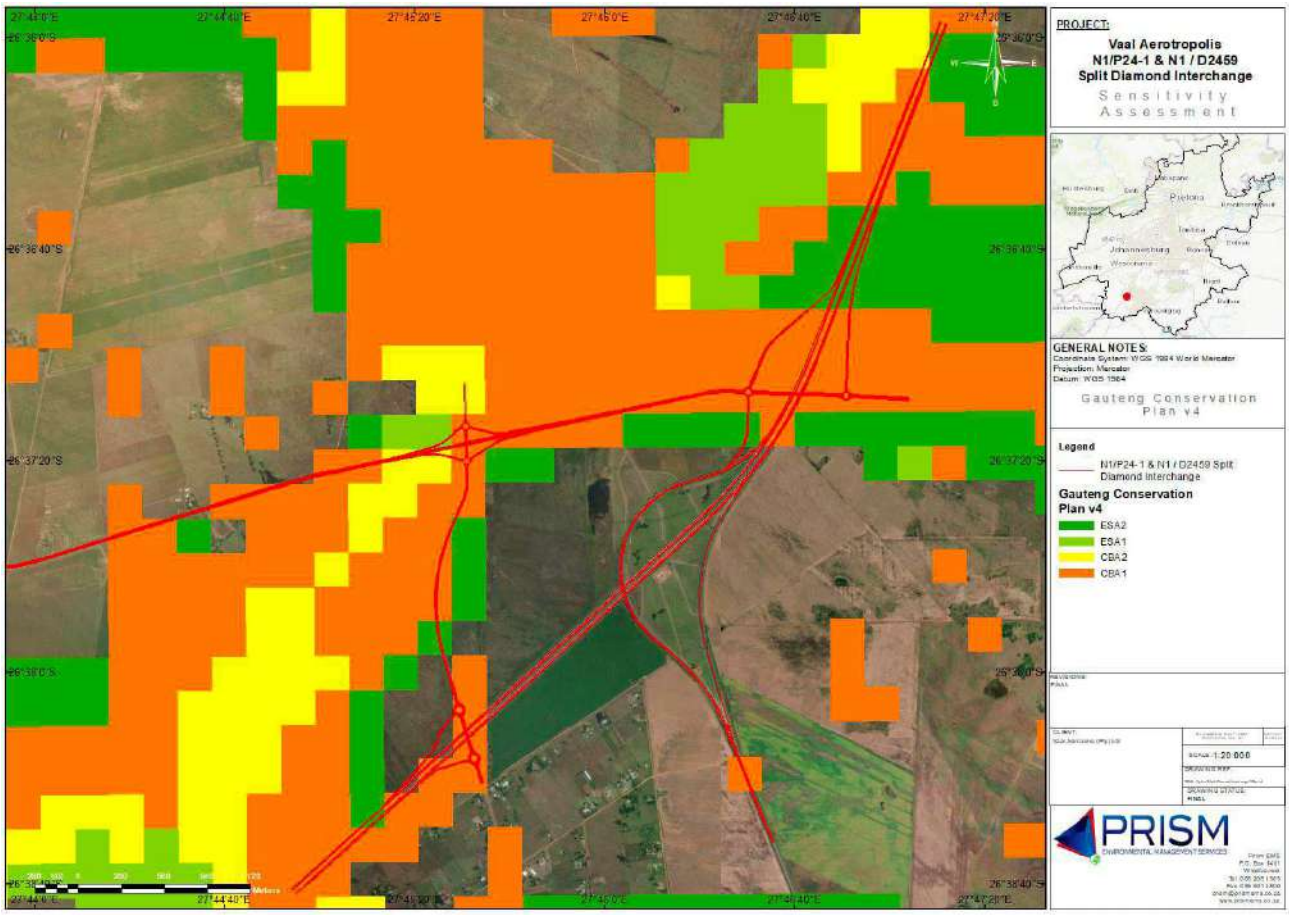


Figure 10-5 – Option 2 N1/P24-1 & N1/D2459 Split Diamond Interchange CBA & ESA Map

The proposed intersection and road upgrade at the Option 2 N1/P24-1 & N1 / D2459 Split Diamond Interchange cross a river and an associated wetland system, as illustrated in Figure 10-6. These aquatic features form part of a hydrologically connected system that provides important ecological functions within the broader landscape. While the presence of a wetland introduces environmental sensitivities that require consideration, the potential impacts can be effectively managed through appropriate planning, design and mitigation measures.

At this stage, the precise extent and characteristics of the wetland system have not yet been formally confirmed. A specialist wetland delineation study will therefore be undertaken to accurately determine the full spatial extent, classification and ecological condition of the wetland and its associated buffer areas.

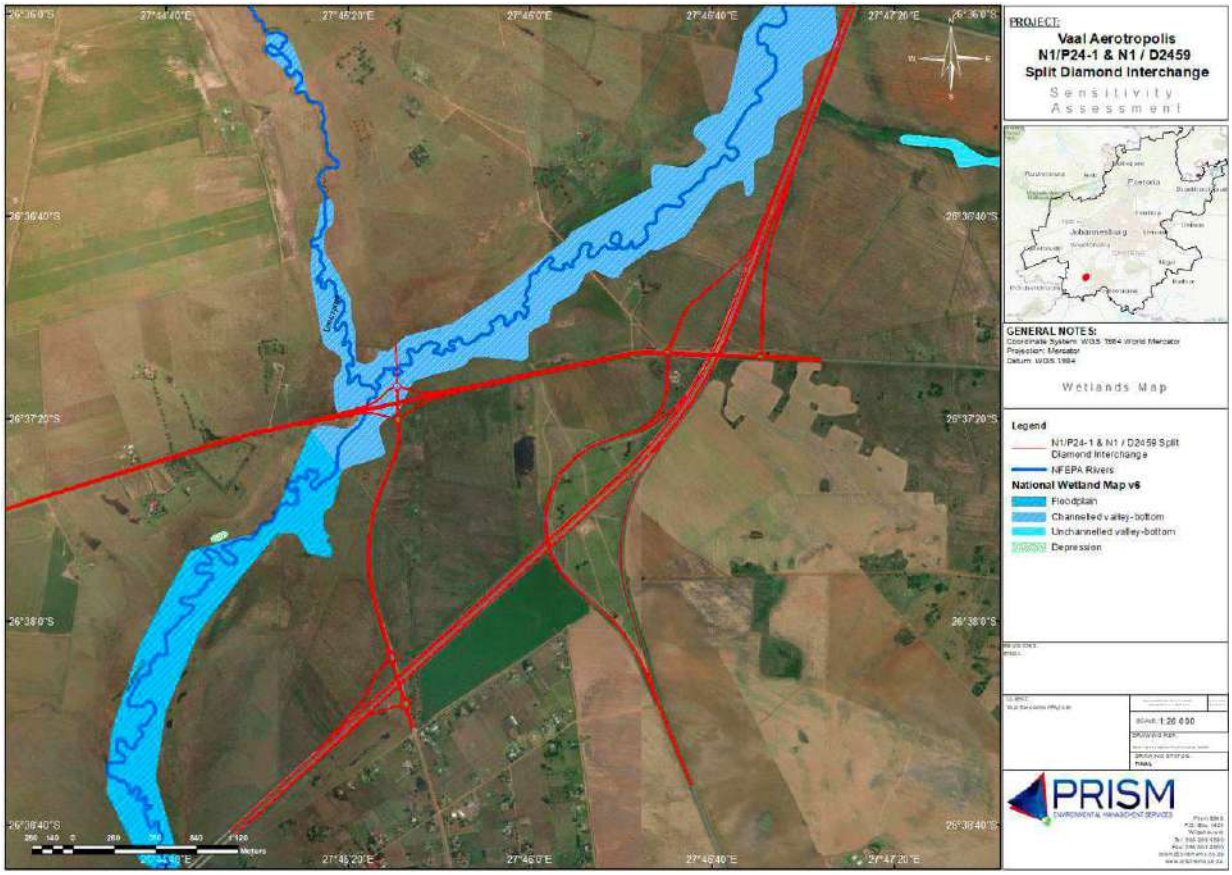


Figure 10-6 – Option 2 N1/P24-1 & N1/D2459 Split Diamond Interchange Wetland Map

10.3 NATIONAL ENVIRONMENTAL MANAGEMENT ACT (NEMA)

In terms of the National Environmental Management Act, Act 107 of 1998 (NEMA), the following possible trigger activities in terms of the listing notices where considered, see Table 10-3.

Listed activities in terms of the NEMA will therefore be trigger and an application for Environmental Authorisation (EA) in terms of the NEMA will be required.

Table 10-3 – NEMA triggers

Listing Notice	Activity Number	Type of Activity	Activity Description	Motivation why the activity is triggered
Listing Notice 1	12	The development of infrastructure	The development of: **(ii) infrastructure** or **structures** with a physical footprint of 100m² or more; (a) within a watercourse; (b) in front of a development setback; ***or*** (c) if no development setback exists, within 32m of a watercourse, measured from the edge of a watercourse;	The bridge infrastructure will have a physical footprint of more than 100m² within a watercourse.
Listing Notice 1	19	The **infilling** or depositing of any material of more than 10m³	The **infilling** or depositing of any material of more than 10m³ into, or the dredging, excavation, removal or moving of soil, sand, shells, shell grit, pebbles or rock of more than 10m³ from a watercourse	The bridge infrastructure will require infilling of material of more than 10m³.
Listing Notice 1	24	The development of a **road**	The development of a **road:** (ii) with a reserve wider than **13,5m**, or where no reserve exists where the road is wider than **8m**;	The road development will be wider than 13,5m.
Listing Notice 1	27	Clearance of vegetation	The clearance of an area of 1 hectare or more, but less than 20 hectares of indigenous vegetation, except where such clearance of indigenous vegetation is required for— (i) the undertaking of a linear activity; or (ii) maintenance purposes undertaken in accordance with a maintenance management plan.	More than 1 ha of indigenous vegetation will be cleared.
Listing Notice 1	56	Road - expansion	The widening of a road by more than 6 metres, or the lengthening of a road by more than 1 kilometre— (i) where the existing reserve is wider than 13,5 meters; or (ii) where no reserve exists, where the existing road is wider than 8 metres; excluding where widening or lengthening occur inside urban areas.	The road expansion will be wider than 6 metres.
Listing Notice 3	12	Clearance of vegetation	The clearance of an area of 300 square metres or more of indigenous vegetation except where such clearance of indigenous vegetation is required for maintenance purposes undertaken in accordance with a maintenance management plan. c. Gauteng: ii. Within CBAs or ESAs identified in the Gauteng Conservation Plan or bioregional plans;	More than 300m² of indigenous vegetation will be cleared within a CBA.

Listing Notice 3	14	The development of infrastructure within a watercourse	The development of— (ii) infrastructure or structures with a physical footprint of 10m² or more; where such development occurs— (a) within a watercourse; (b) in front of a development setback; or (c) if no development setback has been adopted, within 32m of a watercourse, measured from the edge of a watercourse; excluding the development of infrastructure or structures within existing ports or harbours that will not increase the development footprint of the port or harbour. c. Gauteng; iv. Sites identified as CBAs or ESAs in the Gauteng Conservation Plan or in bioregional plans;	The development of the bridge infrastructure will exceed 10m^2 and will be within a CBA, within a watercourse
Listing Notice 3	18	Roads - expansion	The widening of a road by more than 4 metres, or the lengthening of a road by more than 1 kilometre. c. Gauteng; iv. Sites identified as CBAs or ESAs in the Gauteng Conservation Plan or in bioregional plans;	The road expansion will be wider than 4m within a CBA
Listing Notice 3	23	The expansion of infrastructure within a watercourse	The expansion of (ii) infrastructure or structures where the physical footprint is expanded by 10m² or more; where such expansion occurs— (a) within a watercourse; (b) in front of a development setback adopted in the prescribed manner; or (c) if no development setback has been adopted, within 32m of a watercourse, measured from the edge of a watercourse; excluding the expansion of infrastructure or structures within existing ports or harbours that will not increase the development footprint of the port or harbour. c. Gauteng; iv. Sites identified as CBAs or ESAs in the Gauteng Conservation Plan or in bioregional plans;	The bridge infrastructure will be expanded by more than 10m^2 and within a CBA, within a watercourse

10.4 NATIONAL WATER ACT (NWA)

In terms of the National Water Act, Act 36 of 1998 (NWA), the following possible trigger activities under Section 21 of the NWA is considered, see Table 10-4. Activities in terms of the Section 21 of the NWA will therefore be trigger and an application for a Water Use License (WUL) in terms of the NWA will be required.

Table 10-4 – NWA triggers

Section 21 Activity Number	Activity Description	Motivation why the activity is triggered
c	Impeding or diverting the flow of water in a watercourse.	The construction of a bridge and road within the river and wetland system.
i	Altering the bed, banks, courses or characteristics of a watercourse.	The construction of a bridge and road within the river and wetland system.

11 SDI IMPLEMENTATION PLAN - PHASING

The implementation of the N1 interchange will be a single-phase construction. This ensures immediate and complete access to the Vaal Aerotropolis, facilitating efficient traffic flow. The project will encompass the full construction of an N1 access interchange and the required provincial road network upgrades for Phase 1, eliminating the need for segmented phases.

However, while the interchange itself will be implemented in one phase for Phase1 of the Aerotropolis, future road network expansions, improvements and additional and/or upgraded interchange/s will be assessed as part of Phase 2 and Phase 3 of the Vaal Aerotropolis when their planning and implementation starts.

12 CONCLUSIONS AND RECOMMENDATIONS

The Vaal Aerotropolis project requires effective road infrastructure to ensure seamless connectivity to the N1 highway. In this regard, two viable interchange options have been proposed and evaluated in this study. Both options adhere to geometric design standards, meet the spacing requirements for interchanges, and align with the broader transportation and economic objectives of the development.

12.1 INTERCHANGE VIABILITY

The interchange option considered in this study is a Split Diamond Interchange of the N1-with the P24 and the D2459, at exiting overpasses.

The interchange was found to be technically feasible and is broadly in-line with the Gauteng Department of Roads and Transport's planning framework, and SANRAL design criteria. The interchange will provide direct freeway access to the Vaal Aerotropolis, facilitate economic growth, and support the anticipated traffic demands associated with the airport and surrounding developments. It will also improve connectivity to the N1 freeway for the surrounding areas.

12.2 COST CONSIDERATIONS

High-level cost estimates have been prepared for both interchange options:

- N1-P24/1 Interchange: +/- R82.7 million

This estimate account for design, construction, and associated infrastructure costs. Further refinement of costs will be undertaken during the detailed design phase when the geotechnical and pavement design is undertaken, and the latest material and construction costs are available

12.3 ENVIRONMENTAL CONSIDERATIONS

A preliminary environmental assessment has been completed, identifying key sensitivities in the study area. Both interchange options will require a detailed Environmental Impact Assessment (EIA) at design development stages to ensure compliance with regulatory requirements. The findings indicate that while the proposed locations intersect certain environmentally sensitive zones, mitigation measures can be implemented to minimize negative impacts.

12.4 CONCLUSION

The N1 Split Diamond Interchange with the P24 and the D2459 is considered a viable solution for providing access to the Vaal Aerotropolis and the greater Gauteng Provincial Road Network.

WSP is seeking SANRAL's in-principle approval for the proposed interchange as it complies with the required technical standards.

To support the decision-making process, WSP has provided key information, including traffic volume analysis, cost comparisons, and a high-level environmental review. The selected interchange will play a vital role in improving connectivity and supporting the long-term development of the Vaal Aerotropolis.

12.5 RECOMMENDATIONS

- WSP seeks SANRAL's approval for the proposed interchange, as it is technically viable.
- A full Environmental Impact Assessment (EIA) will be conducted at design development stage for the approved interchange to ensure compliance with environmental regulations and to identify necessary mitigation strategies.
- Continued engagement with SANRAL, the Gauteng Department of Roads and Transport and other relevant authorities should be prioritized to secure approvals and ensure alignment with broader transport planning initiatives.

Appendix A

SANRAL COMMENTS ON PREVIOUS FATAL FLAW REPORT

SANRAL
BUILDING SOUTH AFRICA THROUGH BETTER ROADS

THE SOUTH AFRICAN NATIONAL ROADS AGENCY SOC LTD.

VAAL AEROTROPOLIS N1 INTERCHANGES

Comments on

FATAL FLAW REPORT

DATE: 3 June 2025

The comments provided herein are based on the information provided related to the VAAL AEROTROPOLIS N1 INTERCHANGES and the FATAL FLAW REPORT, reference 43103146.FF dated March 2025.

Alan Robinson Pr.Eng

1 Issue Statement

1.1 The objective of a Fatal Flaw Report for a proposed interchange on national roads is to determine if the interchange would conform to and support previously planned road networks, can be implemented meeting design standards and would not pose environmental risks to an extent that the interchange cannot be implemented such that it adequately connects to the surrounding road network.

1.2 The proposed road network that the interchange would connect to, and the interchange itself, must have adequate capacity to accommodate the proposed development. If the development is planned in phases, the requirements of each phase need to be assessed.

1.3 The phased development consists of:

1.3.1 7.2m pax + 150k tonnes

1.3.2 25m pax + expanded cargo.

1.3.3 45m pax + commercial, residential and leisure spaces.

1.4 ORTIA currently handles 21m pax + 650k tonnes.

2 Road Network Planning

2.1 Figure 4-3 depicts the Planned Gauteng Major Route Network. It is noted that the PWV20 joins the N1 at a systems interchange with the PWV5 to the south of the proposed development site and continues east to the existing N1/R57(P155-1) interchange and continue further east from there.

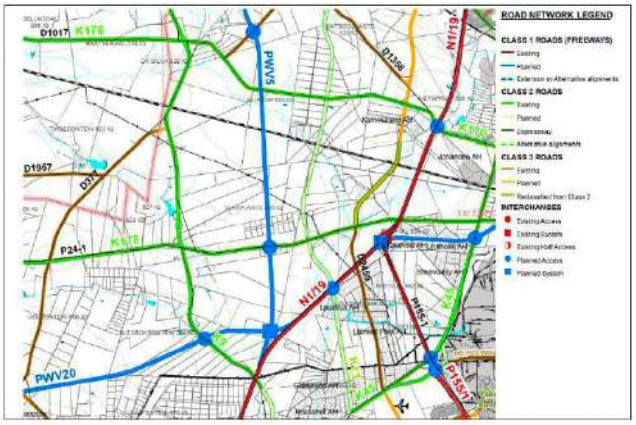


Figure 4-3 – Planned Gauteng Major Route Network (May 2010)

2.2 Access interchanges are planned on the N1 connecting the K170 to the north of the site and K13 to the south of the site.

2.3 Whilst an additional access interchange is planned on the N1 at the future K13 this would not meet access spacing criteria between the PWV20/N1/PWV5 systems interchange and the N1/R57(P115-1) directional trumpet interchange.

2.4 The double loading of the N1 between the western and eastern portion of the PWV20 could be problematic and might necessitate the review of the Gauteng

strategic road network in this area. Gauteng Department of Roads and Transport will be required in this regard.

3 Design Standards

3.1 Interchange and intersection spacing on all road classes must comply with TRH26. This must be included and demonstrated in the list of Design Criteria, especially on green-fields projects. This is crucial in a Fatal Flaw Report.

3.2 Capacity analysis must be demonstrated at a high level to ensure that the various phases of development can be accommodated.

3.3 Whilst the Gauteng planning indicates various interchanges, implementation must still comply with TRH26. If spacing no longer complies, additional road planning should be undertaken and discussed with Gauteng to ensure compliance and provide a safe and realistic network with the required mobility.

4 Proposed Interchanges

4.1 Option 1: R57 (P155-1) linking to the R54 (K178).

4.1.1 This option provides access from the N1 to the west only.

4.1.2 At the connection to the R54, again the connection is to the west only.

4.1.3 There is no access from the R57 to the airport. This is the main road to the primary target market. (Section 2.3 "*The proposed Vaal Aerotropolis development centers around the creation of a new international airport and its associated infrastructure to drive economic growth and connectivity within the Emfuleni region*").

4.1.4 East west movements in this area will be restricted.

4.1.5 The double loading of the PWV20 traffic onto the N1 was planned decades ago and, in other instances, has proven to be problematic.

4.2 Option 2: K176/K170

4.2.1 This is a currently planned interchange and provides linkages to the second order road network to the east and west.

4.2.2 There are no issues with access spacing.

4.2.3 From a transport planning perspective and the promotion of a balanced road hierarchy, this option is supported.

5 Alternative Options

5.1 PWV20 considerations

5.1.1 The PWV20 is planned to link onto the N1 from the west at the location of the PWV5 interchange and then run east from the R57 interchange.

5.1.2 The connections between the PWV20 and the N1 and PWV5 interchange should be reviewed as there are three class one routes joining one systems interchange.

5.1.3 The realignment of the PWV20 to limit the linkages to N1, particularly at the R57 interchange would enable additional access links to the target market with the R57 extending to the R54.

5.2 K13 consideration

5.2.1 There is a planned interchange on the N1 at the K13 to the south of the R57 interchange, which has not been considered.

5.2.2 This is closer to the main entrance to the airport and may provide an alternative access interchange location. Please provide reasons why this was not an option.

5.3 Split diamond option.

5.3.1 Pulling the R57 north ramps through the R54 bridge jack-spans would enable northern ramps from the R54 to merge/diverge with them before connecting to the N1. This will provide access from the north.

5.3.2 Providing southern ramps to the D2459 would provide the southern legs to the N1.

5.3.3 The distance between the YLBP would be approximately 3.7km.

Note that the split diamond is merely a concept idea that could provide an acceptable solution. It has not been rigorously evaluated. This will also need to be proposed to Gauteng Department of Roads since the southern access would have an impact on the proposed K13 interchange. This concept is tabled to provide a potentially more cost-effective solution since, for Phase 1 the bridge structures exist, yet it would promote a more balanced and accessible secondary road network. SANRAL would still require a full due diligence on this option and cannot take any responsibility if it is not acceptable to the Gauteng Department of Roads or does not meet any of the design criteria.

6 Conclusions and Recommendations

6.1 The inclusion of the PWV20 in the N1/R57 interchange is deemed problematic as it restricts all directional access, including the ramps to the airport development.

6.2 The lack of all movements, particularly east-west at both the N1/R57 interchange and the connection to the R54 does not promote a balanced road network and is geared at providing direct access to the airport from the N1 only.

6.3 It is recommended that:

6.3.1 The future planning of the PWV20 be discussed with Gauteng Department of Roads with the view of realigning it away from the N1 and R57 interchange. Comments from the Province would be required.

6.3.2 Full accessibility needs to be investigate through the proposed K57/N1 interchange to provide east/west connectivity or at least onto the K54.

6.3.3 Option 2 should be the preferred option from the road network and access perspective.

6.3.4 Consideration may be given to the split diamond concept for the north and south access to the N1 as the current proposal supports this accessibility as the main consideration. A review of this option from a transport accessibility, geometric feasibility and cost consideration.

Appendix B

GPDRT APPROVAL OF N1 / P24/1 / D2459 SDI

Confidential

GAUTENG PROVINCE
ROADS AND TRANSPORT
REPUBLIC OF SOUTH AFRICA

Life Centre Building, 45 Commissioner Street, Private Bag X88, Marshalltown, 2107
Tel: (011) 355 7095, Fax: (011) 355 7235

Enquiry : R. de Klerk
Ref / Verw : 2/1/1/3/1/1- P24/1 **13 March 2026**

WSP
Building 1
Maxwell Office Park Magwa Crescent West
Waterfall City
Midrand
1685

Sir,

Attention: Christo Bredenhann

IN PRINCIPLE APPROVAL VAAL AEROTROPOLIS N1/P24-1 (R541) INTERCHANGE ACCESS APPLICATION

Your report with reference 43103146.N1R541.INT dated February 2026 has reference.

Your application for the "In Principle Approval" for the following road upgrades has been approved:

- New proposed N1/ P24-1(K178) Interchange Access as indicated on Plan No102934-WSP-HGN-VAAL-DR-CH-00003.
- Grade separated junction of P24/1 and D2459 (Option 3).
- Subsequent upgrades to P24/1 and D2459 to enable the proposed implementations of the said interchanges (grade separations) as indicated on Plan No102934-WSP-HGN-VAAL-DR-CH-00003.

This "In Principle Approval" is subject to the following conditions:

- Geometric design standards must be fully achieved in terms of the design speed and applicable sighting distance, horizontal and vertical design standards.
- Design conforms to the typical plans and other design requirements applicable.
- Necessary amendments to be made on the Preliminary Designs of K178 and D2459 with all auxiliary approvals (EIA, WULA) that are to be obtained.
- All cost related to the design, land acquisition and subsequent studies will be for the cost of the developer.

This In Principle Approval does not grant approval for any construction or works in the provincial road reserve.

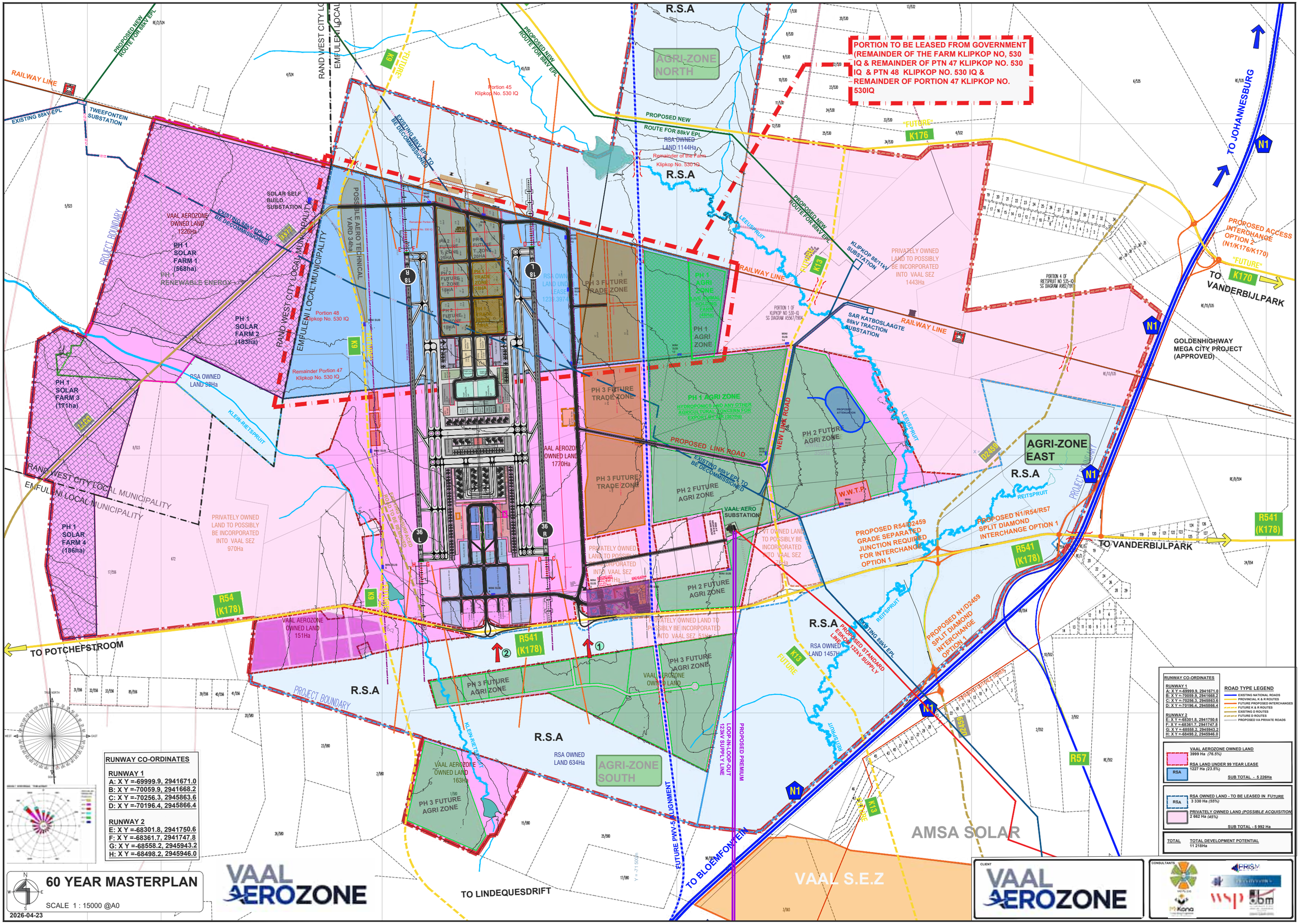
Yours faithfully

Ms. R. de Klerk
GAUTENG PROVINCIAL GOVERNMENT
DEPARTMENT OF ROADS AND TRANSPORT

Appendix C

VAAL AEROTROPOLIS MASTERPLAN

Confidential


PORTION TO BE LEASED FROM GOVERNMENT (REMAINDER OF THE FARM KLIPKOP NO, 530 IQ & REMAINDER OF PTN 47 KLIPKOP NO. 530 IQ & PTN 48 KLIPKOP NO. 530 IQ & REMAINDER OF PORTION 47 KLIPKOP NO. 530IQ
AGRI-ZONE NORTH
AGRI-ZONE EAST
AGRI-ZONE SOUTH
R.S.A
RAILWAY LINE
EXISTING 88kV EPL
TWEEFONTEIN SUBSTATION
PROPOSED NEW ROUTE FOR 88kV EPL
EXISTING 88kV EPL TO BE DECOMMISSIONED
RAND WEST CITY LOCAL MUNICIPALITY
EMFULENI LOCAL MUNICIPALITY
PROJECT BOUNDARY
SOLAR SELF BUILD SUBSTATION
VAAL AEROZONE OWNED LAND 1226Ha
PH 1 SOLAR FARM 1 (568ha)
PH 1 RENEWABLE ENERGY
PH 1 SOLAR FARM 2 (183ha)
PH 1 SOLAR FARM 3 (171ha)
PH 1 SOLAR FARM 4 (186ha)
POSSIBLE AERO TECHNICAL YARD 34ha
Portion 45 Klipkop No. 530 IQ
Portion 48 Klipkop No. 530 IQ
Remainder Portion 47 Klipkop No. 530 IQ
Remainder of the Farm Klipkop No. 530 IQ
RSA OWNED LAND 1144Ha
RSA OWNED LAND 98Ha
RSA OWNED LAND 1239.3974Ha
RSA OWNED LAND 1457Ha
RSA OWNED LAND 634Ha
VAAL AEROZONE OWNED LAND 1770Ha
VAAL AEROZONE OWNED LAND 151Ha
VAAL AEROZONE OWNED LAND 163Ha
PH 2 FUTURE T. ZONE 25HA
PH 3 FUTURE T. ZONE 20HA
PH 2 FUTURE T. ZONE 18HA
PH 2 FUTURE T. ZONE 18HA
PH 1 TRADE ZONE 18HA
PH 3 FUTURE TRADE ZONE
PH 1 AGRI ZONE
PH 1 AGRI ZONE (LIVE AVIAL HOUSING FARM) (48Ha)
PH 1 AGRI ZONE (HYDROPONICS AND ANY OTHER AGRICULTURAL PROGRAM FOR EXPORT) (307Ha)
PH 2 FUTURE AGRI ZONE
PH 3 FUTURE AGRI ZONE
PROPOSED LINK ROAD
NEW LINK ROAD
PROPOSED ATTENUATION
W.W.T.P.
VAAL AERO SUBSTATION
KLIPKOP 88/11kV SUBSTATION
SAR KATBOSLAAGTE 88kV TRACTION SUBSTATION
PRIVATELY OWNED LAND TO POSSIBLY BE INCORPORATED INTO VAAL SEZ 1443Ha
PRIVATELY OWNED LAND TO POSSIBLY BE INCORPORATED INTO VAAL SEZ 970Ha
PRIVATELY OWNED LAND TO POSSIBLY BE INCORPORATED INTO VAAL SEZ 51Ha
PRIVATELY OWNED LAND TO POSSIBLY BE INCORPORATED INTO VAAL SEZ 26Ha
PROPOSED R54/D2459 GRADE SEPARATED JUNCTION REQUIRED FOR INTERCHANGE OPTION 1
PROPOSED N1/R54/R57 SPLIT DIAMOND INTERCHANGE OPTION 1
PROPOSED N1/D2459 SPLIT DIAMOND INTERCHANGE OPTION 1
PROPOSED STANDARD LINE FOR 132kV SUPPLY
EXISTING 88kV EPL
PROPOSED PREMIUM
LOOP-IN-LOOP-OUT 132kV SUPPLY LINE
FUTURE PWV-5 ALIGNMENT
AMSA SOLAR
VAAL S.E.Z
TO JOHANNESBURG
TO VANDERBILJPARK
TO POTCHEFSTROOM
TO LINDEQUESDRIFT
TO BLOEMFONTEIN
PROPOSED ACCESS INTERCHANGE OPTION 2 (N1/K176/K170)
GOLDENHIGHWAY MEGA CITY PROJECT (APPROVED)
RUNWAY CO-ORDINATES
RUNWAY 1
A: X Y =-69999.9, 2941671.0
B: X Y =-70059.9, 2941668.2
C: X Y =-70256.3, 2945863.6
D: X Y =-70196.4, 2945866.4
RUNWAY 2
E: X Y =-68301.8, 2941750.6
F: X Y =-68361.7, 2941747.8
G: X Y =-68558.2, 2945943.2
H: X Y =-68498.2, 2945946.0
ROAD TYPE LEGEND
EXISTING NATIONAL ROADS
PROVINCIAL K & R ROUTES
FUTURE PROPOSED INTERCHANGES
FUTURE K & R ROUTES
EXISTING D ROUTES
FUTURE D ROUTES
PROPOSED VA PRIVATE ROADS
VAAL AEROZONE OWNED LAND 3999 Ha (76.5%)
RSA LAND UNDER 99 YEAR LEASE 1227 Ha (23.5%)
SUB TOTAL - 5 226Ha
RSA OWNED LAND - TO BE LEASED IN FUTURE 3 330 Ha (55%)
PRIVATELY OWNED LAND (POSSIBLE ACQUISITION 2 662 Ha (45%)
SUB TOTAL - 5 992 Ha
TOTAL DEVELOPMENT POTENTIAL 11 218Ha
60 YEAR MASTERPLAN
SCALE 1 : 15000 @A0
2026-04-23
VAAL AEROZONE
CLIENT
CONSULTANTS

Appendix D

ENVIRONMENTAL SCREENING REPORTS

Confidential

SCREENING REPORT FOR AN ENVIRONMENTAL AUTHORIZATION AS REQUIRED BY THE 2014 EIA REGULATIONS – PROPOSED SITE ENVIRONMENTAL SENSITIVITY

EIA Reference number: TBC

Project name: Option 1 N1 / R541 & N1/D2459 Interchange

Project title: Vaal Aerotropolis

Date screening report generated: 10/04/2026 14:49:14

Applicant: Vaal Aerozone

Compiler: Prism EMS

Compiler signature:

……

Application Category: Infrastructure|Transport Services|Roads|Public

OFFICIAL

Table of Contents

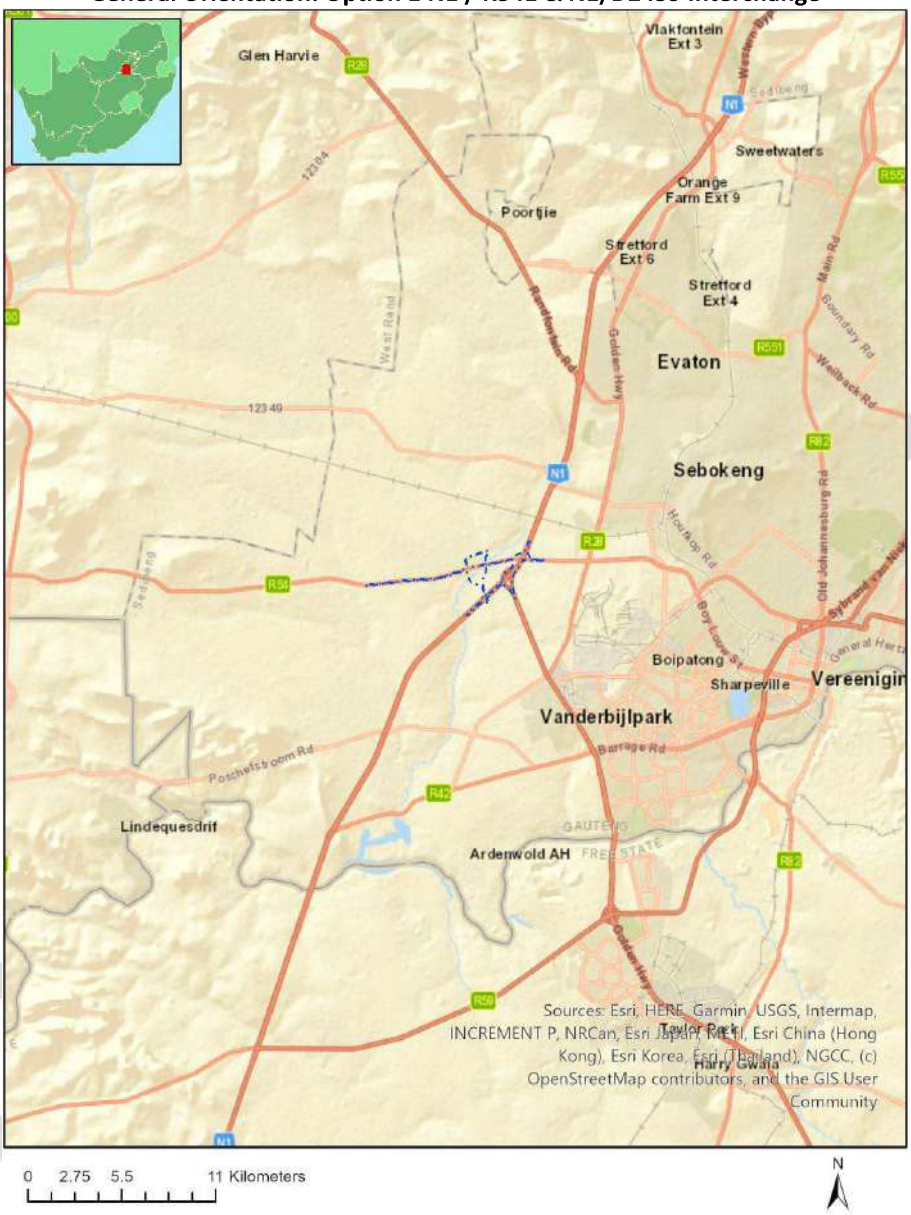
Proposed Project Location 3
Orientation map 1: General location 3
Map of proposed site and relevant area(s) 4
Cadastral details of the proposed site 4
Wind and Solar developments with an approved Environmental Authorisation or applications under consideration within 30 km of the proposed area 5
Environmental Management Frameworks relevant to the application 6
Environmental screening results and assessment outcomes 6
Relevant development incentives, restrictions, exclusions or prohibitions 6
Proposed Development Area Environmental Sensitivity 7
Specialist assessments identified 7
Results of the environmental sensitivity of the proposed area. 9
MAP OF RELATIVE AGRICULTURE THEME SENSITIVITY 9
MAP OF RELATIVE ANIMAL SPECIES THEME SENSITIVITY 10
MAP OF RELATIVE AQUATIC BIODIVERSITY THEME SENSITIVITY 11
MAP OF RELATIVE ARCHAEOLOGICAL AND CULTURAL HERITAGE THEME SENSITIVITY 12
MAP OF RELATIVE CIVIL AVIATION THEME SENSITIVITY 13
MAP OF RELATIVE DEFENCE THEME SENSITIVITY 14
MAP OF RELATIVE PALEONTOLOGY THEME SENSITIVITY 15
MAP OF RELATIVE PLANT SPECIES THEME SENSITIVITY 16
MAP OF RELATIVE TERRESTRIAL BIODIVERSITY THEME SENSITIVITY 17

OFFICIAL

Proposed Project Location

Orientation map 1: General location

General Orientation: Option 1 N1 / R541 & N1/D2459 Interchange



Map of proposed site and relevant area(s)

Cadastral details of the proposed site

Property details:

No	Farm Name	Farm/ Erf No	Portion	Latitude	Longitude	Property Type
1	RIETKUIL	552	0	26°38'56.62S	27°46'34.42E	Farm
2	VLAKPLAATS	555	0	26°37'21.83S	27°42'14.17E	Farm
3	RIETKUIL	554	0	26°37'2.12S	27°46'7.35E	Farm
4	LOUISRUS	586	0	26°38'57.21S	27°45'36.73E	Farm
5	RIETKUIL	554	40	26°36'41.54S	27°46'52.91E	Farm Portion
6	VLAKPLAATS	555	52	26°37'42.54S	27°42'20.64E	Farm Portion
7	LOUISRUS	586	0	26°39'3.94S	27°45'20.41E	Farm Portion
8	RIETKUIL	554	15	26°37'22.1S	27°44'5.63E	Farm Portion
9	RIETKUIL	554	10	26°37'1.44S	27°45'15.65E	Farm Portion
10	RIETKUIL	554	39	26°37'13.53S	27°46'34.74E	Farm Portion
11	RIETKUIL	554	16	26°37'18.07S	27°44'21.27E	Farm Portion
12	RIETKUIL	554	20	26°37'29.55S	27°47'29.66E	Farm Portion
13	RIETKUIL	554	44	26°37'13.16S	27°46'35.79E	Farm Portion
14	RIETKUIL	554	38	26°37'39.13S	27°46'9.85E	Farm Portion
15	RIETKUIL	554	11	26°36'31.02S	27°46'27.74E	Farm Portion
16	RIETKUIL	554	5	26°37'11.54S	27°46'28.39E	Farm Portion
17	RIETKUIL	554	2	26°38'22.33S	27°44'18.73E	Farm Portion
18	RIETKUIL	552	2	26°38'35.1S	27°46'18.58E	Farm Portion
19	RIETKUIL	552	10	26°37'59.93S	27°46'23.08E	Farm Portion
20	RIETKUIL	554	28	26°37'51.55S	27°45'23.09E	Farm Portion
21	LINKHOLM AH	2	0	26°37'15.05S	27°46'40.24E	Agri Holding
22	LINKHOLM AH	1	0	26°37'11.19S	27°46'41.21E	Agri Holding
23	LINKHOLM AH	1	1	26°37'10.55S	27°46'38.57E	Agri Holding
24	LINKHOLM AH	118	0	26°37'6.47S	27°47'1.05E	Agri Holding
25	LINKHOLM AH	121	0	26°37'5.1S	27°47'21.87E	Agri Holding
26	LINKHOLM AH	122	0	26°37'4.83S	27°47'26.12E	Agri Holding
27	LINKHOLM AH	141	0	26°37'10.15S	27°46'52.01E	Agri Holding
28	LINKHOLM AH	120	0	26°37'5.42S	27°47'16.91E	Agri Holding

Disclaimer applies

29	LINKHOLM AH	119	0	26°37'5.84S	27°47'10.69E	Agri Holding

Development footprint[1] vertices:
No development footprint(s) specified.

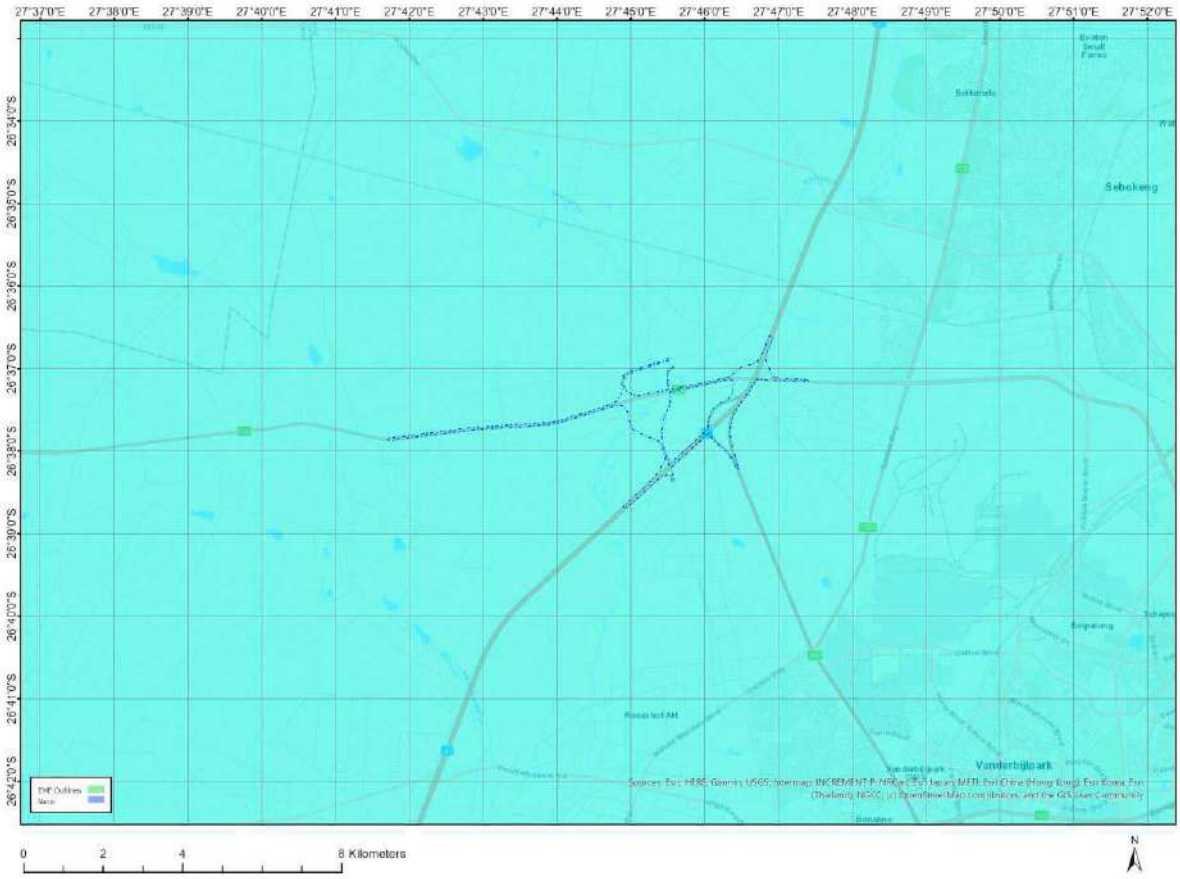
Wind and Solar developments with an approved Environmental Authorisation or applications under consideration within 30 km of the proposed area

No	EIA Reference No	Classification	Status of application	Distance from proposed area (km)
1	14/12/16/3/3/2/2566	Solar PV	Approved	14.7
2	14/12/16/3/3/2/2568	Solar PV	Approved	18.7
3	14/12/16/3/3/2/2569	Solar PV	Approved	16.6
4	14/12/16/3/3/2/2679	Solar PV	Approved	3.9
5	14/12/16/3/3/2/2077	Wind	Approved	22.7
6	14/12/16/3/3/2/2567	Solar PV	Approved	14.1
7	14/12/16/3/3/2/2078	Solar PV	Approved	18.5
8	14/12/16/3/3/2/753	Solar PV	Approved	22.5
9	14/12/16/3/3/2/2375	Solar PV	Approved	28.9
10	14/12/16/3/3/2/2385	Wind	Approved	28

OFFICIAL

[1] "development footprint", means the area within the site on which the development will take place and incudes all ancillary developments for example roads, power lines, boundary walls, paving etc. which require vegetation clearance or which will be disturbed and for which the application has been submitted.

Environmental Management Frameworks relevant to the application



Environmental Management Framework	LINK
Gauteng EMF	https://screening.environment.gov.za/ScreeningDownloads/EMF/GPEMF_2021_Gazette_and_summary.pdf

Environmental screening results and assessment outcomes

The following sections contain a summary of any development incentives, restrictions, exclusions or prohibitions that apply to the proposed development site as well as the most environmental sensitive features on the site based on the site sensitivity screening results for the application classification that was selected. The application classification selected for this report is: **Infrastructure|Transport Services|Roads|Public**.

Relevant development incentives, restrictions, exclusions or prohibitions

The following development incentives, restrictions, exclusions or prohibitions and their implications that apply to this site are indicated below.

Incentive, restriction or prohibition	Implication
Strategic Transmission Corridor-Central corridor	https://screening.environment.gov.za/ScreeningDownloads/Developmen

	tZones/Combined_EGI.pdf
Air Quality-Vaal Triangle Airshed Priority Area	https://screening.environment.gov.za/ScreeningDownloads/DevelopmentZones/Final_VTAPA_AQMP_20090408_-15_April_2009.pdf
Strategic Gas Pipeline Corridors-Phase 3: Richards Bay to Gauteng	https://screening.environment.gov.za/ScreeningDownloads/DevelopmentZones/Combined_GAS.pdf
Gauteng EMF-Urban development zone 1	https://screening.environment.gov.za/ScreeningDownloads/DevelopmentZones/Zone1_2021.pdf

Proposed Development Area Environmental Sensitivity

The following summary of the development site environmental sensitivities is identified. Only the highest environmental sensitivity is indicated. The footprint environmental sensitivities for the proposed development footprint as identified, are indicative only and must be verified on site by a suitably qualified person before the specialist assessments identified below can be confirmed.

Theme	Very High sensitivity	High sensitivity	Medium sensitivity	Low sensitivity
Agriculture Theme	X			
Animal Species Theme		X		
Aquatic Biodiversity Theme	X			
Archaeological and Cultural Heritage Theme				X
Civil Aviation Theme		X		
Defence Theme				X
Paleontology Theme			X	
Plant Species Theme			X	
Terrestrial Biodiversity Theme	X			

Specialist assessments identified

Based on the selected classification, and the known impacts associated with the proposed development, the following list of specialist assessments have been identified for inclusion in the assessment report. It is the responsibility of the EAP to confirm this list and to motivate in the assessment report, the reason for not including any of the identified specialist study including the provision of photographic evidence of the site situation.

No	Specialist assessment	Assessment Protocol
1	Agricultural Impact Assessment	https://screening.environment.gov.za/ScreeningDownloads/AssessmentProtocols/Gazetted_General_Agriculture_Assessment_Protocols.pdf
2	Landscape/Visual Impact Assessment	https://screening.environment.gov.za/ScreeningDownloads/AssessmentProtocols/Gazetted_General_Requirement_Assessment_Protocols.pdf
3	Archaeological and Cultural Heritage Impact Assessment	https://screening.environment.gov.za/ScreeningDownloads/AssessmentProtocols/GuidanceforHIA.pdf
4	Palaeontology Impact Assessment	https://screening.environment.gov.za/ScreeningDownloads/AssessmentProtocols/GuidanceforPIA.pdf
5	Terrestrial Biodiversity Impact Assessment	https://screening.environment.gov.za/ScreeningDownloads/AssessmentProtocols/Gazetted_Terrestrial_Biodiversity_Assessment_

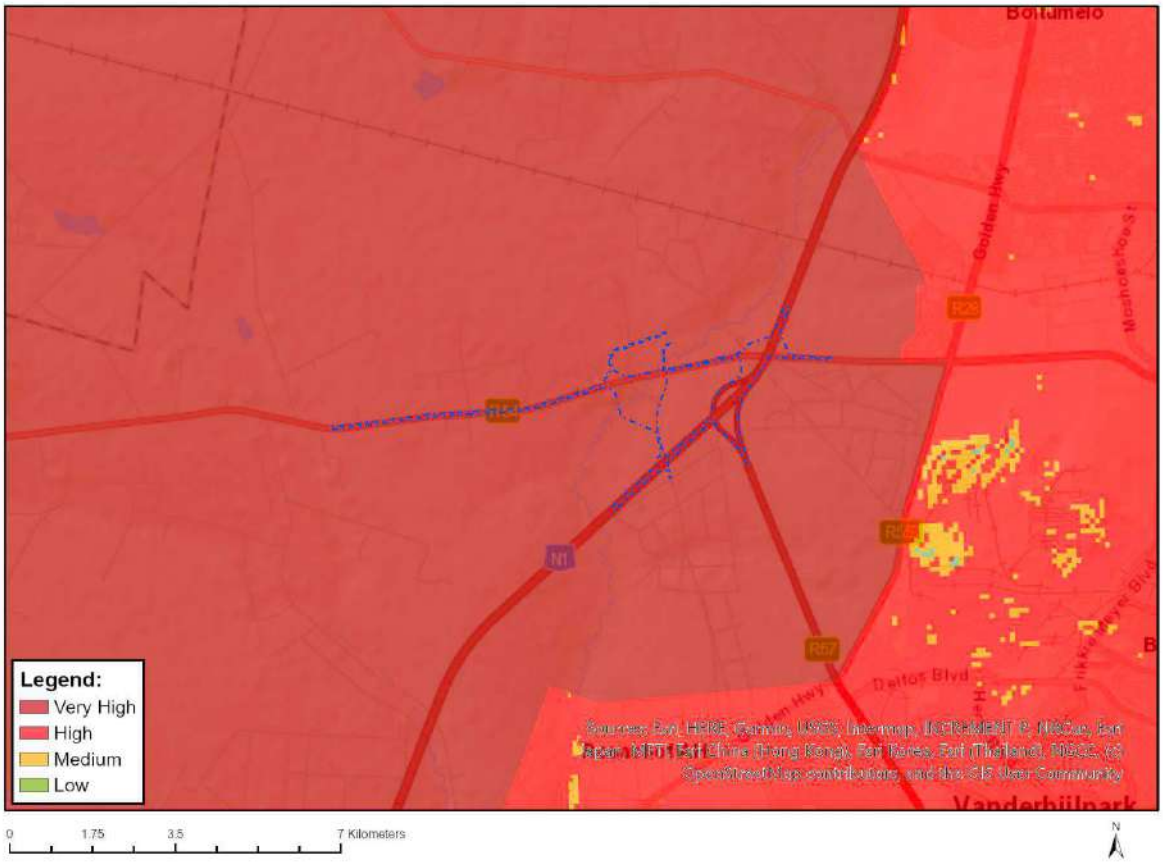
		Protocols.pdf
6	Aquatic Biodiversity Impact Assessment	https://screening.environment.gov.za/ScreeningDownloads/AssessmentProtocols/Gazetted_Aquatic_Biodiversity_Assessment_Protocols.pdf
7	Noise Impact Assessment	https://screening.environment.gov.za/ScreeningDownloads/AssessmentProtocols/Gazetted_Noise_Impacts_Assessment_Protocol.pdf
8	Traffic Impact Assessment	https://screening.environment.gov.za/ScreeningDownloads/AssessmentProtocols/Gazetted_General_Requirement_Assessment_Protocols.pdf
9	Geotechnical Assessment	https://screening.environment.gov.za/ScreeningDownloads/AssessmentProtocols/Gazetted_General_Requirement_Assessment_Protocols.pdf
10	Socio-Economic Assessment	https://screening.environment.gov.za/ScreeningDownloads/AssessmentProtocols/Gazetted_General_Requirement_Assessment_Protocols.pdf
11	Ambient Air Quality Impact Assessment	https://screening.environment.gov.za/ScreeningDownloads/AssessmentProtocols/Gazetted_General_Requirement_Assessment_Protocols.pdf
12	Plant Species Assessment	https://screening.environment.gov.za/ScreeningDownloads/AssessmentProtocols/Gazetted_Plant_Species_Assessment_Protocols.pdf
13	Animal Species Assessment	https://screening.environment.gov.za/ScreeningDownloads/AssessmentProtocols/Gazetted_Animal_Species_Assessment_Protocols.pdf

OFFICIAL

Results of the environmental sensitivity of the proposed area.

The following section represents the results of the screening for environmental sensitivity of the proposed site for relevant environmental themes associated with the project classification. It is the duty of the EAP to ensure that the environmental themes provided by the screening tool are comprehensive and complete for the project. Refer to the disclaimer.

MAP OF RELATIVE AGRICULTURE THEME SENSITIVITY

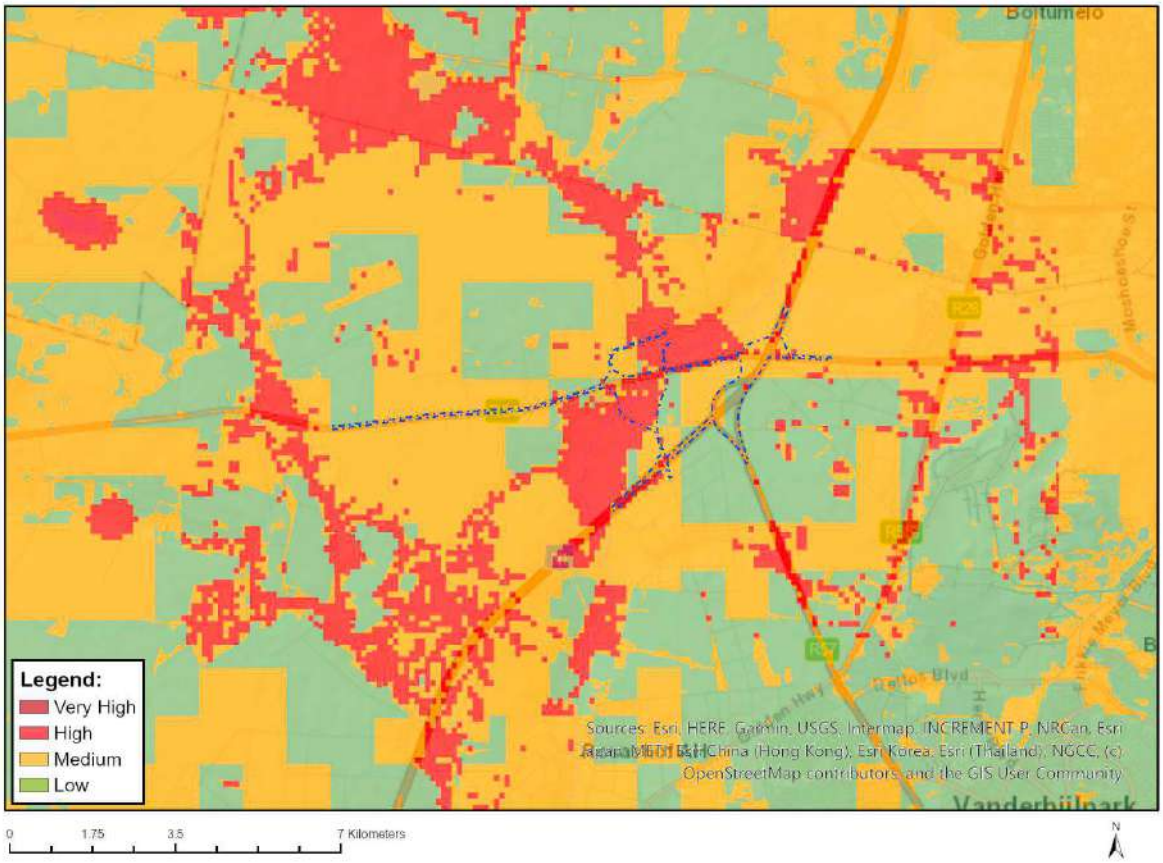


Very High sensitivity	High sensitivity	Medium sensitivity	Low sensitivity
X			

Sensitivity Features:

Sensitivity	Feature(s)
High	Rainfed Annual Crop Cultivation / Planted Pastures
High	Small_Holdings
High	08. Moderate
High	10. Moderate-High
High	09. Moderate-High
Medium	07. Low-Moderate
Very High	Fochville PAA

MAP OF RELATIVE ANIMAL SPECIES THEME SENSITIVITY



Where only a sensitive plant unique number or sensitive animal unique number is provided in the screening report and an assessment is required, the environmental assessment practitioner (EAP) or specialist is required to email SANBI at eiadatarequests@sanbi.org.za listing all sensitive species with their unique identifiers for which information is required. The name has been withheld as the species may be prone to illegal harvesting and must be protected. SANBI will release the actual species name after the details of the EAP or specialist have been documented.

Very High sensitivity	High sensitivity	Medium sensitivity	Low sensitivity
	X		

Sensitivity Features:

Sensitivity	Feature(s)
High	Aves-Tyto capensis
Low	Subject to confirmation
Medium	Insecta-Lepidochrysops procera
Medium	Mammalia-Crocidura maquassiensis
Medium	Mammalia-Hydrictis maculicollis

MAP OF RELATIVE AQUATIC BIODIVERSITY THEME SENSITIVITY

Very High sensitivity	High sensitivity	Medium sensitivity	Low sensitivity
X			

Sensitivity Features:

Sensitivity	Feature(s)
Low	Low Sensitivity
Very High	Wetlands_Channelled valley-bottom
Very High	Wetlands_Floodplain
Very High	Rivers

Disclaimer applies
10/04/2026

MAP OF RELATIVE ARCHAEOLOGICAL AND CULTURAL HERITAGE THEME SENSITIVITY

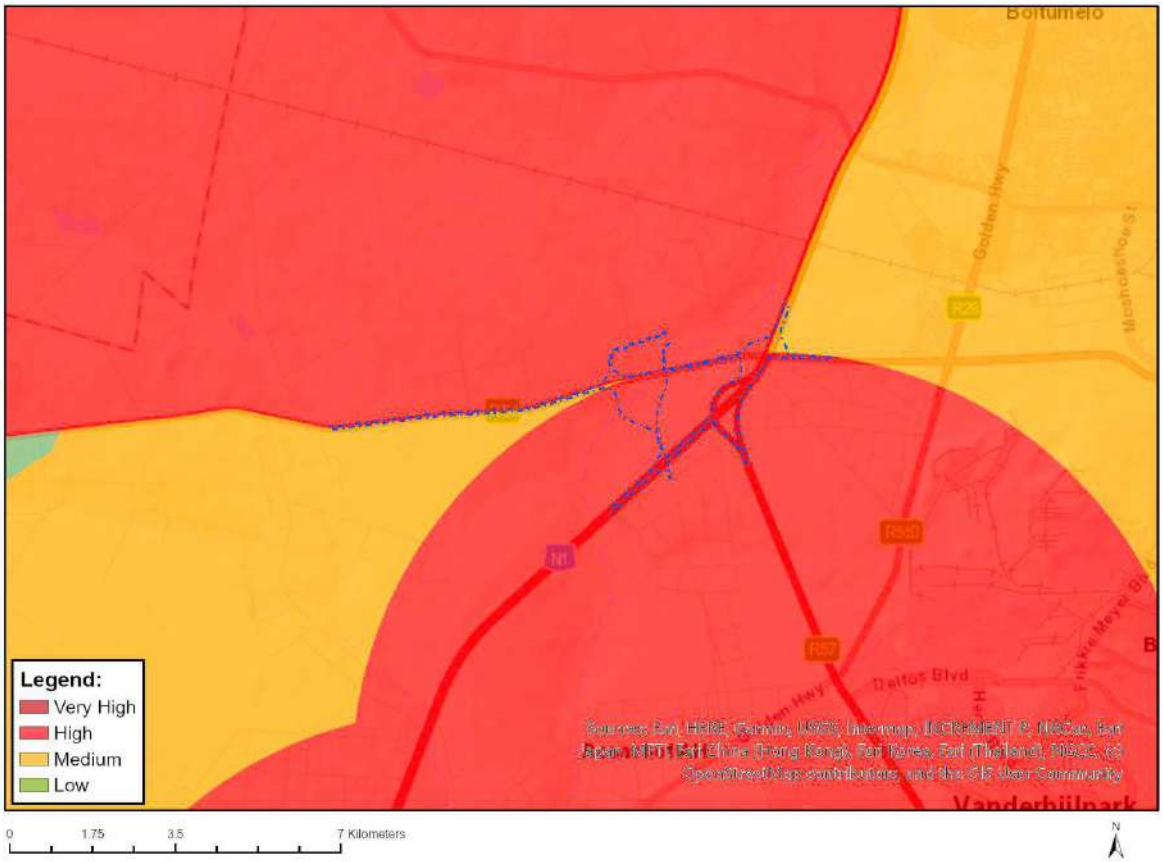
Very High sensitivity	High sensitivity	Medium sensitivity	Low sensitivity
			X

Sensitivity Features:

Sensitivity	Feature(s)
Low	Low Sensitivity

Disclaimer applies
10/04/2026

MAP OF RELATIVE CIVIL AVIATION THEME SENSITIVITY



Very High sensitivity	High sensitivity	Medium sensitivity	Low sensitivity
	X		

Sensitivity Features:

Sensitivity	Feature(s)
High	Within 8 km of other civil aviation aerodrome
High	Dangerous and restricted airspace as demarcated
Medium	Between 8 and 15 km of other civil aviation aerodrome

Disclaimer applies
10/04/2026

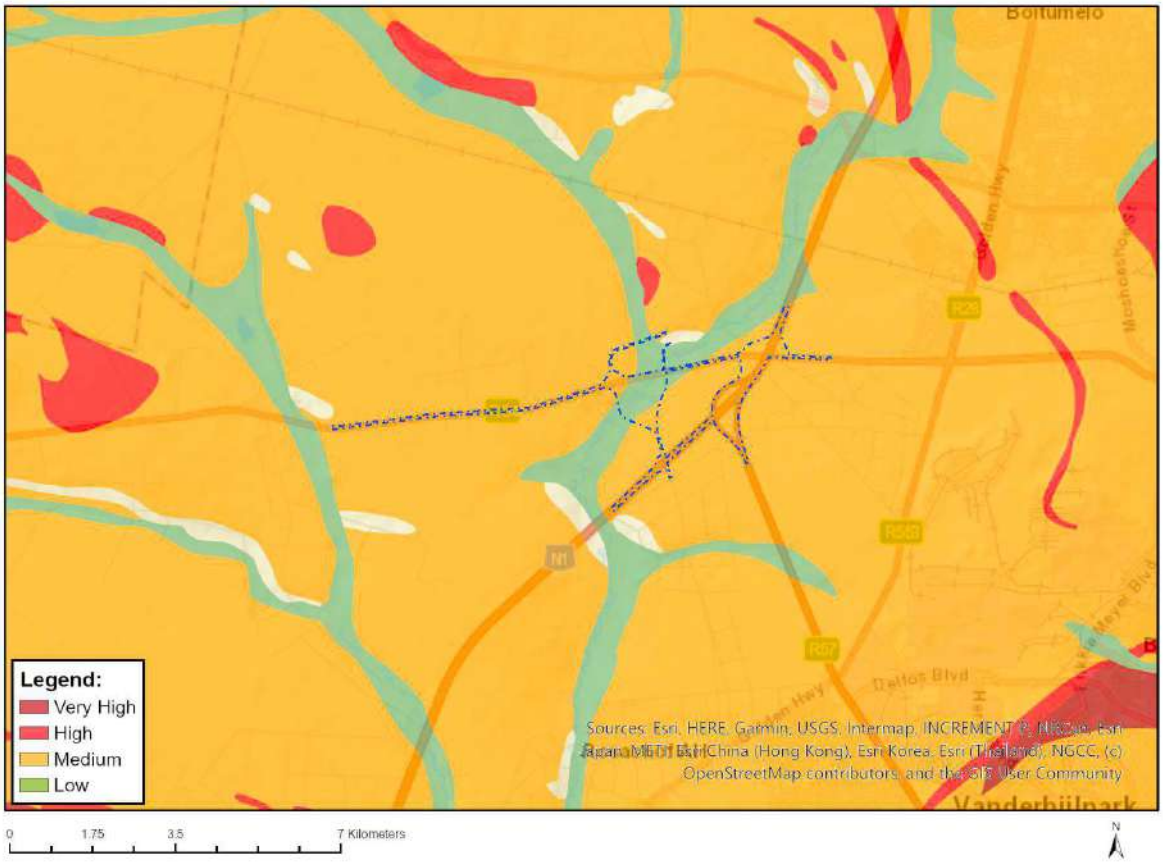
MAP OF RELATIVE DEFENCE THEME SENSITIVITY

Very High sensitivity	High sensitivity	Medium sensitivity	Low sensitivity
			X

Sensitivity Features:

Sensitivity	Feature(s)
Low	Low Sensitivity

MAP OF RELATIVE PALEONTOLOGY THEME SENSITIVITY

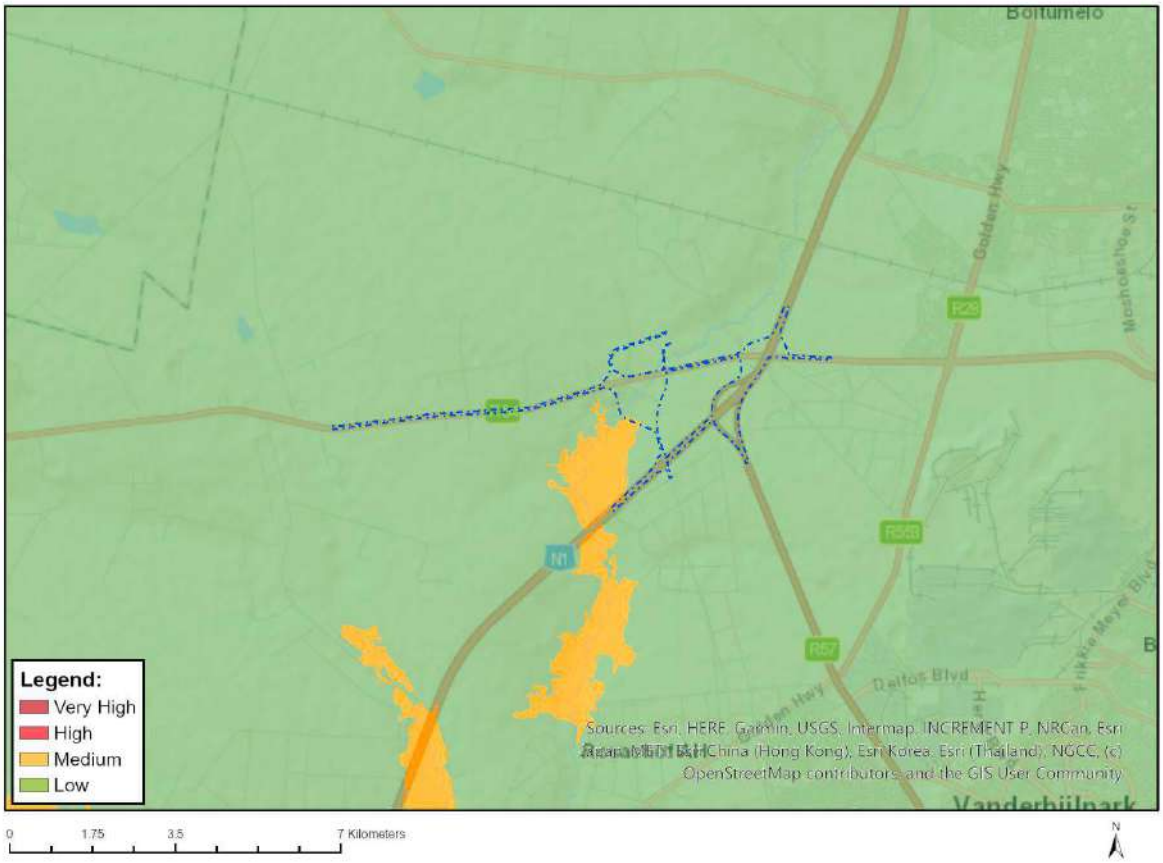


Very High sensitivity	High sensitivity	Medium sensitivity	Low sensitivity
		X	

Sensitivity Features:

Sensitivity	Feature(s)
Low	Features with a Low paleontological sensitivity
Medium	Features with a Medium paleontological sensitivity

MAP OF RELATIVE PLANT SPECIES THEME SENSITIVITY



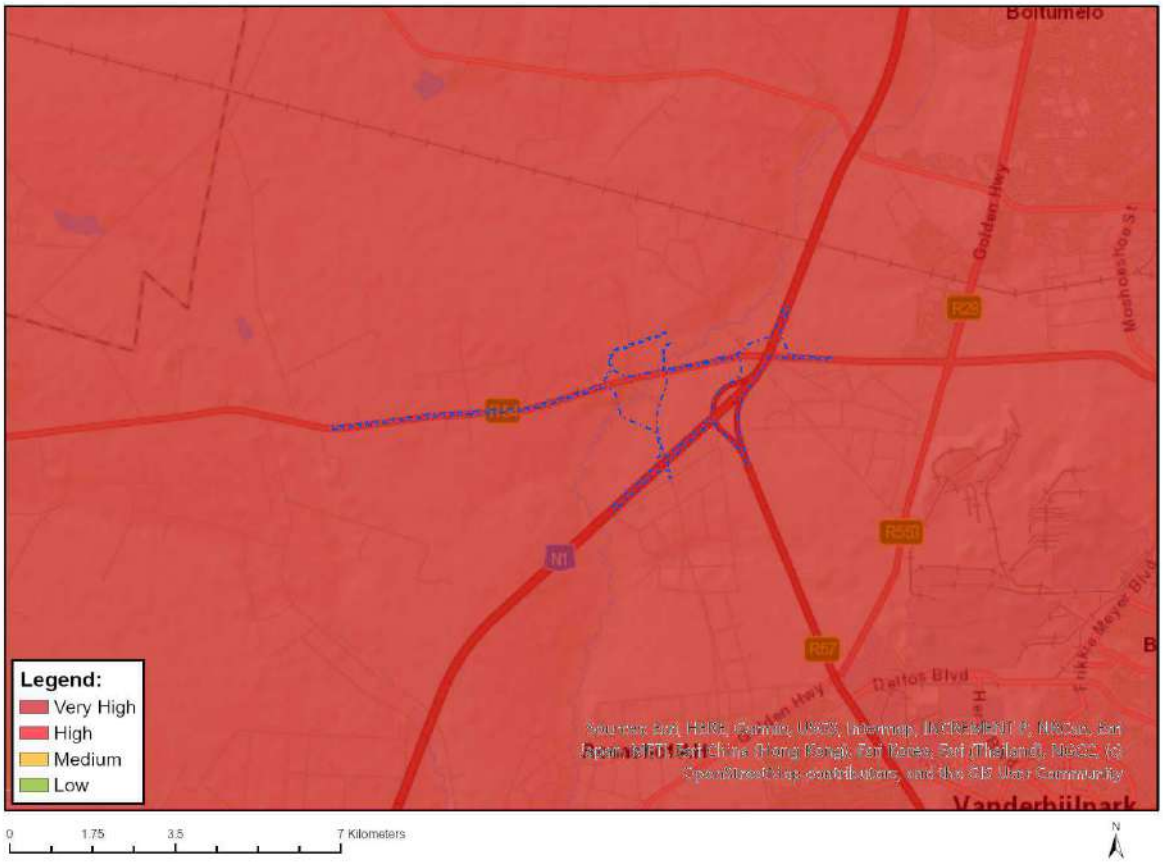
Where only a sensitive plant unique number or sensitive animal unique number is provided in the screening report and an assessment is required, the environmental assessment practitioner (EAP) or specialist is required to email SANBI at eiadatarequests@sanbi.org.za listing all sensitive species with their unique identifiers for which information is required. The name has been withheld as the species may be prone to illegal harvesting and must be protected. SANBI will release the actual species name after the details of the EAP or specialist have been documented.

Very High sensitivity	High sensitivity	Medium sensitivity	Low sensitivity
		X	

Sensitivity Features:

Sensitivity	Feature(s)
Low	Low Sensitivity
Medium	Sensitive species 954

MAP OF RELATIVE TERRESTRIAL BIODIVERSITY THEME SENSITIVITY



Very High sensitivity	High sensitivity	Medium sensitivity	Low sensitivity
X			

Sensitivity Features:

Sensitivity	Feature(s)
Very High	CBA 1
Very High	CBA 2
Very High	ESA 1
Very High	ESA 2
Very High	National Protected Area Expansion Strategy (NPAES)
Very High	VU_Soweto Highveld Grassland

Disclaimer applies
10/04/2026

SCREENING REPORT FOR AN ENVIRONMENTAL AUTHORIZATION AS REQUIRED BY THE 2014 EIA REGULATIONS – PROPOSED SITE ENVIRONMENTAL SENSITIVITY

EIA Reference number: TBC

Project name: Option 2 N1 / R541 & N1/D2459 Interchange

Project title: Vaal Aerotropolis

Date screening report generated: 13/04/2026 11:40:53

Applicant: Vaal Aerozone

Compiler: Prism EMS

Compiler signature:

……

Application Category: Infrastructure|Transport Services|Roads|Public

OFFICIAL

Table of Contents

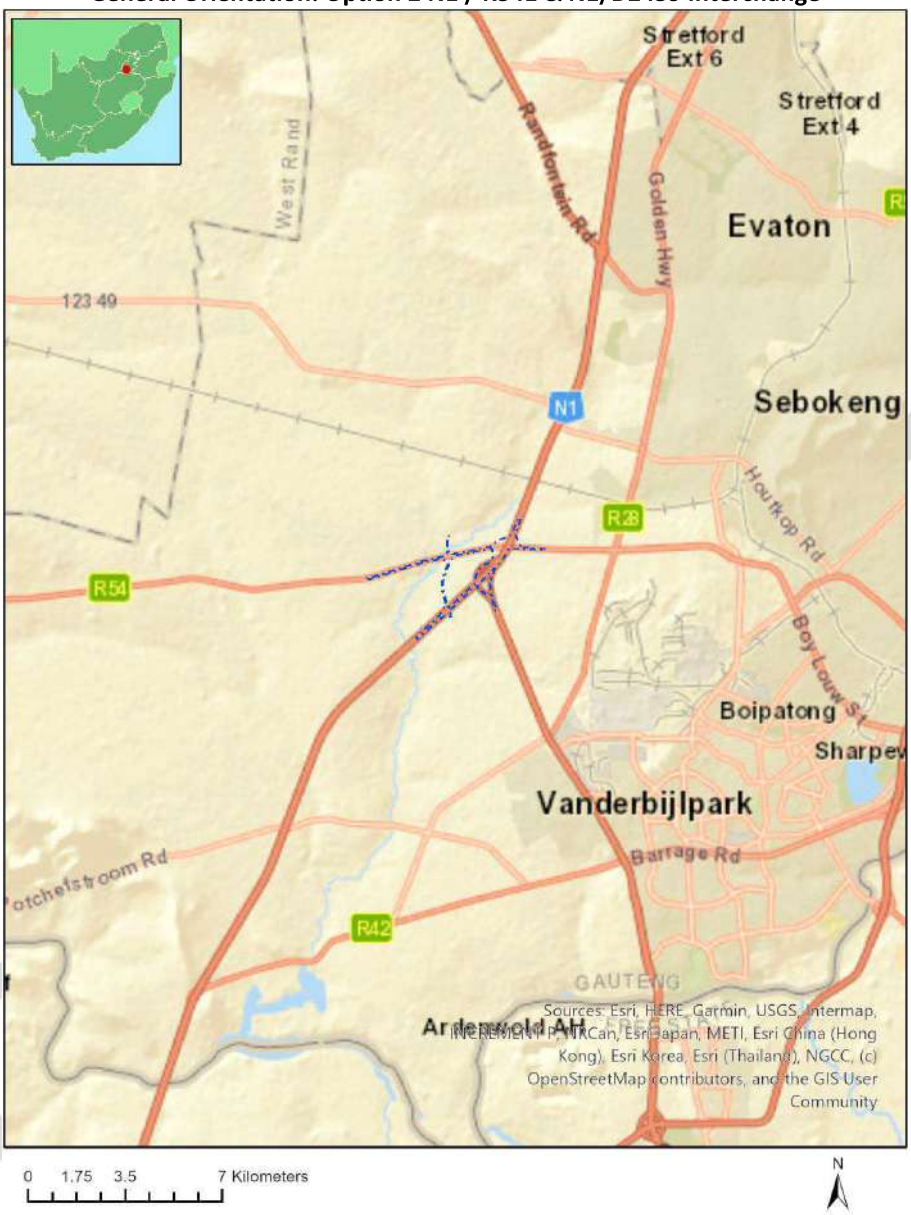
Proposed Project Location 3
Orientation map 1: General location 3
Map of proposed site and relevant area(s) 4
Cadastral details of the proposed site 4
Wind and Solar developments with an approved Environmental Authorisation or applications under consideration within 30 km of the proposed area 5
Environmental Management Frameworks relevant to the application 5
Environmental screening results and assessment outcomes 6
Relevant development incentives, restrictions, exclusions or prohibitions 6
Proposed Development Area Environmental Sensitivity 6
Specialist assessments identified 7
Results of the environmental sensitivity of the proposed area. 8
MAP OF RELATIVE AGRICULTURE THEME SENSITIVITY 8
MAP OF RELATIVE ANIMAL SPECIES THEME SENSITIVITY 9
MAP OF RELATIVE AQUATIC BIODIVERSITY THEME SENSITIVITY 10
MAP OF RELATIVE ARCHAEOLOGICAL AND CULTURAL HERITAGE THEME SENSITIVITY 11
MAP OF RELATIVE CIVIL AVIATION THEME SENSITIVITY 12
MAP OF RELATIVE DEFENCE THEME SENSITIVITY 13
MAP OF RELATIVE PALEONTOLOGY THEME SENSITIVITY 14
MAP OF RELATIVE PLANT SPECIES THEME SENSITIVITY 15
MAP OF RELATIVE TERRESTRIAL BIODIVERSITY THEME SENSITIVITY 16

OFFICIAL

Proposed Project Location

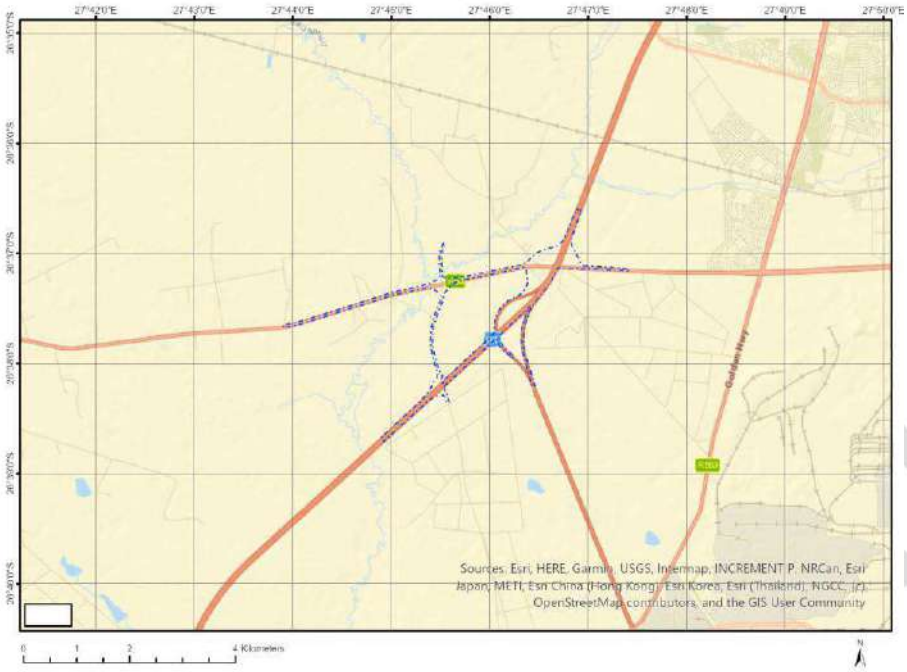
Orientation map 1: General location

General Orientation: Option 2 N1 / R541 & N1/D2459 Interchange



Disclaimer applies

Map of proposed site and relevant area(s)



Cadastral details of the proposed site

Property details:

No	Farm Name	Farm/ Erf No	Portion	Latitude	Longitude	Property Type
1	RIETKUIL	552	0	26°38'56.62S	27°46'34.42E	Farm
2	VLAKPLAATS	555	0	26°37'21.83S	27°42'14.17E	Farm
3	RIETKUIL	554	0	26°37'2.12S	27°46'7.35E	Farm
4	RIETKUIL	554	28	26°37'51.55S	27°45'23.09E	Farm Portion
5	RIETKUIL	552	10	26°37'59.93S	27°46'23.08E	Farm Portion
6	RIETKUIL	552	2	26°38'35.1S	27°46'18.58E	Farm Portion
7	RIETKUIL	554	2	26°38'22.33S	27°44'18.73E	Farm Portion
8	RIETKUIL	554	5	26°37'11.54S	27°46'28.39E	Farm Portion
9	RIETKUIL	554	11	26°36'31.02S	27°46'27.74E	Farm Portion
10	RIETKUIL	554	38	26°37'39.13S	27°46'9.85E	Farm Portion
11	RIETKUIL	554	44	26°37'13.16S	27°46'35.79E	Farm Portion
12	RIETKUIL	554	20	26°37'29.55S	27°47'29.66E	Farm Portion
13	RIETKUIL	554	16	26°37'18.07S	27°44'21.27E	Farm Portion
14	RIETKUIL	554	39	26°37'13.53S	27°46'34.74E	Farm Portion
15	RIETKUIL	554	10	26°37'1.44S	27°45'15.65E	Farm Portion
16	RIETKUIL	554	15	26°37'22.1S	27°44'5.63E	Farm Portion
17	RIETKUIL	554	40	26°36'41.54S	27°46'52.91E	Farm Portion
18	VLAKPLAATS	555	52	26°37'42.54S	27°42'20.64E	Farm Portion
19	LINKHOLM AH	1	1	26°37'10.55S	27°46'38.57E	Agri Holding
20	LINKHOLM AH	1	0	26°37'11.19S	27°46'41.21E	Agri Holding
21	LINKHOLM AH	118	0	26°37'6.47S	27°47'1.05E	Agri Holding
22	LINKHOLM AH	121	0	26°37'5.1S	27°47'21.87E	Agri Holding
23	LINKHOLM AH	141	0	26°37'10.15S	27°46'52.01E	Agri Holding
24	LINKHOLM AH	119	0	26°37'5.84S	27°47'10.69E	Agri Holding
25	LINKHOLM AH	2	0	26°37'15.05S	27°46'40.24E	Agri Holding
26	LINKHOLM AH	122	0	26°37'4.83S	27°47'26.12E	Agri Holding
27	LINKHOLM AH	120	0	26°37'5.42S	27°47'16.91E	Agri Holding

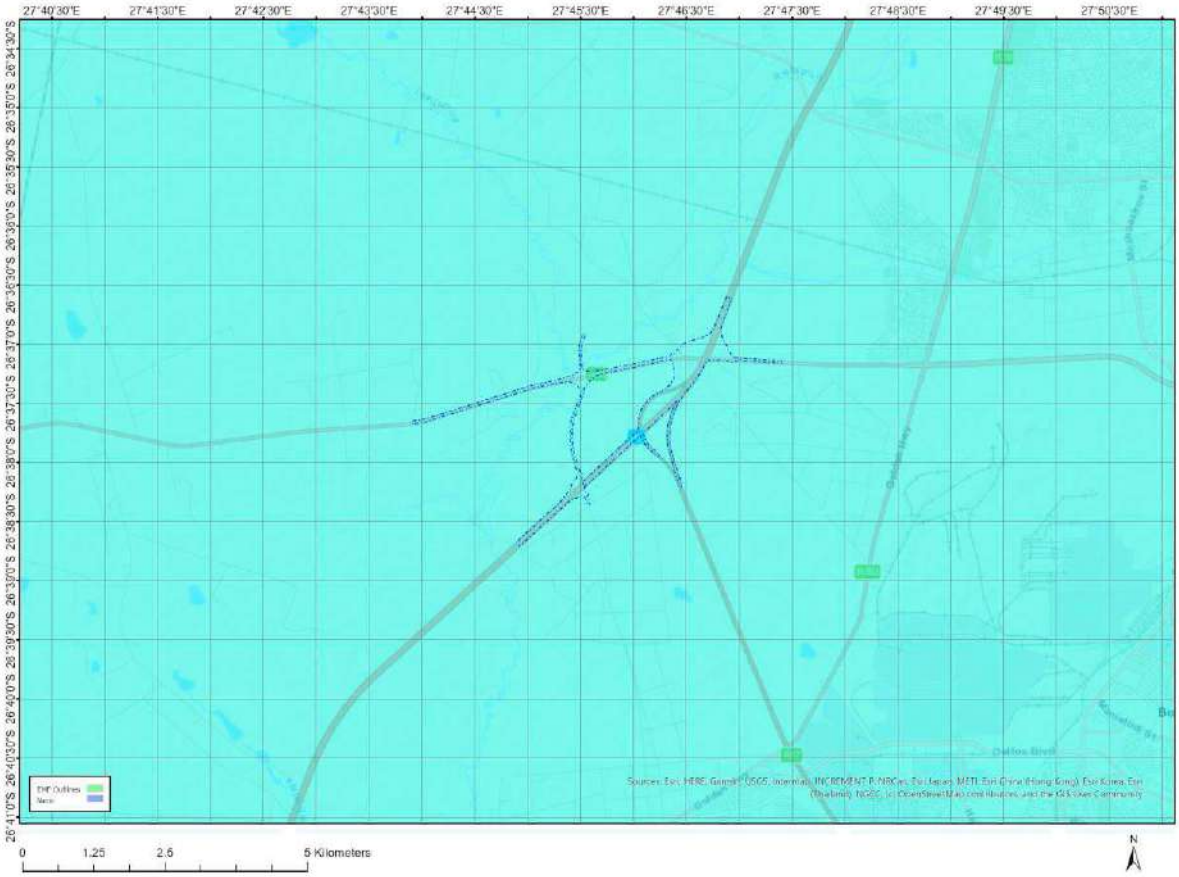
Disclaimer applies

Development footprint[1] vertices:
No development footprint(s) specified.

Wind and Solar developments with an approved Environmental Authorisation or applications under consideration within 30 km of the proposed area

No	EIA Reference No	Classification	Status of application	Distance from proposed area (km)
1	14/12/16/3/3/2/2566	Solar PV	Approved	14.7
2	14/12/16/3/3/2/2568	Solar PV	Approved	18.7
3	14/12/16/3/3/2/2569	Solar PV	Approved	16.6
4	14/12/16/3/3/2/2679	Solar PV	Approved	3.9
5	14/12/16/3/3/2/2077	Wind	Approved	23.8
6	14/12/16/3/3/2/2567	Solar PV	Approved	14.1
7	14/12/16/3/3/2/2078	Solar PV	Approved	19.9
8	14/12/16/3/3/2/753	Solar PV	Approved	22.5

Environmental Management Frameworks relevant to the application



[1] "development footprint", means the area within the site on which the development will take place and incudes all ancillary developments for example roads, power lines, boundary walls, paving etc. which require vegetation clearance or which will be disturbed and for which the application has been submitted.

Disclaimer applies
13/04/2026

Environmental Management Framework	LINK
Gauteng EMF	https://screening.environment.gov.za/ScreeningDownloads/EMF/GPEMF_2021_Gazette_and_summary.pdf

Environmental screening results and assessment outcomes

The following sections contain a summary of any development incentives, restrictions, exclusions or prohibitions that apply to the proposed development site as well as the most environmental sensitive features on the site based on the site sensitivity screening results for the application classification that was selected. The application classification selected for this report is: **Infrastructure|Transport Services|Roads|Public**.

Relevant development incentives, restrictions, exclusions or prohibitions

The following development incentives, restrictions, exclusions or prohibitions and their implications that apply to this site are indicated below.

Incentive, restriction or prohibition	Implication
Strategic Transmission Corridor-Central corridor	https://screening.environment.gov.za/ScreeningDownloads/DevelopmentZones/Combined_EGI.pdf
Air Quality-Vaal Triangle Airshed Priority Area	https://screening.environment.gov.za/ScreeningDownloads/DevelopmentZones/Final_VTAPA_AQMP_20090408_-15_April_2009.pdf
Strategic Gas Pipeline Corridors-Phase 3: Richards Bay to Gauteng	https://screening.environment.gov.za/ScreeningDownloads/DevelopmentZones/Combined_GAS.pdf
Gauteng EMF-Urban development zone 1	https://screening.environment.gov.za/ScreeningDownloads/DevelopmentZones/Zone1_2021.pdf

Proposed Development Area Environmental Sensitivity

The following summary of the development site environmental sensitivities is identified. Only the highest environmental sensitivity is indicated. The footprint environmental sensitivities for the proposed development footprint as identified, are indicative only and must be verified on site by a suitably qualified person before the specialist assessments identified below can be confirmed.

Theme	Very High sensitivity	High sensitivity	Medium sensitivity	Low sensitivity
Agriculture Theme	X			
Animal Species Theme		X		
Aquatic Biodiversity Theme	X			
Archaeological and Cultural Heritage Theme				X
Civil Aviation Theme		X		
Defence Theme				X
Paleontology Theme			X	
Plant Species Theme			X	
Terrestrial Biodiversity Theme	X			

Specialist assessments identified

Based on the selected classification, and the known impacts associated with the proposed development, the following list of specialist assessments have been identified for inclusion in the assessment report. It is the responsibility of the EAP to confirm this list and to motivate in the assessment report, the reason for not including any of the identified specialist study including the provision of photographic evidence of the site situation.

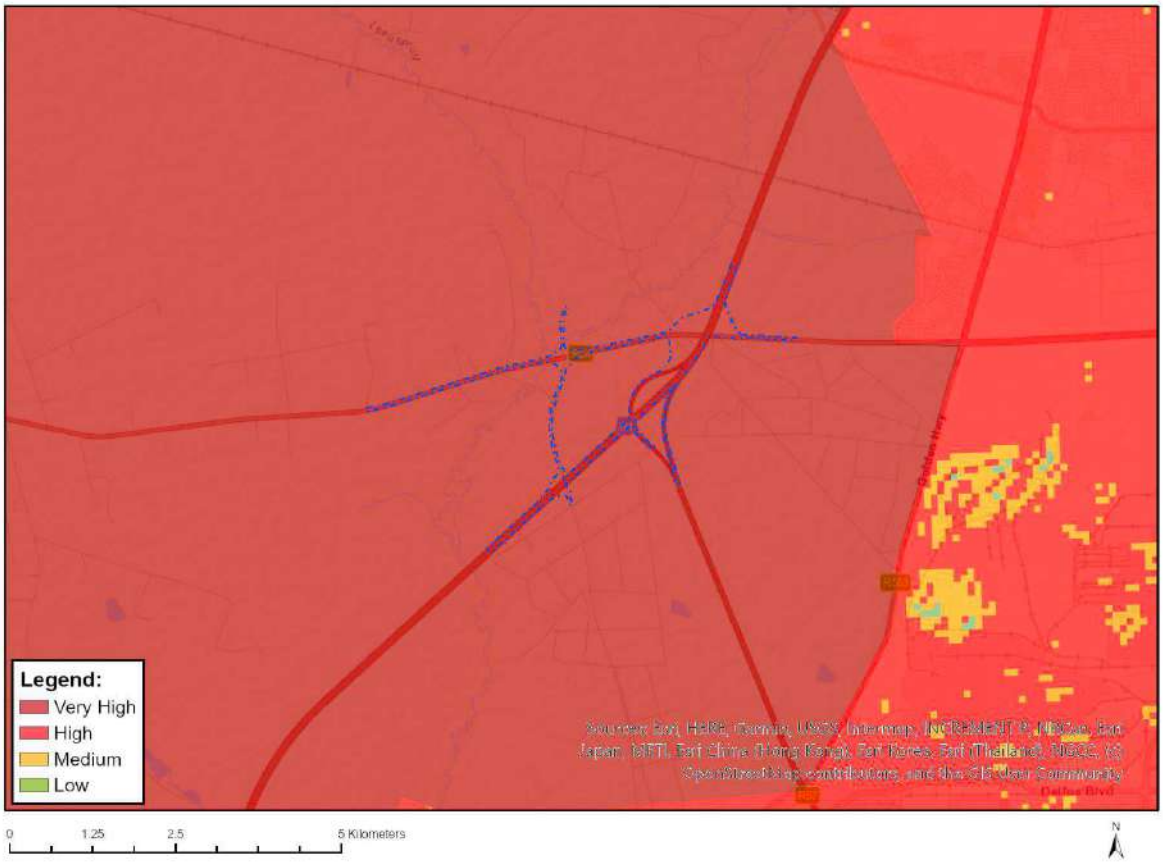
No	Specialist assessment	Assessment Protocol
1	Agricultural Impact Assessment	https://screening.environment.gov.za/ScreeningDownloads/AssessmentProtocols/Gazetted_General_Agriculture_Assessment_Protocols.pdf
2	Landscape/Visual Impact Assessment	https://screening.environment.gov.za/ScreeningDownloads/AssessmentProtocols/Gazetted_General_Requirement_Assessment_Protocols.pdf
3	Archaeological and Cultural Heritage Impact Assessment	https://screening.environment.gov.za/ScreeningDownloads/AssessmentProtocols/GuidanceforHIA.pdf
4	Palaeontology Impact Assessment	https://screening.environment.gov.za/ScreeningDownloads/AssessmentProtocols/GuidanceforPIA.pdf
5	Terrestrial Biodiversity Impact Assessment	https://screening.environment.gov.za/ScreeningDownloads/AssessmentProtocols/Gazetted_Terrestrial_Biodiversity_Assessment_Protocols.pdf
6	Aquatic Biodiversity Impact Assessment	https://screening.environment.gov.za/ScreeningDownloads/AssessmentProtocols/Gazetted_Aquatic_Biodiversity_Assessment_Protocols.pdf
7	Noise Impact Assessment	https://screening.environment.gov.za/ScreeningDownloads/AssessmentProtocols/Gazetted_Noise_Impacts_Assessment_Protocol.pdf
8	Traffic Impact Assessment	https://screening.environment.gov.za/ScreeningDownloads/AssessmentProtocols/Gazetted_General_Requirement_Assessment_Protocols.pdf
9	Geotechnical Assessment	https://screening.environment.gov.za/ScreeningDownloads/AssessmentProtocols/Gazetted_General_Requirement_Assessment_Protocols.pdf
10	Socio-Economic Assessment	https://screening.environment.gov.za/ScreeningDownloads/AssessmentProtocols/Gazetted_General_Requirement_Assessment_Protocols.pdf
11	Ambient Air Quality Impact Assessment	https://screening.environment.gov.za/ScreeningDownloads/AssessmentProtocols/Gazetted_General_Requirement_Assessment_Protocols.pdf
12	Plant Species Assessment	https://screening.environment.gov.za/ScreeningDownloads/AssessmentProtocols/Gazetted_Plant_Species_Assessment_Protocols.pdf
13	Animal Species Assessment	https://screening.environment.gov.za/ScreeningDownloads/AssessmentProtocols/Gazetted_Animal_Species_Assessment_Protocols.pdf

OFFICIAL

Results of the environmental sensitivity of the proposed area.

The following section represents the results of the screening for environmental sensitivity of the proposed site for relevant environmental themes associated with the project classification. It is the duty of the EAP to ensure that the environmental themes provided by the screening tool are comprehensive and complete for the project. Refer to the disclaimer.

MAP OF RELATIVE AGRICULTURE THEME SENSITIVITY

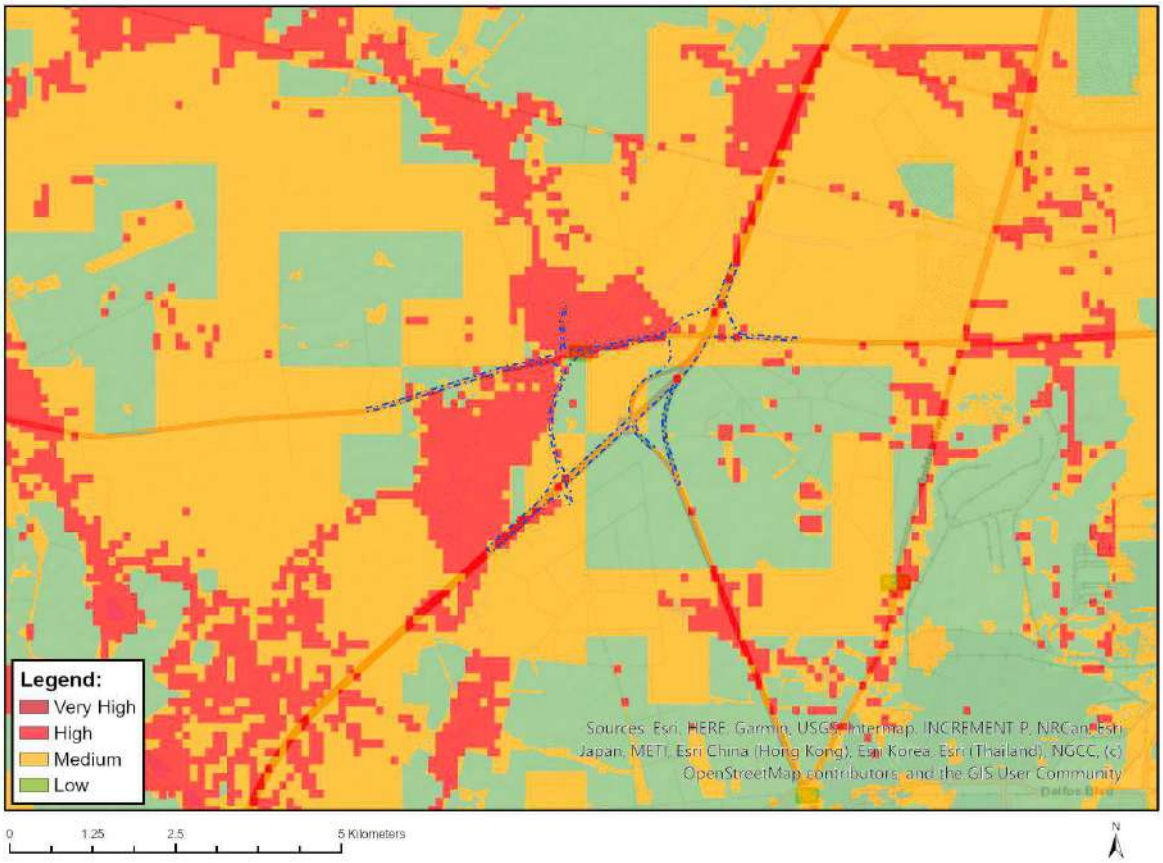


Very High sensitivity	High sensitivity	Medium sensitivity	Low sensitivity
X			

Sensitivity Features:

Sensitivity	Feature(s)
High	Rainfed Annual Crop Cultivation / Planted Pastures
High	Small_Holdings
High	08. Moderate
High	10. Moderate-High
High	09. Moderate-High
Very High	Fochville PAA

MAP OF RELATIVE ANIMAL SPECIES THEME SENSITIVITY



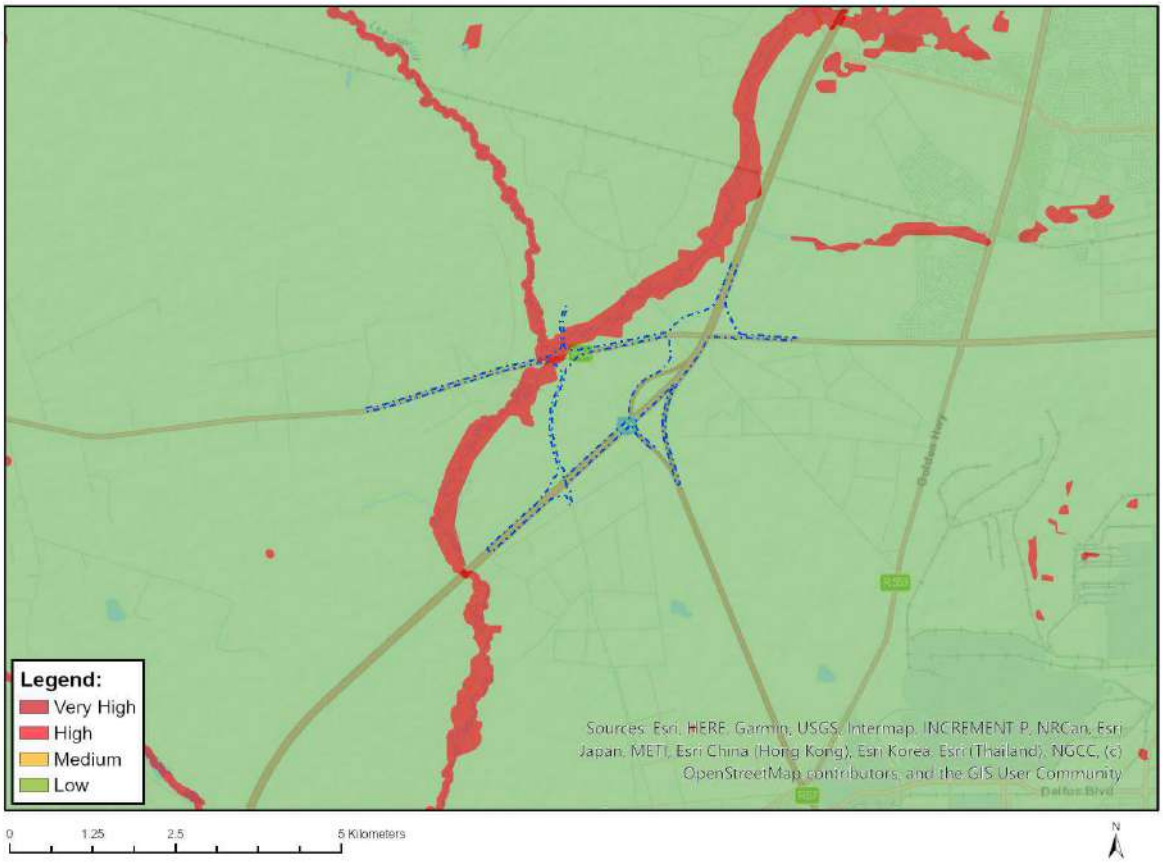
Where only a sensitive plant unique number or sensitive animal unique number is provided in the screening report and an assessment is required, the environmental assessment practitioner (EAP) or specialist is required to email SANBI at eiadatarequests@sanbi.org.za listing all sensitive species with their unique identifiers for which information is required. The name has been withheld as the species may be prone to illegal harvesting and must be protected. SANBI will release the actual species name after the details of the EAP or specialist have been documented.

Very High sensitivity	High sensitivity	Medium sensitivity	Low sensitivity
	X		

Sensitivity Features:

Sensitivity	Feature(s)
High	Aves-Tyto capensis
Low	Subject to confirmation
Medium	Insecta-Lepidochrysops procera
Medium	Mammalia-Crocidura maquassiensis
Medium	Mammalia-Hydrictis maculicollis

MAP OF RELATIVE AQUATIC BIODIVERSITY THEME SENSITIVITY



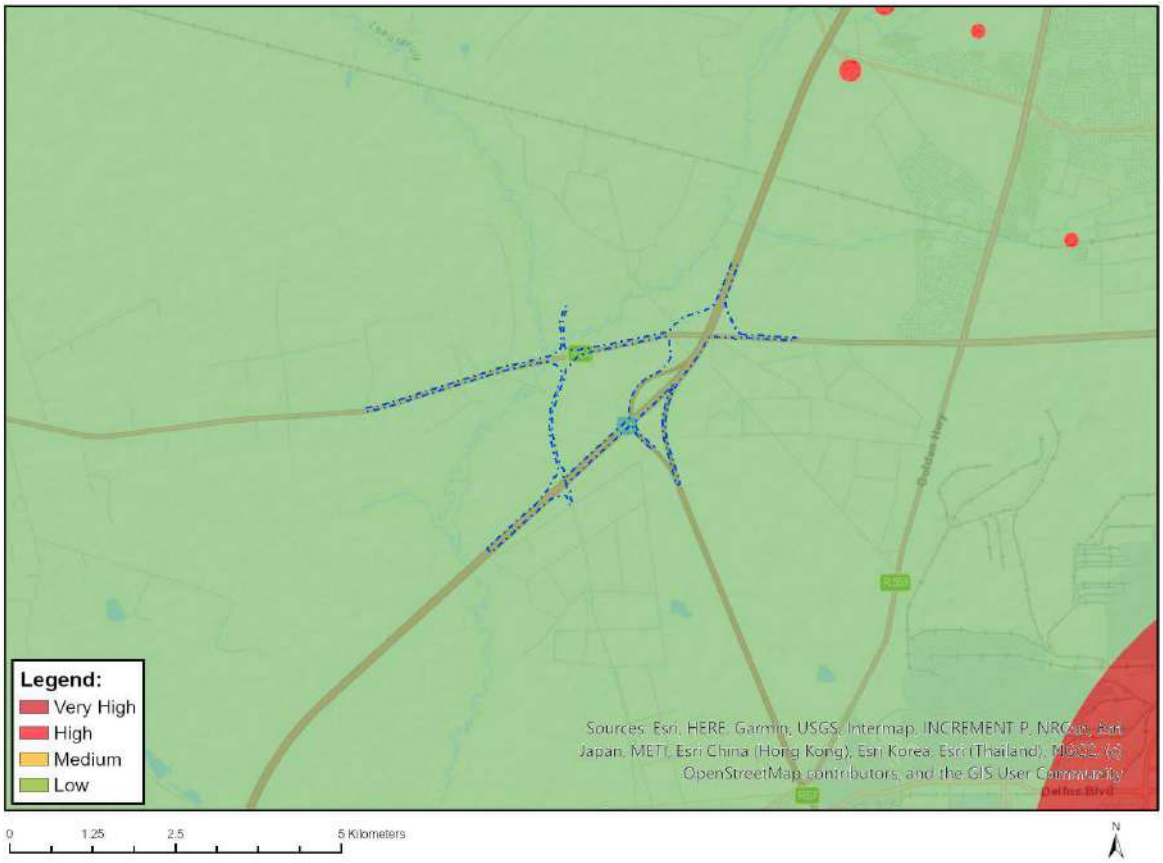
Very High sensitivity	High sensitivity	Medium sensitivity	Low sensitivity
X			

Sensitivity Features:

Sensitivity	Feature(s)
Low	Low Sensitivity
Very High	Wetlands_Channelled valley-bottom
Very High	Rivers

Disclaimer applies
13/04/2026

MAP OF RELATIVE ARCHAEOLOGICAL AND CULTURAL HERITAGE THEME SENSITIVITY



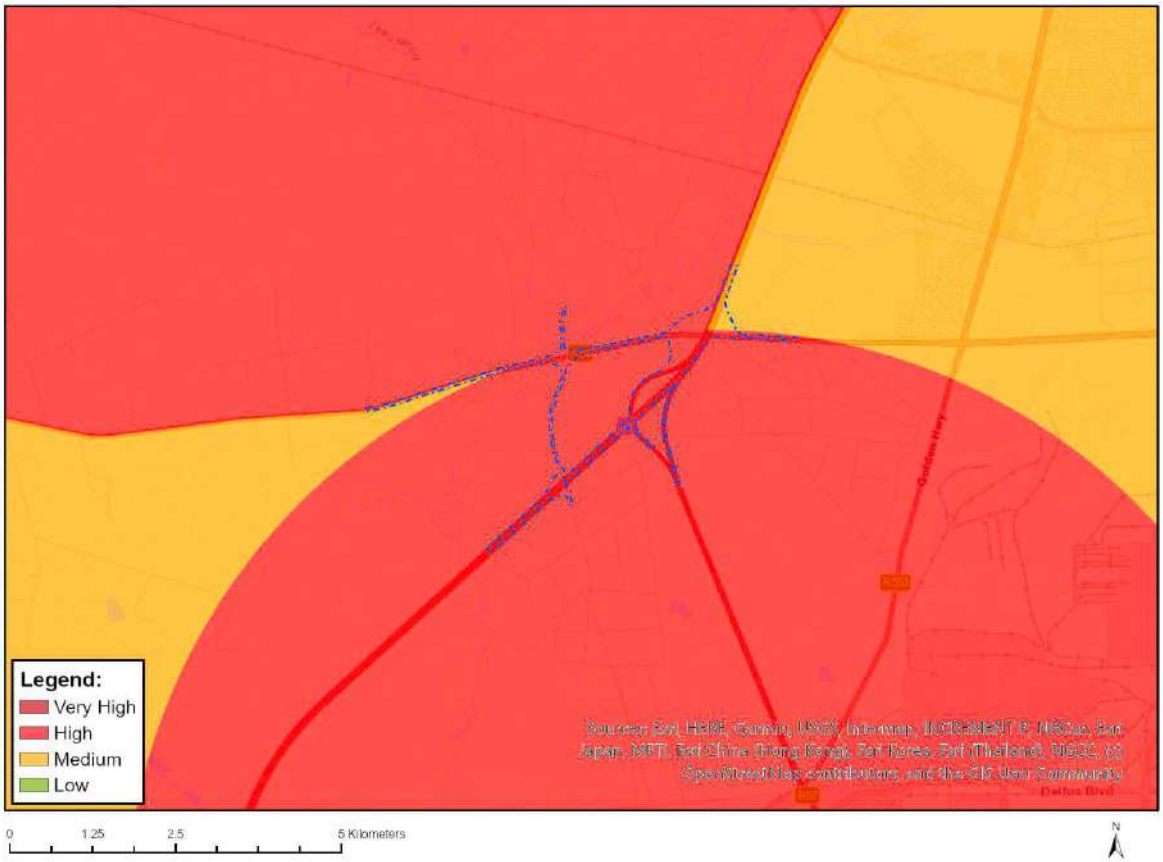
Very High sensitivity	High sensitivity	Medium sensitivity	Low sensitivity
			X

Sensitivity Features:

Sensitivity	Feature(s)
Low	Low Sensitivity

Disclaimer applies
13/04/2026

MAP OF RELATIVE CIVIL AVIATION THEME SENSITIVITY



Very High sensitivity	High sensitivity	Medium sensitivity	Low sensitivity
	X		

Sensitivity Features:

Sensitivity	Feature(s)
High	Within 8 km of other civil aviation aerodrome
High	Dangerous and restricted airspace as demarcated
Medium	Between 8 and 15 km of other civil aviation aerodrome

Disclaimer applies
13/04/2026

MAP OF RELATIVE DEFENCE THEME SENSITIVITY

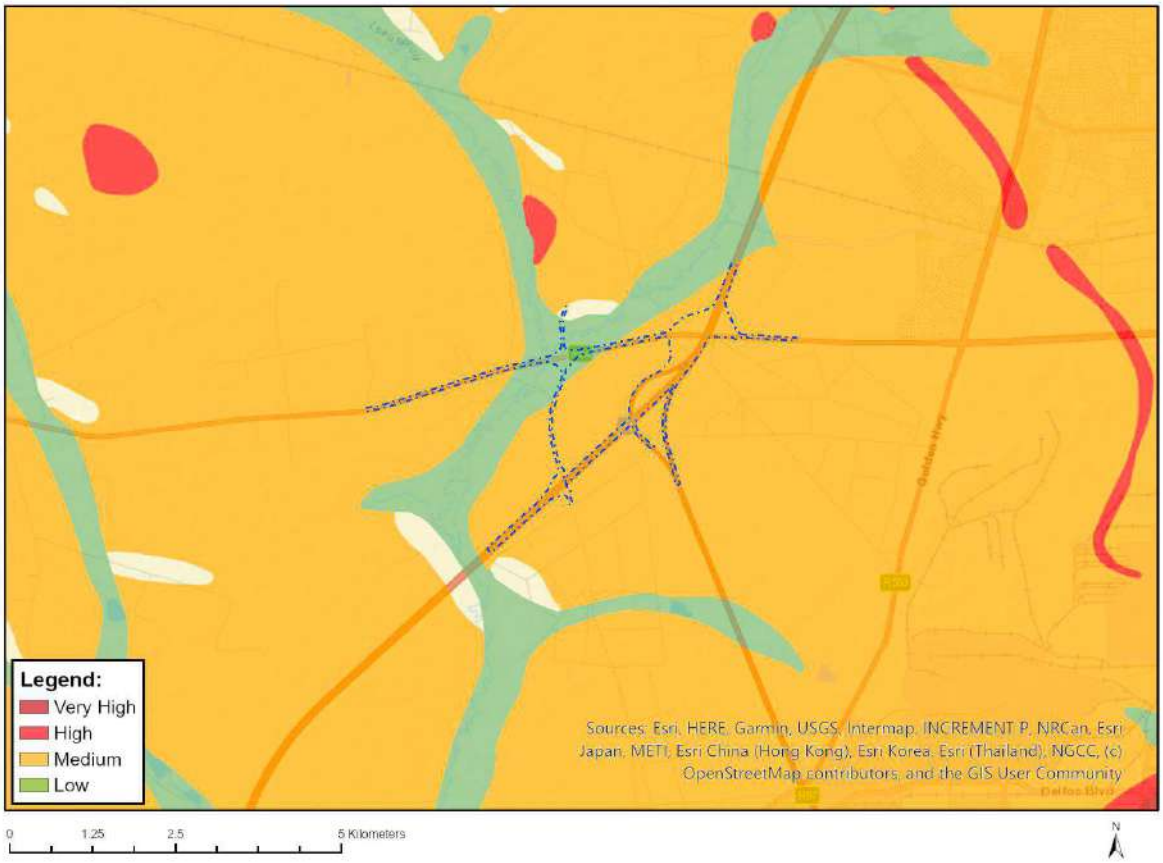
Very High sensitivity	High sensitivity	Medium sensitivity	Low sensitivity
			X

Sensitivity Features:

Sensitivity	Feature(s)
Low	Low Sensitivity

Disclaimer applies
13/04/2026

MAP OF RELATIVE PALEONTOLOGY THEME SENSITIVITY



Very High sensitivity	High sensitivity	Medium sensitivity	Low sensitivity
		X	

Sensitivity Features:

Sensitivity	Feature(s)
Low	Features with a Low paleontological sensitivity
Medium	Features with a Medium paleontological sensitivity

Disclaimer applies
13/04/2026

MAP OF RELATIVE PLANT SPECIES THEME SENSITIVITY

Where only a sensitive plant unique number or sensitive animal unique number is provided in the screening report and an assessment is required, the environmental assessment practitioner (EAP) or specialist is required to email SANBI at eiadatarequests@sanbi.org.za listing all sensitive species with their unique identifiers for which information is required. The name has been withheld as the species may be prone to illegal harvesting and must be protected. SANBI will release the actual species name after the details of the EAP or specialist have been documented.

Very High sensitivity	High sensitivity	Medium sensitivity	Low sensitivity
		X	

Sensitivity Features:

Sensitivity	Feature(s)
Low	Low Sensitivity
Medium	Sensitive species 954

MAP OF RELATIVE TERRESTRIAL BIODIVERSITY THEME SENSITIVITY

Very High sensitivity	High sensitivity	Medium sensitivity	Low sensitivity
X			

Sensitivity Features:

Sensitivity	Feature(s)
Very High	CBA 1
Very High	CBA 2
Very High	ESA 1
Very High	ESA 2
Very High	National Protected Area Expansion Strategy (NPAES)
Very High	VU_Soweto Highveld Grassland

Disclaimer applies
13/04/2026

Building 1, Maxwell Office Park
Magwa Crescent West, Waterfall City
Midrand, 1685
South Africa

wsp.com

CONFIDENTIAL

VAAL AEROTROPOLIS DESIGN (PTY) LTD

VAAL AEROTROPOLIS N1/P24-1 (R541) INTERCHANGE ACCESS APPLICATION

SUPPORT DOCUMENT TO THE TRANSPORTATION IMPACT ASSESSMENT & PROPOSED N1 INTERCHANGE FATAL FLAW REPORT

43103146.N1R541.INT
FEBRUARY 2026

CONFIDENTIAL

VAAL AEROTROPOLIS DESIGN (PTY) LTD

VAAL AEROTROPOLIS N1/P24-1 (R541) INTERCHANGE ACCESS APPLICATION

SUPPORT DOCUMENT TO THE TRANSPORTATION IMPACT ASSESSMENT & PROPOSED N1 INTERCHANGE FATAL FLAW REPORT

TYPE OF DOCUMENT (VER 1) CONFIDENTIAL

PROJECT NO. 43103146

OUR REF. NO. 43103146.N1R541.INT

DATE: FEBRUARY 2026

WSP

Building 1, Maxwell Office Park
Magwa Crescent West, Waterfall City
Midrand, 1685
South Africa

Phone: +27 11 254 4800

WSP.com

QUALITY CONTROL

Issue/revision	First issue	Revision 1	Revision 2	Revision 3
Remarks				
Date	16 February 2026 2025			
Prepared by	Christo Bredenhann PrEng			
Signature				
Checked by	John Rammutla PrEng			
Signature				
Authorised by	Sameshan Naidoo PrEng			
Signature				
Project number	43103146			
Report number	Version 01			
File reference	\\corp.pbwan.net\za\Central_Data\Projects\43100xxx\43103108 - VAAL - LAND PREPARATION\43 H&T\43 HT\01-D&D Docs\03-Outputs\01-Reports\08 - Interchange Application Province			

CONTENTS

EXECUTIVE SUMMARY

ABBREVIATIONS AND ACRONYMS 3

1 BACKGROUND 4

2 INTERCHANGE OPTIONS DEVELOPMENT & ASSESSMENT 3

3 N1 FREEWAY INTERCHANGE DEVELOPMENT AND ASSESSMENT 10

4 P24/1 AND D2459 GRADE SEPARATED JUNCTION OPTIONS 21

5 EXISTING AND PLANNED PROVINCIAL ROAD NETWORK 28

6 VAAL AEROTROPOLIS PHASE 1 TRAFFIC FLOW ASSESSMENT 41

7 ENVIRONMENTAL SCREENING REPORT 49

8 IMPLEMENTATION PLAN (PHASING) 58

9 CONCLUSIONS AND RECOMMENDATIONS 59

TABLES

Table 3-1 – Minimum Spacing between Rural Freeway Interchanges (GDPTRW, 2004) 15

Table 5-1 – Existing N1 Cross-section geometrics 33

Table 5-2 – Existing P24/1 cross-section geometric details 35

Table 5-3 – Design decision register: N1SDI, P24/1 & P24/1 / D2459 junction 37

Table 6-1 – Vaal Aerotropolis Phase Development Trips (weekday peak hours) 41

Table 6.2 - Capacity Analysis of P24/1 and N1 SDI Northbound on-ramp 45

Table 6.3 - Capacity Analysis of P24/1 and N1 SDI Southbound off-ramp 46

Table 6.4 - Capacity Analysis of the D2459 and N1 SDI Northbound off-ramp 47

Table 6.5 - Capacity Analysis of the D2459 and N1 SDI Southbound on-ramp 48
Table 8-1 - Development Area Environmental Sensitivity (N1/P24-1/D2459 SDI) 49

FIGURES

Figure 1-1 – Aerotropolis Masterplan (Phase 1 – 3) 1
Figure 1-2 – Aerotropolis location and major road network 1
Figure 2-1 – N1 Interchange options considered 5
Figure 2-2 –N1/K170/K176 interchange basic planning 8
Figure 2-3 – N1/D1017_020 access interchange layout (revised) 9
Figure 3-1 – N1/24.1 & N1/D2459 split diamond interchange configuration 13
Figure 3-2 – Future systems and access interchanges on the N1 16
Figure 3-3 – Ramp spacing, SDI Northern ramps to P155-1 18
Figure 3-4 – Ramp spacing, SDI Southern ramps to P155-1 19
Figure 3-5 - Typical cross section of ramps- Single and Two lane 20
Figure 4-1 – Option 1 general arrangement (Current D2459 alignment) 22
Figure 4-2 – Option 2 general arrangement (eastern location) 23
Figure 4-3 – Option 3 general arrangement (western location) 24
Figure 4-1 – Option 1 - Ramp spacing from SDI western ramp terminal to D2459 25
Figure 4-2 – Option 2 - Ramp spacing from SDI western ramp terminal to D2459 26
Figure 4-3 – Option 3 - Ramp spacing from SDI western ramp terminal to D2459 26
Figure 4-4 – Option 3 Realignment of northern extension of D2459 27
Figure 5-1 – Alignment of the existing major road network 28
Figure 5-2 – N1/P155-1 Existing Partial Cloverleaf interchange 29
Figure 5-3 – Planned Gauteng Major Route Network (May 2010) 31
Figure 5-4 – Existing cross-section of the N1 and P155/1 ramps 33
Figure 5-5 – Existing P24/1 cross-section 35
Figure 5-6 – Standard cross-section 36
Figure 6-1 – Aerotropolis Phase 1: 2033 Development trips 43
Figure 6-2 – Aerotropolis Phase 1: 2033 Background, latent and Development trips 44
Figure 8-1 –N1/P24/1/D2459 SDI & P24/1/D2459 Interchange Vegetation Map 51

Figure 8-2 – N1/P24-1/D2459 Split Diamond Interchange CBA & ESA Map 52
Figure 8-3 – N1/P24-1/D2459 Split Diamond Interchange Wetland Map 53

APPENDICES

APPENDIX A

PRELIMINARY DESIGN DRAWINGS

EXECUTIVE SUMMARY

This report serves as an application to the Gauteng Department of Roads and Transport (GDRT) to obtain in-principle approval for a proposed new split diamond access interchange (SDI) of the N1 freeway with the P24/1-60 (R541/K178), and with district road D2459-010 (Roots Road), located in Emfuleni Municipality.

The purpose of the interchange is to provide a suitable access to the N1, from and to all directions, to serve the planned Vaal Aerotropolis Phase 1, to be located approximately 10km west of the N1. The Vaal Aerotropolis is a planned multi-phase International Airport as anchor to a logistics, agri-culture and trade zone with a focus on air cargo import and export, as well as commercial air travel (national, regional, and international). The N1 SDI will also provide additional network capacity and flexibility for the region to access the N1, which is currently limited to a partial access interchange of the P155-1 (R57) and the N1.

The split diamond access interchange will consist of a northern on- and off-ramp from the N1 at the existing P24/1 overpass over the N1, and a one-way link from the P155-1 northbound on-ramp to the N1 which will split from the on-ramp and links to the western ramp terminal of the N1/P24/1 interchange. The southern portion of the interchange will be an on- and off-ramp to the N1 at the existing D2459 overpass over the N1.

This report comprises of the following sections:

1. Background
2. Interchange option development & assessment
3. N1 Freeway interchange assessment and development
4. P24/1 and D2459 grade separated junction options
5. Existing and Planned Provincial road network
6. Vaal Aerotropolis Phase 1 traffic flow assessment
7. Environmental Screening Report
8. Implementation plan (phasing)
9. Conclusions and Recommendations

The in-principle approval from GDRT is sought for the N1 Split Diamond Interchange, the Option 3 P24/1 & D2459 grade separated junction and the upgrade of a portion of the P24/1 to K-road standard, to enable WSP to apply for in-principle approval of the N1 SDI from SANRAL. This will be applied for with a Fatal Flaw Report.

In parallel, a full Traffic Impact Assessment has been prepared in support of the land-use application for Phase 1 of the Vaal Aerotropolis. Pending the receipt of the GDRT and SANRAL in-principle approvals, the interchange will be included in the TIA as the preferred freeway access option to serve Phase 1 of the Vaal Aerotropolis.

Contact name Christo Bredenhann

Contact details +27 83 781 3695 | Christo.bredenhann@wsp.com

ABBREVIATIONS AND ACRONYMS

DTPC	Dube Trade Port Corporation
DN	Do Nothing
EIA	Environmental Impact Assessment
GLA	Gross Leasable Area
PCU	Passenger Car Equivalent Units
SEZ	Special Economic Zone
TIA	Transportation Impact Assessment
TMP	Transport Master Plan
DFP	Development Framework Plan
ELM	Emfuleni Local Municipality
ELUS	Emfuleni Land Use Scheme of 2023
EMP	Environmental Management Plan
GFA	Gross Floor Area
GPEMF	Gauteng Province Environmental Management Framework
IDP	Integrated Development Plan
LSDF	Local Spatial Development Framework
LTDF	Long Term Development Framework
MPPA	Million passengers per annum
MRO	Maintenance, Repair, and Overhaul (hangars)
NEMA	National Environmental Management Act, 1998 (Act No. 107 of 1998)
NHRA	National Heritage Resources Act, 1999 (Act No. 25 of 1999)
NWA	National Water Act, 1999 (Act No. 36 of 1998)
Pax	Passenger
SANRAL	South African National Roads Agency
SDF	Spatial Development Framework
SDP	Site Development Plan
SDM	Sedibeng District Municipality
SEZ	Special Economic Zone
SDI	Split Diamond Interchange
sqm	square metre
VA	Vaal Aerotropolis
VAZ	Vaal Aero Zone

1 BACKGROUND

1.1 INTRODUCTION

The Vaal Aerotropolis is a planned new multi-phase development in Emfuleni Municipality that will consist of an international airport with passenger terminals, a secure cargo terminal, a strategically located Trade Zone, surrounding Agri zones and an Airport City business park which will include commercial and retail amenities. The Aerotropolis will offer facilities featuring environmentally sustainable practices and various incentives to attract international airlines and freight carriers. It is the intention to incorporate the Vaal Aerotropolis in the Vaal Special Economic Zone (SEZ).

The Aerotropolis will comprise of various components:

- An International Airport with a 4,2km runway to accommodate any size of aircraft, with a second parallel runway of 4.2 km in to be constructed in a future phase, with a central apron link.
- Three passenger and cargo terminals including all supporting facilities.
- The terminals and runways will be implemented in three phases.
- Agri-zones and holding areas for produce being air freighted across the world.
- External provincial road network upgrades with direct access to the N1 at a new access interchange.
- Trade port with logistics and distribution facilities and general and cold warehousing and other commercial and industrial opportunities.
- Agri-zones and holding areas for produce being air freighted across the world.
- Airport City with commercial land uses.

At the heart of the development, the Aerotropolis is envisioned to alleviate capacity constraints at existing regional airports, such as OR Tambo and Lanseria. Additionally, the Vaal Aerotropolis is designed to function as a logistics hub with direct access to the N1 freeway, ensuring seamless connectivity for freight and passenger traffic. Surrounding land uses will include advanced manufacturing zones, agricultural processing hubs, and commercial facilities, enhancing the airport's functionality and economic impact. The three phases of development are summarized below. The phases span 60 years, ensuring gradual and scalable development.

Refer to Figure 1-1 for the current Masterplan of the ultimate development.

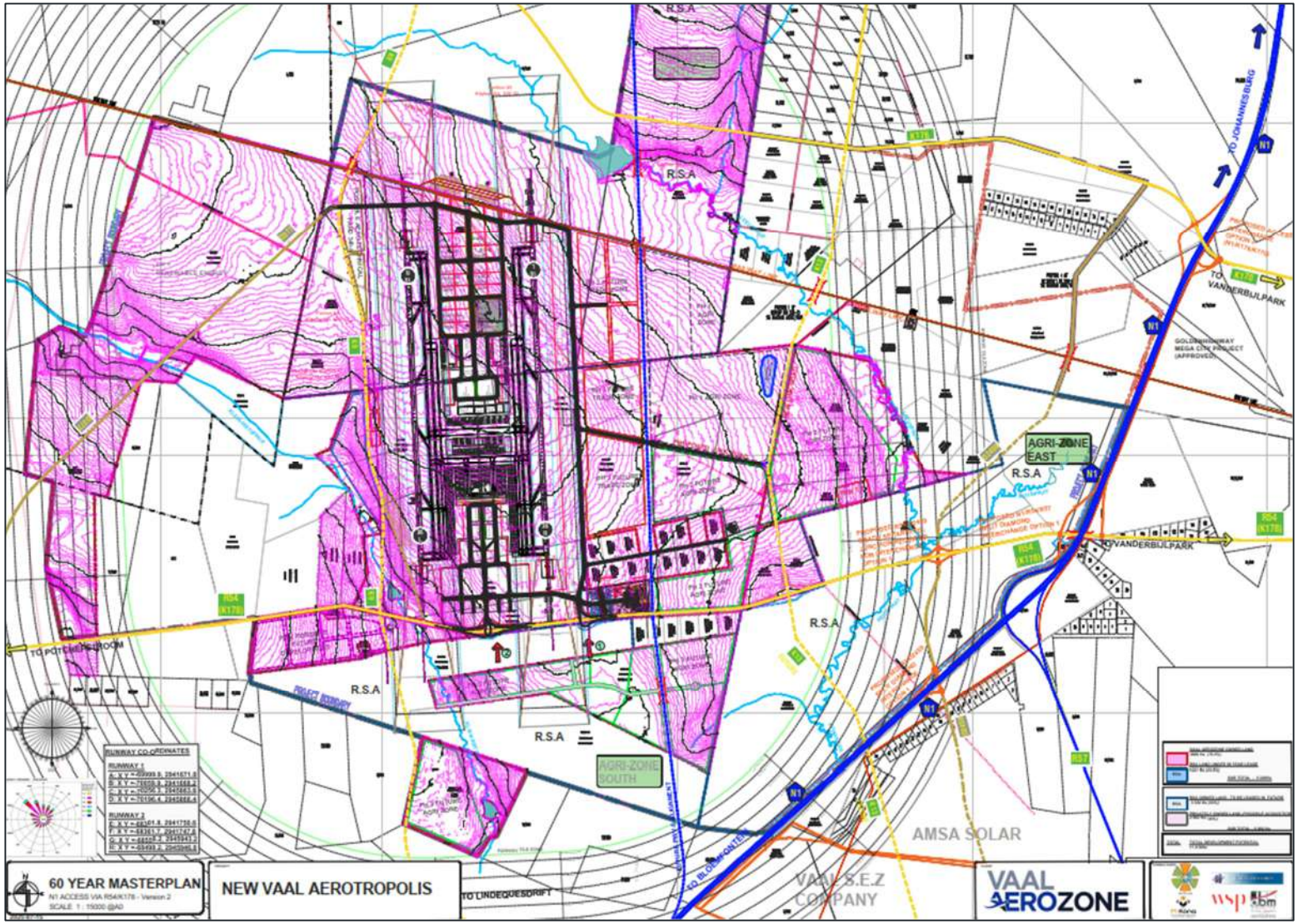


Figure 1-1 – Aerotropolis Masterplan (Phase 1 – 3)

1.2 VAAL AEROTROPOLIS LOCATION

The Vaal Aerotropolis will be located in the Sedibeng District Municipality, +/- 10km west of National Road N1 and directly adjacent and north of Provincial Road P24/1-60 (R541/future K178).

The planned VAAL SEZ is a separate development, to be located east of the N1 freeway, south-east of the Vaal Aerotropolis.

Refer to Figure 1-2 for the location of the Aerotropolis, the VAAL SEZ and the local high order road network.

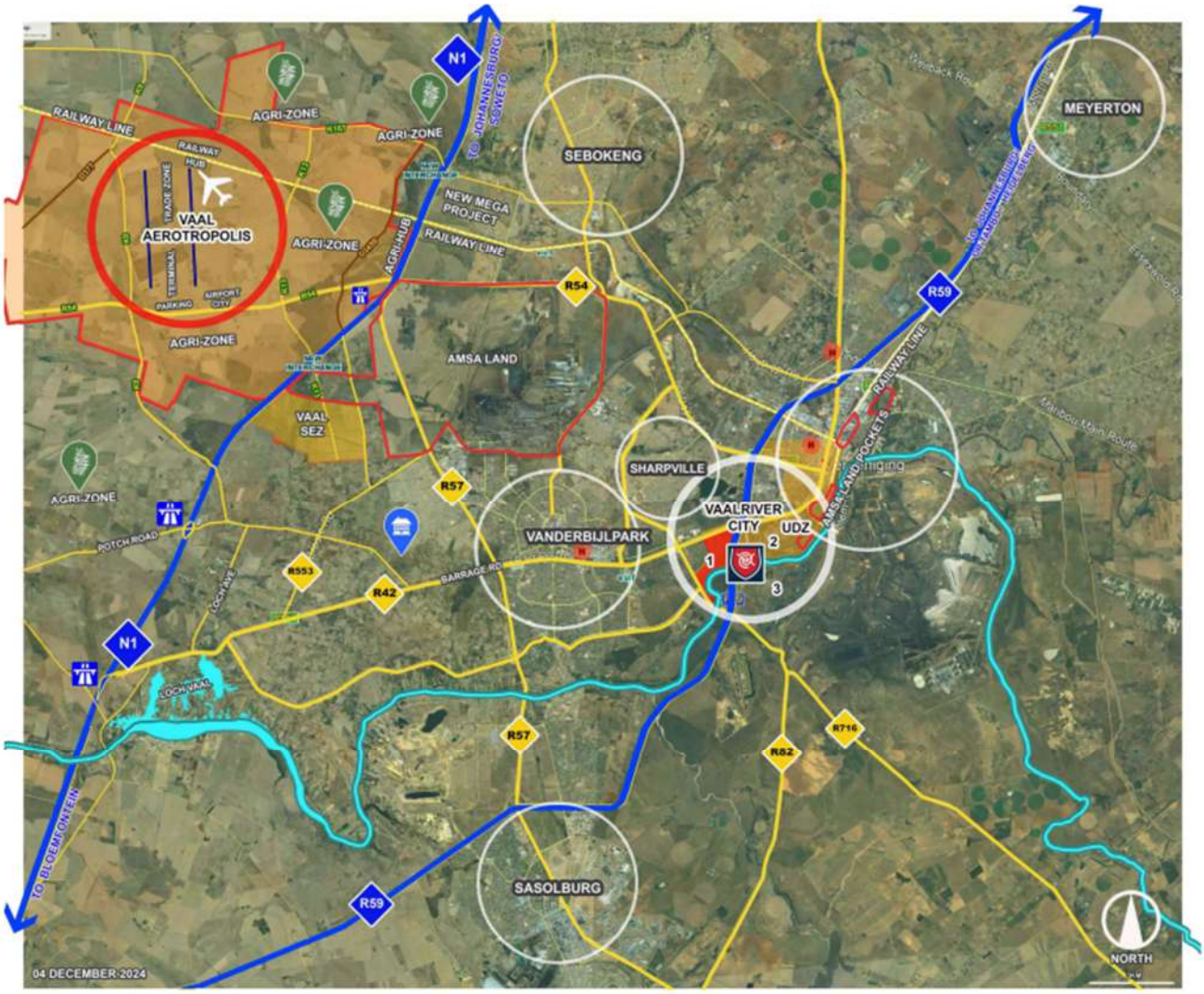


Figure 1-2 – Aerotropolis location and major road network

1.3 PURPOSE OF THIS DOCUMENT

The Vaal Aerotropolis Phase 1 requires a new interchange on the N1 Freeway to provide it with access from the national freeway network. Various interchange options were developed and assessed, and two interchange options were presented to GDRT and subsequently to SANRAL in a Fatal Flaw Report. Refer to Chapter 2 for the options.

SANRAL provided in-principle approval for the access interchange of the N1 with the D1017-020, and rejected the N1/P24-1 interchange due to various issues.

SANRAL suggested a 3rd interchange option, a split diamond access interchange of the N1 freeway with the P24/1-60 (R54/future K178) and D2459-010 (Roots Road) overpasses. The split diamond interchange will consist of a southbound off-ramp and a northbound on-ramp to the N1 at the P24/1, and a southbound on-ramp and northbound off-ramp from the N1 at the D2459. An additional northbound link will connect the R57 on-ramp to the N1 to the western ramp terminal at the P24/1.

This interchange is the preferred option to serve as minimum Phase 1 of the Aerotropolis, and is recommended by WSP and the Client. WSP believes this option is the best solution to serve not only the Aerotropolis, but is the most feasible in terms of Provincial network planning and will provide additional network flexibility with the access to the N1.

This report details this interchange option and is serves as the formal application for in-principle approval of the interchange, as requested by Gauteng Department of Roads and Transport. Once Province has approved the interchange, it will be formally presented to SANRAL in a revised Fatal Flaw Report.

The Traffic Impact Assessment and this report assesses the access needs for only Phase 1 of the Aerotropolis. Due to the long-term planned implementation of Phase 2 and Phase 3 of up to 60 years, the Emfuleni Local Municipality confirmed that only the opening year (2033) traffic impact of Phase 1 of the Vaal Aerotropolis must be assessed as part of the TIA. Due to this, only the freeway access needs for Phase 1 of the Aerotropolis were assessed and is applied for in this report.

2 INTERCHANGE OPTIONS DEVELOPMENT & ASSESSMENT

2.1 MOTIVATION FOR A NEW ACCESS INTERCHANGE

The development of the Vaal Aerotropolis hinges on seamless connectivity to the surrounding National and Provincial Class 1 and Class 2 road network, ensuring efficient access for both passengers and freight. There is currently no suitable direct access to the N1 freeway to serve Phase 1 of the Aerotropolis. This chapter outlines the need for, and the assessment of the freeway interchange options that were considered to provide access to Phase 1 of the Aerotropolis.

2.2 VAAL AEROTROPOLIS PHASE 1 INFRASTRUCTURE AND ACCESS

Phase 1

The first phase of the Aerotropolis is an international airport with a 4.2 km runway and passenger terminal supporting 7.2 million passengers per annum, and a cargo terminal and Trade Zone with a 150,000 tons cargo per annum capacity. It includes the creation of the Agri-Zone, Africa's largest high-tech agricultural cluster, and a Trade Zone for logistics and warehousing. Airport City will see the development of offices, retail, and hospitality spaces.

The Aerotropolis construction is expected to commence in January 2029 for 4 years, and the opening of Phase 1 is planned for January 2033.

- Access and Connectivity:
  - A split diamond access interchange connecting the P24/1 and D2459 to the N1 highway at the existing overpass over the N1.
  - Integration with the regional road network to facilitate smooth logistics and passenger movement.
  - Grade separated junctions of the P24/1 and the D2459
  - The interchange and road upgrades will provide integration with the regional road network to facilitate smooth logistics and passenger movement.
  - This phase is crucial for laying the groundwork for future expansion of the Aerotropolis, with the N1 interchange being vital for ensuring safe and efficient access to the airport and serving the greater network.

Phase 2: Expansion

In Phase 2 the airport's capacity will grow to handle 25 million passengers per annum and expanded cargo volumes. Infrastructure will also be upgraded, including passenger facilities and parking. The Agri-Zone and Trade Zone will be expanded to accommodate increased agricultural and logistical operations.

The access and capacity needs of Phase 2 of the Aerotropolis will be investigated when the phase is initiated. Due to the long-term future implementation timeframe for Phase 2, estimated in 30 years, freeway and provincial road connectivity cannot be assessed with any degree of

certainty so long in advance. To note that there is a potential that the split diamond interchange serving Phase 1 will have sufficient spare capacity to also serve Phase 2. If not, the N1/D1017 access interchange could be implemented.

Phase 3: Ultimate

The final phase focuses on reaching full airport capacity, including a second runway and terminal expansion to handle 45 million passengers per annum. The completion of Airport City with additional commercial, residential, and leisure spaces will occur, alongside the full operationalization of the Special Economic Zone (SEZ) to attract investments and drive industrial growth.

The access and capacity needs of Phase 3 of the Aerotropolis will be investigated when the phase is initiated. Due to the long-term future implementation timeframe, estimated in 60 years, additional freeway and provincial road connectivity cannot be assessed with any degree of certainty so long in advance.

2.3 INTERCHANGE OPTIONS CONSIDERED

Several interchange options were evaluated to provide access to the Vaal Aerotropolis Phase 1. These options are illustrated in Figure 2-1.

- N1/K13 Interchange and K13 link to the P24.1 (future K178)
- N1/PWV20/PWV5 Interchange and PWV5 link to the PWV5/K178 (R54) interchange
- N1/P24.1 interchange at the R57 *(previous configuration*)
- N1/K170/K176 interchange
- N1/PWV20

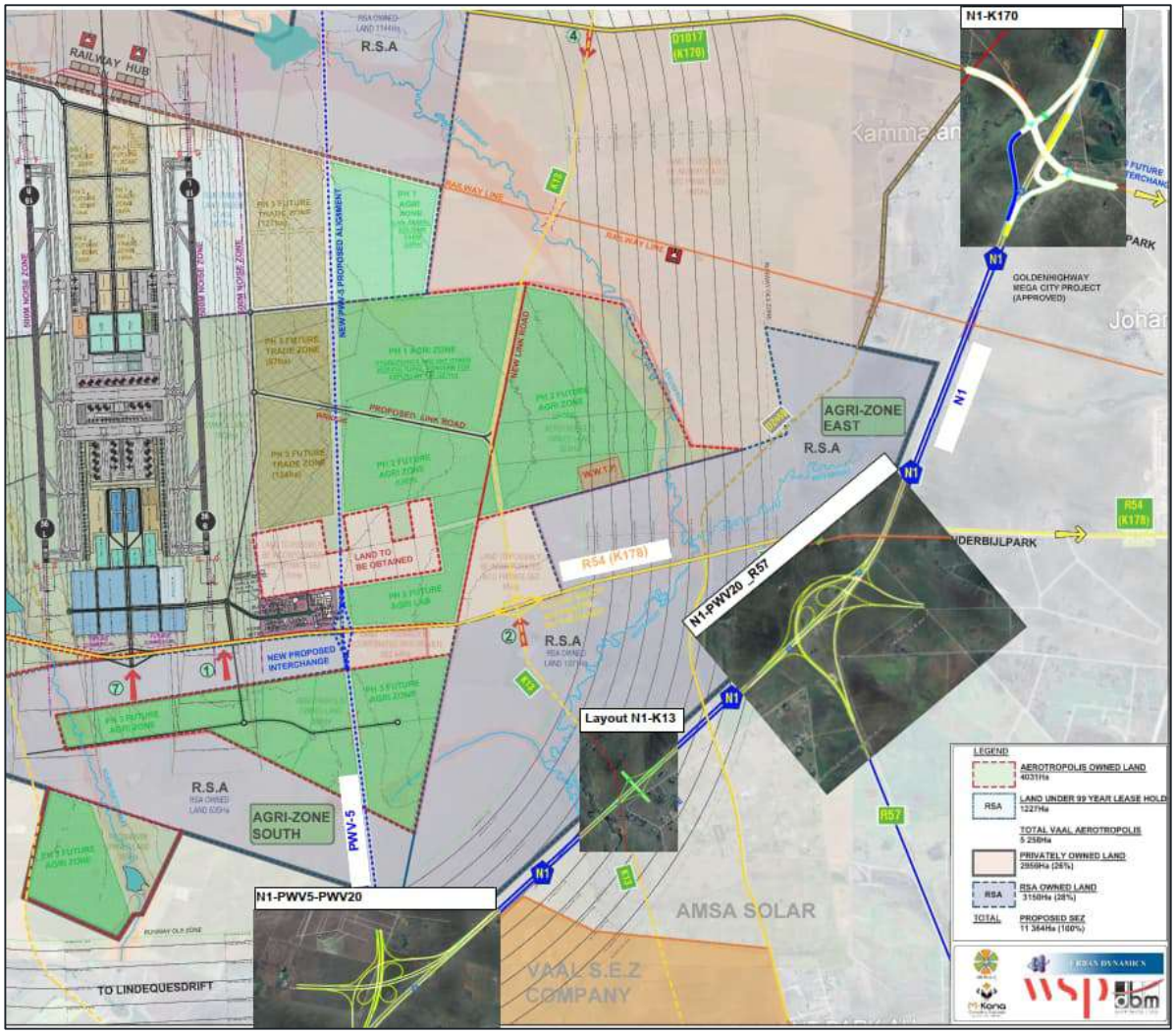


Figure 2-1 – N1 Interchange options considered

2.4 CONSULTATION

Extensive consultations were held with SANRAL to discuss and evaluate the interchange options, detailed below.

Date: 21 June 2024

Attendees: Alan Robinson (SANRAL), Christo Bredenhann (WSP), Sabata Malope (WSP), Kerisha Govender (WSP), De Wet Botha (Prism), Jean-Luc Limacher (Urban Dynamics).

Meeting Outcomes:

- The Key Plan of the project and surrounding areas was presented and reviewed to provide a clearer understanding of the project's location in relation to the affected roadways.
- The concept design for Option 1 of the N1/K13 interchange was presented and discussed.
- The proximity of the N1/K13 interchange to the YLBP and R57, as well as the future PWV5, was identified as a concern due to spacing conflicts with SANRAL standards.

- Minimal adjustments to the location of the interchanges were considered; however, these modifications were insufficient to comply with the required spacing standards.
- SANRAL proposed that other interchange options are developed, potentially the following:
  - N1/PWV5/PWV20 interchange with a portion of the PWV5 linking to the R54
  - An interchange north of the future N1/K176 interchange

Date: 7 November 2024

Attendees: Alan Robinson (SANRAL), Christo Bredenhann (WSP), Sabata Malope (WSP), Kerisha Govender (WSP), Jean-Luc Limacher (Urban Dynamics).

Meeting Outcomes:

- The previously proposed interchange and access option was presented at concept level, namely:
- N1/PWV5/PWV20 interchange with a portion of the PWV5 linking to the R54
- The proximity of the N1/PWV5/PWV20 interchange to the PWV5/R54 interchange is sub-standard, and therefore the concept was rejected.
- SANRAL proposed that other options be considered, namely:
  - N1/K176/K170 interchange – which has previously been designed.
  - Access ramps from the N1 at the R57 interchange.

A supplementary meeting was held with Gauteng Department of Roads and Transport to present the conceptual design of the proposed N1 interchanges.

Date: 6 December 2024

Attendees: Riaana de Klerk (Gauteng), Loud du Plessis (Gauteng), Jason Nash (Gauteng), Sam Naidoo, (WSP), Christo Bredenhann (WSP), Sabata Malope (WSP), Kerisha Govender (WSP), Jean-Luc Limacher (Urban Dynamics).

Meeting Outcomes:

- The conceptual designs of the N1/K176/K170 interchange and the Access interchange from the N1 at the R57 interchange to link to the R54 was presented and discussed at length.
- The SANRAL requirement for roundabout or unsignalised ramp terminals at the N1/K176/K170 interchange was discussed and approved in principle.
- The interchange designs were accepted in principle for further development to be included in the Fatal Flaw Report for consideration.

2.5 SANRAL FEEDBACK AND REJECTED INTERCHANGES

Two of the interchange options were evaluated and subsequently discarded after detailed consideration and presentations to SANRAL.

N1/K13 Access Interchange

The N1/K13 interchanges was initially explored as an access interchange. However, the option was found unsuitable due to the following reasons:

- Interchange Spacing: The proposed N1/K13 interchange is too close to the planned N1/R57/PWV20 interchange, failing to meet SANRAL's interchange spacing standards.
- Minimal Relocation Possibilities: While minor relocations of these interchanges were considered, they were insufficient to meet SANRAL's required spacing standards.
- Sub-Standard Vehicle Weaving Distances: The insufficient distance between the K13 and future interchanges raised significant concerns regarding vehicle weaving and traffic safety.

N1/PWV20/PWV5 System Interchange and PWV5 link to the PWV5/K178 (R54) interchange

The option to access from the N1/PWV5/PWV20 interchange via the PWV5 to the PWV5/K178 interchange was evaluated. The option was discarded due to the is sub-standard spacing between the two interchanges that does not comply with SANRAL's interchange spacing standards. This lack of adequate spacing raises concerns regarding traffic safety, vehicle weaving distances, and overall feasibility, making the option unsuitable for implementation.

N1/P24/1 interchange at the R57

The option was rejected by SANRAL due to the following:

- The inclusion of the PWV20 in the N1/R57 interchange is deemed problematic as it restricts all directional access, including the ramps to the airport development.
- The lack of all movements, particularly east-west at both the N1/R57 interchange and the connection to the R54 does not promote a balanced road network and is geared at providing direct access to the airport from the N1 only.

N1/PWV20 system interchange

SANRAL stated that the double loading of the N1 between the western and eastern portion of the PWV20 could be problematic and might necessitate the review of the Gauteng strategic road network in this area.

2.6 PROVISIONALLY ACCEPTED INTERCHANGE

There is a planned access interchange of the N1 with the D1017 (the future K170/K176), contained in the Gauteng Department of Road and Transport's Strategic Major Road Network plan (May 2010). The implementation timeframe of the interchange has not been determined by GDRT. The interchange was accepted in principle by SANRAL to potentially serve the Vaal Aerotropolis. The interchange is not recommended for Phase 1 of the Aerotropolis.

Refer to Figure 2-2 for the basic planning of the interchange, undertaken by Uhlmann, Witthaus & Prins in 1989.

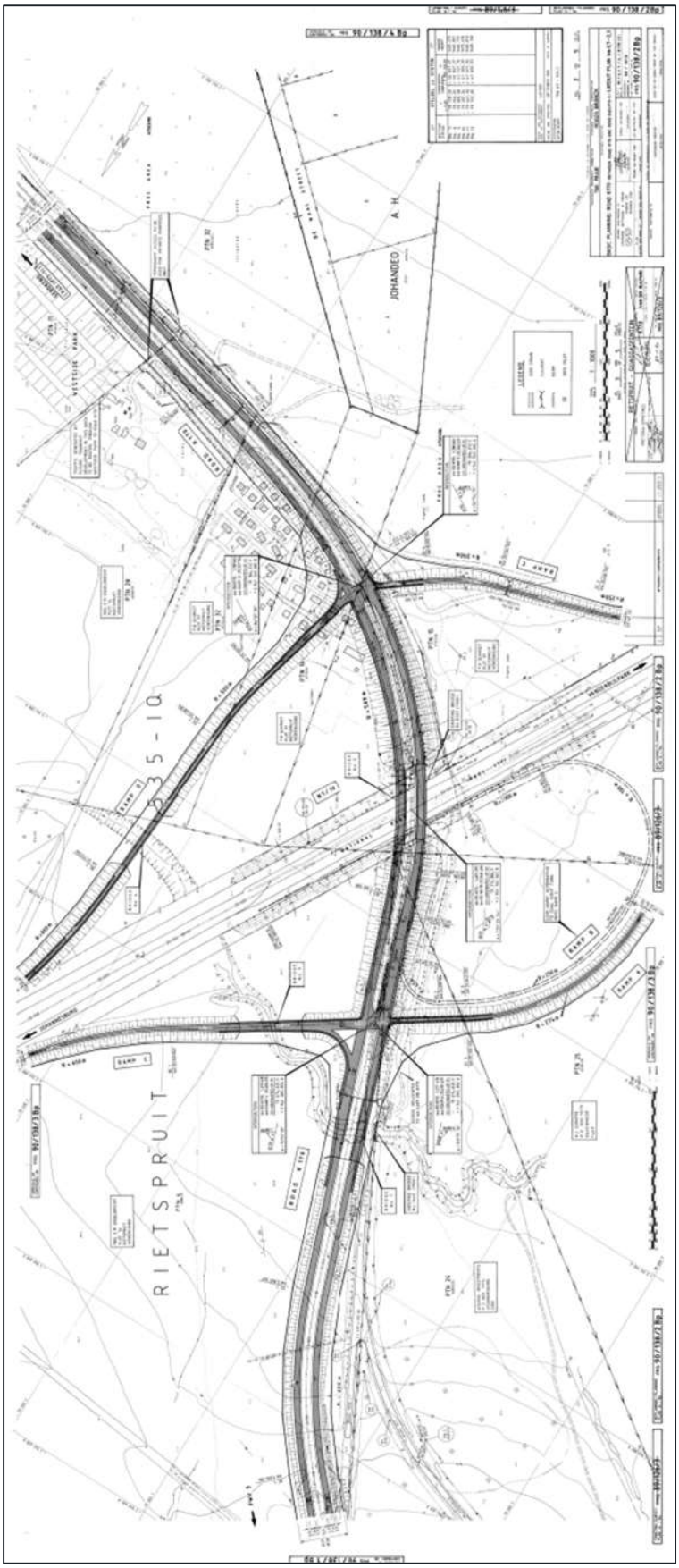


Figure 2-2 –N1/K170/K176 interchange basic planning

WSP revised the geometry of the interchange for improved capacity and reduced environmental and land-use impacts. Refer to Figure 2-3 for the provisional layout. The Basic Planning was revised due to the residential settlement that will be impacted by the southbound off-ramp, and this off-ramp will require a structure over the heavily polluted Rietspruit.

The southbound-off-ramp was therefore replaced with a loop.

Although the interchange can serve the Aerotropolis Phase 1, **it is not recommended** due to its location, extensive road upgrades required and distance to the Aerotropolis's main access off the P24/1.

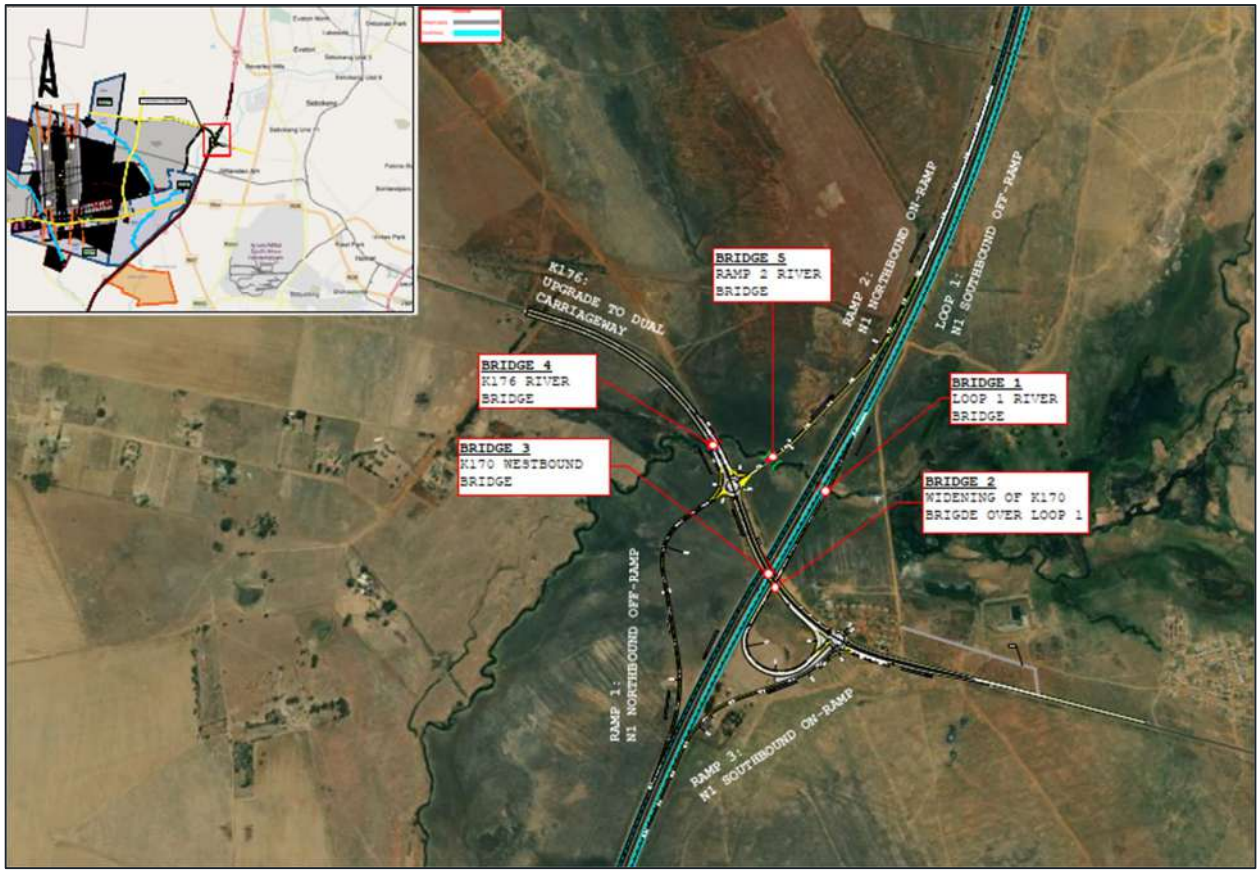


Figure 2-3 – N1/D1017_020 access interchange layout (revised)

2.7 CONCLUSION

The assessment of the various interchange options, and the SANRAL comments on the Fatal Flaw Report has resulted in only the N1/P24/1/D2459 split diamond interchange being considered suitable for Phase 1.

Refer to Chapter 3 for the assessment of the interchange.

3 N1 FREEWAY INTERCHANGE DEVELOPMENT AND ASSESSMENT

3.1 BACKGROUND

SANRAL proposed a split diamond interchange of the N1 with the P24.1 (future K178) and the D2459. GDRT requested WSP to develop a preliminary design of the interchange and the section of the P24.1 that will link to the N1 interchange.

The interchange will be the only access to the N1 to serve Phase 1 of the Aerotropolis. It will provide high-capacity movements between the N1 highway and the upgraded Provincial road network to accommodate the expected traffic volumes of Phase 1 of the Aerotropolis.

Refer to Figure 3-1 and Appendix A for the preliminary design drawings of the N1 SDI (this Chapter), the three options for the P24/1 - D2459 grade separated junction (Chapter 4) and the provincial road upgrades (Chapter 5).

KEY PLANS

- 102934-WSP-HGN-VAAL- DR-CH-000001
  KEY PLAN – OPTION 1
- 102934-WSP-HGN-VAAL- DR-CH-000002
  KEY PLAN – OPTION 2
- 102934-WSP-HGN-VAAL- DR-CH-000003
  KEY PLAN – OPTION 3

GENERAL ARRANGEMENTS

- 102934-WSP-HGN-VAAL- DR-CH-000004
  GENERAL ARRANGEMENT PLAN - N1 & P24/1_060 INTERCHANGE
- 102934-WSP-HGN-VAAL- DR-CH-000005
  GENERAL ARRANGEMENT PLAN -P24/1_050, 060 & D2459 INTERCHANGE OPTION 1
- 102934-WSP-HGN-VAAL- DR-CH-000006
  GENERAL ARRANGEMENT PLAN -P24/1_050, 060 & D2459 INTERCHANGE OPTION 2
- 102934-WSP-HGN-VAAL- DR-CH-000007
  GENERAL ARRANGEMENT PLAN -P24/1_050, 060 & D2459 INTERCHANGE OPTION 3

LONG SECTIONS

- 102934-WSP-HGN-VAAL- DR-CH-000008
  PLAN AND PROFILE - P24/1_050 & 060 (SHEET 1 OF 3)

- 102934-WSP-HGN-VAAL- DR-CH-000009
  PLAN AND PROFILE - P24/1_050 & 060 (SHEET 2 OF 3)
- 102934-WSP-HGN-VAAL- DR-CH-000010
  PLAN AND PROFILE - P24/1_050 & 060 (SHEET 3 OF 3)
- 102934-WSP-HGN-VAAL- DR-CH-000011
  PLAN AND PROFILE - N1 SOUTHBOUND & P24/1_60 OFF-RAMP SHEET (1 OF 1)
- 102934-WSP-HGN-VAAL- DR-CH-000012
  PLAN AND PROFILE - N1 NORTHBOUND & P24/1_60 ON-RAMP SHEET (1 OF 1)
- 102934-WSP-HGN-VAAL- DR-CH-000013
  PLAN AND PROFILE - P155/1 to P24/1 LINK SHEET (1 OF 1)

General notes on the Preliminary design

- Data Sources
  - The proposed alignment and cross section for the mainline and ramps were developed using the default **Civil 3D Bing aerial maps,** as topographical survey data is not available.
  - The proposed profiles and tie-ins were generated based on **SRTM exported elevation data**
  - The existing wetland extents are referenced from **National Wetland Map Version 6,** but is indicative. Refer to Chapter 7.

- Standards Referred
  - SA National Road Agency Geometric Design Guidelines
  - Typical Plans for Road Design Volume 1 and 2 – Gauteng Province Road and Transport
  - Road Design Manual VOL 1:Geometrics – Department of Public Transport, Road and Works, Gauteng Provincial Government
  - TRH 17 – Geometric Design of Rual Roads
  - CD 116 – Geometric Design of Roundabouts, DMRB, UK

Refer to Chapter 5.3 for the Decision Register of the preliminary designs.

3.2 SPLIT DIAMOND INTERCHANGE CONFIGURATION

The proposed interchange is a split diamond interchange with the following configuration:

- The northern portion of the split diamond is an on and off-ramp from the N1 to and from the north to the P24/1 with 2 roundabout ramp terminals. The existing overpass of the P24/1 with the N1 will be dualled for additional capacity.
- A secondary link is proposed from the R57 northbound on-ramp to the N1, to split and link to the western ramp terminal roundabout.

- The southern portion of the split diamond is an on and off-ramp from the N1 to and from the south to the D2459 with 2 roundabout ramp terminals. The D2459 has an existing overpass over the N1 with ample capacity.
- The ramp terminals are dual lane roundabouts that will provide sufficient capacity. Conventional signalised terminals were considered and can provide the required capacity, however SANRAL prefer the use of roundabouts. The rural location of the junctions could lead to vandalism and theft of the signal infrastructure. Should the signals not work for extended periods, the safety and capacity will be severely affected.
- The design ensures seamless integration between Sebokeng and Vanderbijlpark (east of the N1), the planned airport development (west of the N1), and the broader regional road network.

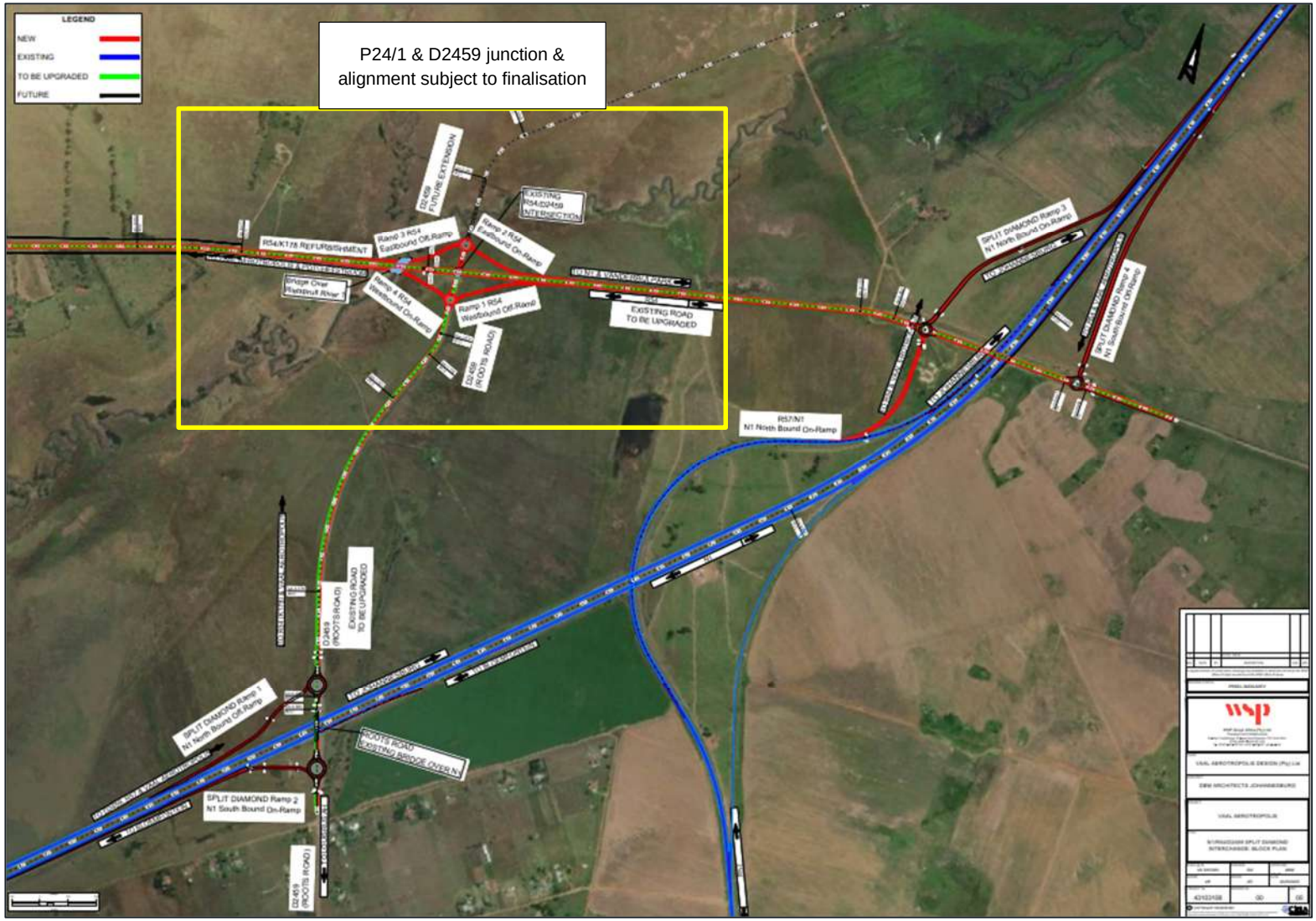


Figure 3-1 – N1/24.1 & N1/D2459 split diamond interchange configuration

3.3 INTERCHANGE TRAFFIC MOVEMENTS

Northern ramps to the P24/1

- Vehicles traveling southbound on the N1 exit via the southbound off-ramp to the eastern ramp terminal roundabout on the P24/1. This roundabout is a decision point, directing traffic either east toward Sebokeng or west to the airport.
- The northbound on-ramp to the N1 starts at the western ramp terminal roundabout on the P24/1. It facilitates movement from both Sebokeng and the airport onto the N1 toward Johannesburg.
- A secondary link will provide access for vehicle travelling on the R57 north towards the N1. The existing on-ramp will split and provide a new links to the western ramp terminal roundabout on the P24/1. Vehicles can turn west only at the roundabout to the airport. The return movement is not possible.

Southern ramps to the D2459

- Vehicles traveling northbound on the N1 exit via the northbound off-ramp to the western ramp terminal roundabout on the D2459. This roundabout is a decision point, directing traffic either north-west on the D2459 to the P24/1 and onto the airport, or southeast on the D2459 to Vanderbijlpark.
- The southbound on-ramp to the N1 starts at the eastern ramp terminal roundabout on the D2459, it facilitates movement from both the airport via the P24/1 and from Vanderbijlpark to the N1 toward Bloemfontein.
- A secondary link will provide access for vehicle travelling on the R57 to the N1 northbound. The on-ramp split and links to the western ramp terminal roundabout on the R54. Vehicles from the R54 can turn west at the roundabout to the airport. The return movement is not possible.

3.4 PUBLIC TRANSPORT

The P24/1 will be a Class 2 Arterial with a divided dual carriageway, 2 lanes per direction, shoulders and verges. It will therefore be suitable for all forms of public transport.

3.5 NON-MOTORISED TRANSPORT

The Gauteng Provincial K-Routes are high-order, strategic arterial roads (Class 1, 2, or 3) designed for mobility and economic development, acting as major mobility spines. Their primary purpose is to provide efficient, high-speed, and safe connectivity between communities, industrial hubs, and provinces, often serving as alternatives to heavily congested freeways.

The P24/1 will be a Class 2 Arterial, however with a proposed divided dual carriageway with 2 lanes per direction, shoulders and verges, it will be suitable for non-motorised transport. To note however due to the location of the Vaal Aerozone and distances to the nearest residential and commercial areas, NMT is not expected to form more than a nominal proportion of the total traffic generation.

3.6 DESIGN CRITERIA (SPACING) FOR INTERCHANGES

N1 Corridor

The N1 route alignment and cross-section will remain unaltered, except for the tie-ins to the four ramps of the SDI.

N1 / P24/1 / D2459 Split Diamond (Access) Interchange to future interchanges spacing assessment

The SANRAL Planning Guidelines, SANRAL Geometric Design guidelines and the TRH26 Guidelines establishes standards for the spacing and design of interchanges and accesses on roads to ensure safety, operational efficiency, and uninterrupted traffic flow. These guidelines are particularly relevant when evaluating the proposed SDI on the N1 to other existing and future interchanges. The interchange spacing requirements are listed in Table 3-1 and are discussed below.

Table 3-1 – Minimum Spacing between Rural Freeway Interchanges (GDPTRW, 2004)

Interchange Type	YLBP spacing (m)	Centre Line Spacing (km)
Access to access	2170 m	2.8 km (absolute min. 2.4 km)
Access to systems	3270 m	4.2 km (absolute min. 3.6 km)
Systems to access	2170 m	2.8 km (absolute min. 2.4 km)

*YLBP refers to the yellow line break point, which is the final point where the on-ramp ends or the first point where the off-ramp starts. All road signing and weaving ideally take place between YLBPs.

As an aid to orientation, refer to Figure 3-2 for the locations of the planned system and access interchanges on the N1 freeway, and the proposed SDI Access interchange.

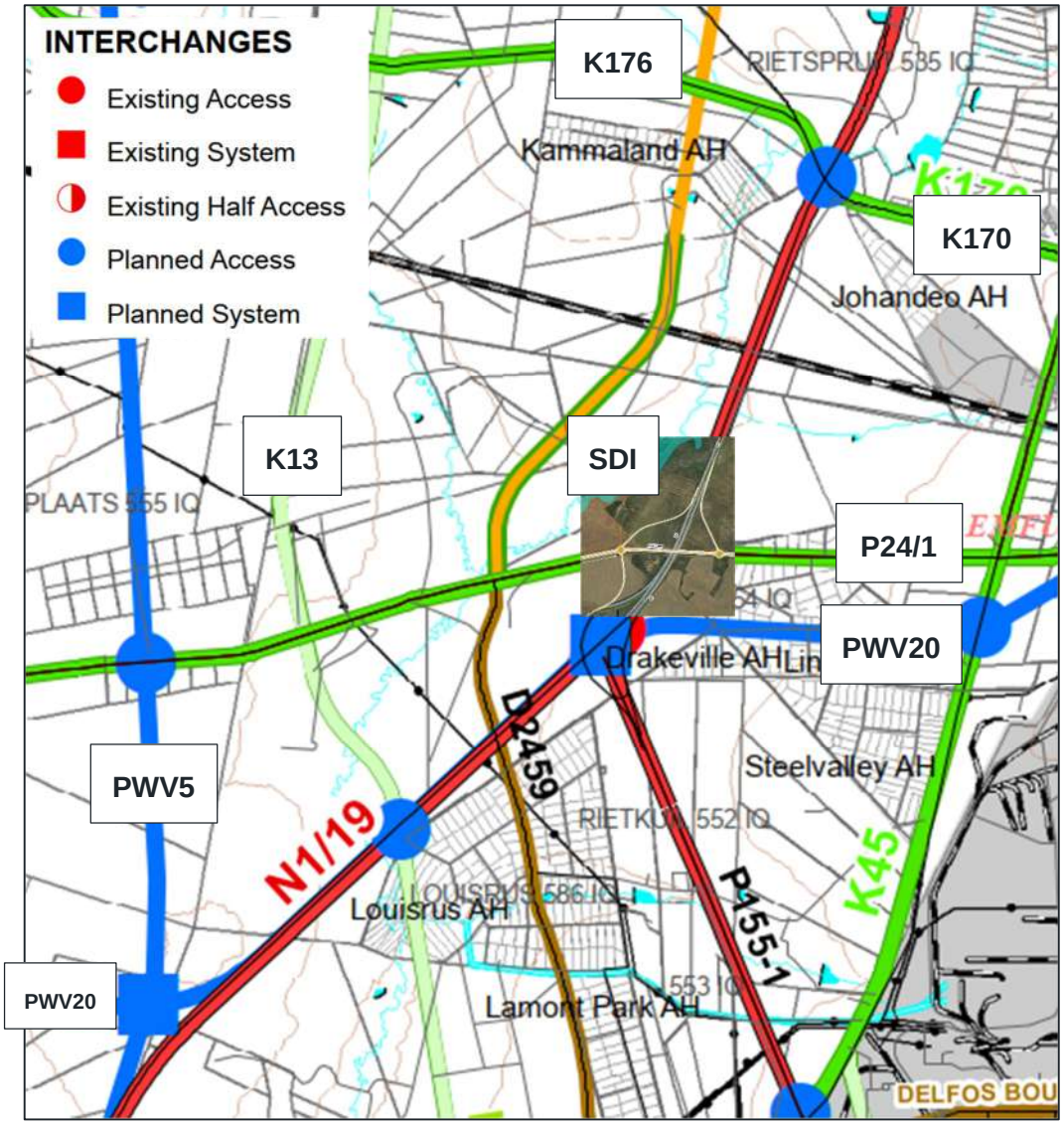


Figure 3-2 – Future systems and access interchanges on the N1

- Proposed SDI (Access interchange) southern ramps to N1/PWV5/PWV20 system interchange (future)

The N1/PWV5/PWV20 systems interchange has not been designed, therefore an accurate interchange spacing assessment cannot be undertaken. An estimate of this distance is approximately 3000m. <u>The minimum access spacing can potentially be achieved for the access to system and system to access interchange spacing of 3.6 km to 45.2km.</u>

Note, SANRAL has stated that the double loading of the N1 with the PWV20 traffic from the PWV5 to the N1/P155 interchanges could be problematic, and might necessitate the review of the Gauteng strategic road network plan in this area. This may include a realignment of the PWV20 to not join a section of the N1, thereby negating the need for the N1/PWV5/PWV20 interchange.

- Proposed SDI (Access interchange) southern ramps to future N1/K13 access interchange

The N1/K13 access interchange was rejected by SANRAL due to the sub-standard spacing between it and the future N1/PWV20 and future N1/PWV5/PWV20 system interchanges as noted in Chapter 2.5. An interchange spacing assessment between the K13 access interchange and the SDI is therefore not required.

- Proposed SDI (Access interchange) northern and southern ramps to future N1/PWV20 system interchange

The future N1/PWV20 systems interchange has not been designed, therefore the configuration, number and types of ramps have not been determined. It is also not known how and if the PWV20 will link to the N1. Therefore an accurate interchange spacing assessment cannot be undertaken.

Note, SANRAL has stated that the double loading of the N1 with the PWV20 traffic between the PWV5 and N1/P155 interchanges could be problematic, and might necessitate the review of the Gauteng strategic road network plan in this area. This may include a realignment of the PWV20 to not join a section of the N1, thereby negating the need for the N1/PWV20 interchange.
Also to note is that the proposed SDI northern ramps can be accommodated in a future N1/PWV20 interchange.

- Proposed SDI (Access interchange) northern ramps to future N1/K170/K176 access interchange

The SDI northern ramps to the N1/K170/K176 interchange is approximately 2.5km. Minimum access spacing can therefore be achieved for the access interchange to access interchange spacing of 2.4km to 2.8km.

N1 / P24/1 / D2459 Split Diamond (Access) Interchange (northern ramps) to P155-1 Interchange spacing assessment

The following are the critical YLBP distances between the SDI's northern ramps to the existing P155-1 on and off ramps:

- Split diamond southbound off-ramp to existing P-155 southbound off-ramp (from the N1): 1550m
- Existing northbound P-155 on-ramp (to the N1), to split diamond northbound on-ramp: 900m

Refer to Figure 3-3 for the layout of the ramps.

The minimum YLBP distances can be achieved on the southbound carriageway, however not on the northbound due to the very long section of the N1 (more than 1.4km) with the 3rd outside lane from the P155 on-ramp. The alignment can be revised if required by either relocating the new on-ramp further north, or segregating the outside 3rd lane from the P155 on-ramp to first merge with the P24/1 on-ramp, and then to merge with the N1 at an acceptable location.

It should also be noted that both these sets of on-ramps is for partial access interchanges, and not full access interchanges.

Figure 3-3 – Ramp spacing, SDI Northern ramps to P155-1

N1 / P24/1 / D2459 Split Diamond (southern ramps) to P155-1 Interchange spacing assessment

The following are the critical distances between the SDI's southern ramps to the existing P155-1 ramps:

- Split diamond northbound off-ramp to existing P155 on-ramp (YLBP to YLBP): 2 800m
- Existing P155 of-ramp to split diamond southbound on-ramp (YLBP to YLBP): 2 500m

Refer to Figure 3-4 for the approximate distances described above.

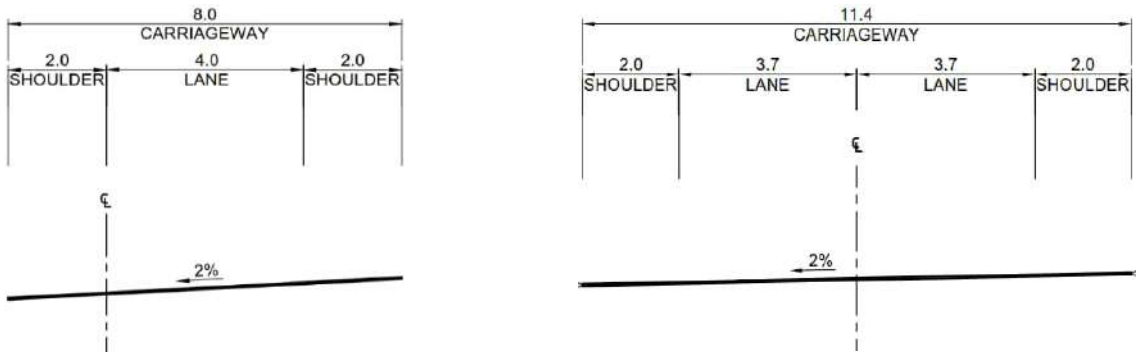
<u>Minimum access spacing can therefore be achieved for the access interchange to access interchange spacing of 1300 m.</u>

Figure 3-4 – Ramp spacing, SDI Southern ramps to P155-1

Interchange ramps

<u>Cross-section</u>

The following minimum SANRAL criteria for cross-sectional requirements, including lane widths and shoulder dimensions, were applied during the optioneering stage. The number of lanes and shoulder requirements for interchange ramps are dictated by traffic volumes and are particularly influenced by conditions at ramp terminals and lane merge/diverge points. Refer to the typical sections in Figure 3-5 for details.



a) Single lane b) Two lane

Figure 3-5 - Typical cross section of ramps- Single and Two lane

The technical compliance of the interchange design, specifically of the on- and off-ramps, with the SANRAL geometric design standards will be investigated in more detail for the purpose of the Fatal Flaw Report for submission to SANRAL.

3.7 CONCLUSION AND RECOMMENDATION

The proposed interchange meets most of the required road design standards, except for the design speed of the ramp terminals that was reduced and the YLBP spacing between the exiting P155 on-ramp and the proposed SDI northern on-ramp. This geometry and alignment can be adapted as required.

4 P24/1 AND D2459 GRADE SEPARATED JUNCTION OPTIONS

4.1 NEED FOR THE INTERCHANGE

The Transportation Impact Assessment of the Vaal Aerotropolis Phase 1 identified the need for a grade separated junction of the D2459 and the upgraded P24-1 (R541).The grade separated junction is required for sufficient capacity to serve the network and the expected trip generation of Phase 1 of the Vaal Aerotropolis.

4.2 GEOMETRY

The geometry of the grade separated junction is a narrow diamond with the D2459 as an overpass over the P24-1, with roundabout ramp terminals. The roundabout will provide sufficient capacity and does do not require signalisation. The terminals are therefore not subject to safety issues during power failures or vandalism of signal infrastructure.

The length and alignment of the ramps will be optimised during conceptual design with informants such as the environment, topography, etc.

The D2459 may be extended north in future as per Provincial network planning. The junction is designed to tie-into this northern extension in future, which may require minor realignment.

4.3 OPTIONS ASSESSED

The following three interchange options were developed and assessed.

OPTION 1: D2459 ON EXISTING ALIGNMENT

Option 1 is a grade separated junction on the current alignment of the D2459 in the vicinity of its junction with the P24/1. Refer to Figure 4-1 for the general arrangement of the junction.

Advantages:

- This option requires no realignment of the existing or northern extension of the D2459, with no additional land impacts.
- The spacing to the future K13 junction on the P 24/1 is as per current Provincial road planning.

Disadvantages:

- The western on and off-ramp will require watercourse crossings.
- The northern ramp terminal and future extension of the D2459 will require watercourse crossings.

- Spacing to the N1 SDI is not regarded as ideal, however there are no firm access spacing standards to guide the design. Refer to Chapter 4.4

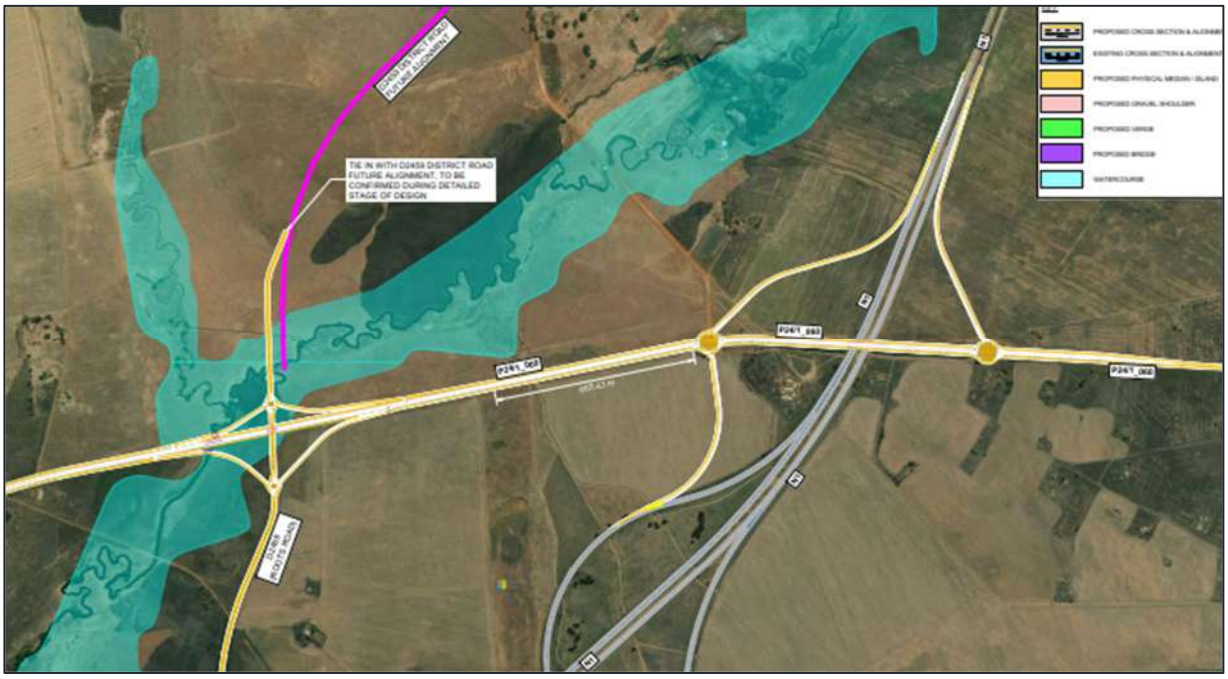


Figure 4-1 – Option 1 general arrangement (Current D2459 alignment)

OPTION 2: PORTION OF D2459 REALIGNED FURTHER EAST

Option 2 is similar to Option 1, however the D2459 (current and future) was realigned to the east to reduced impact on the water courses. Refer to Figure 4-2 for the general arrangement of the junction.

<u>Advantages:</u>

- The option reduces the impact on the watercourses, however not fully.
- The spacing to the future K13 junction on the P 24/1 is improved, as it is marginally increased by approximately 160m.

<u>Disadvantages:</u>

- The existing and future norther extension of the D2459 will require realignment, and rebuild of the southern section. This will have a nominal land impact over agricultural land.
- The northern ramp terminal and future extension of the D2459 will require watercourse crossings.
- Spacing to the N1 SDI is not regarded as ideal, and less so than Option 1. Refer to Chapter 4.4.

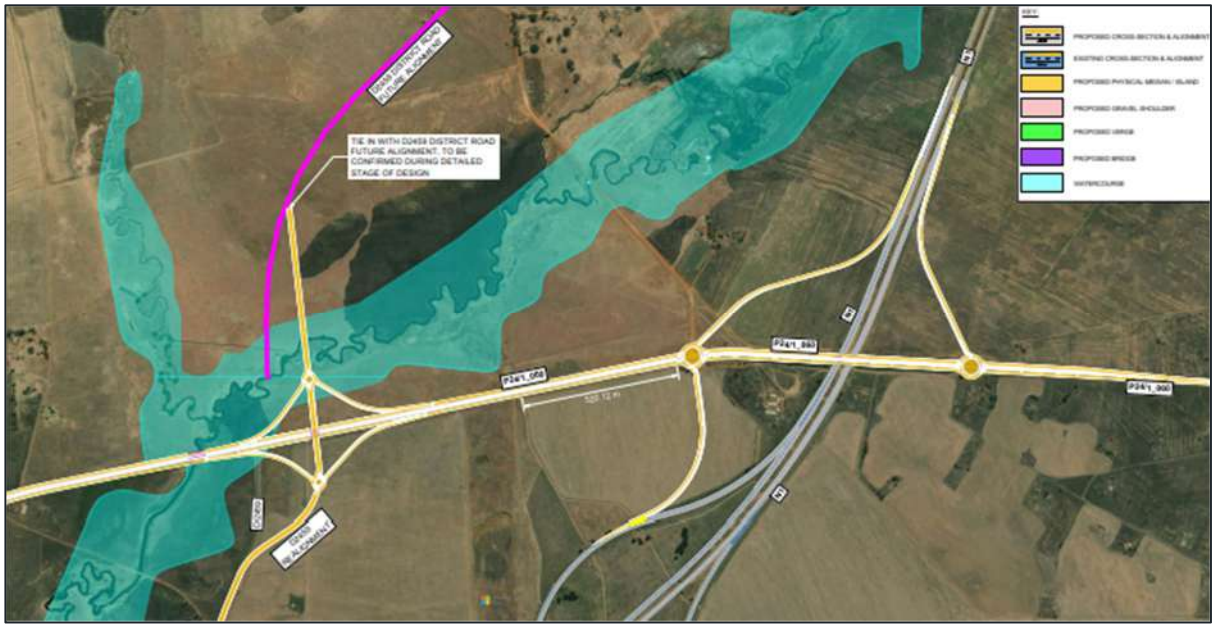


Figure 4-2 – Option 2 general arrangement (eastern location)

OPTION 3: PORTION OF D2459 REALIGNED FURTHER WEST

Option 3 was developed to reduce the impact on the water courses as much as possible, and to maximise the distance to the N1 SDI for improved spacing. The D2459 (current and future) was realigned to the west.

Refer to Figure 4-3 for the general arrangement of the junction.

Advantages:

- The option reduces the impact on the watercourses as much as possible.
- The spacing to the N1 SDI is regarded as the most optimum, as it has been maximised. Refer to Chapter 4.4.
- The future northern section of the D2459 will cross a smaller tributary of the Rietspruit, and may therefore require a smaller (lower cost) bridge or structure. This will have less impact on the water course.

Disadvantages:

- The existing and future northern extension of the D2459 will require realignment, and rebuild of the southern section. This will have a nominal land impact over agricultural land.
- The southern section of the D2459 will require a watercourse crossing.
- Refer to Chapter 4.4 for the spacing assessment.

Figure 4-3 – Option 3 general arrangement (western location)

4.4 SDI (NORTHERN RAMPS) TO P24/1/D2459 INTERCHANGE SPACING ASSESSMENT

The following are the critical distances between the split diamond's western ramp terminal (roundabout) to the grade separated junction of the D2459 with the P24/1:

Option 1 – D2459 on current alignment

- Eastbound on and off-ramp to the P24/1 to the western ramp terminal roundabout (YLBP): 665m. Refer to Figure 4-4 for the layout.
- Conclusion: There are no minimum spacing requirements in TRH26 for grade separated junctions to junctions (roundabouts) on Class 2 rural roads. However, the 665m can be regarded as short for weaving movements from and to the ramps.
- The spacing to the future K13 junction on the P24/1 is approximately 2200m (centre to centre), a per current Provincial road planning.

Option 2 - D2459 realigned 160m east

- Eastbound on and off-ramp to the P24/1 to the western ramp terminal roundabout (YLBP): 520m
- Refer to Figure 4-5 for the layout.
- Conclusion: The 520m can be regarded as short for weaving movements from and to the ramps.

- The spacing to the future K13 junction on the P24/1 is approximately 2360m (centre to centre).

Option 3 - D2459 realigned 970m west

- Eastbound on and off-ramp to the P24/1 to the western ramp terminal roundabout (YLBP): 1670m. Refer to Figure 4-6 for the layout.
- Conclusion: The 1 670m can be regarded as the preferred (longest) distance between the grade separated junction and the roundabout. This option with the western realignment of a portion of the D2459 will also be the least impacted by the watercourse.
  The future northern extension of the D2459 can tie into this junction, and will require a realignment of the southern section tie in, as depicted in Figure 4-7. The realigned section of the D2459 will cross a smaller tributary of the Rietspruit, and may therefore require a smaller (lower cost) bridge or structure.
  The spacing to the future K13 junction on the P24/1 is approximately 1130m (centre to centre). This is less than the required 5km for rural junctions, however the D2459 will be a grade separated junction so the TRH26 standards are not fully applicable. Should this distance be regarded as sub-standard, it is possible to realign a portion of the future K13 with minimal impact on the agricultural land use in the area.
  To note the junction type and geometry of the K13/P24/1 crossing has not been determined.

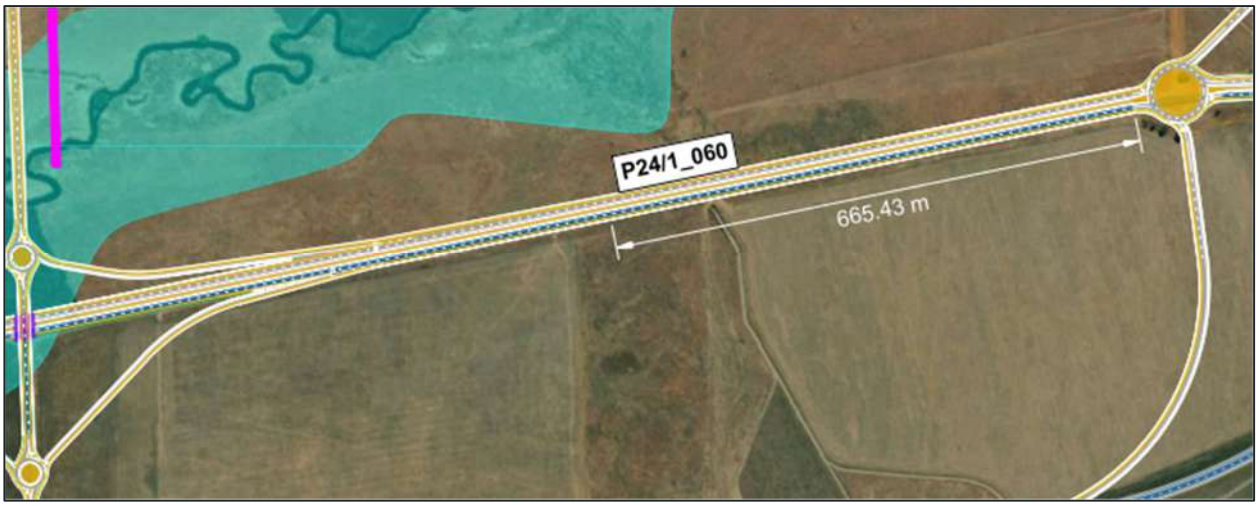


Figure 4-4 – Option 1 - Ramp spacing from SDI western ramp terminal to D2459

Figure 4-5 – Option 2 - Ramp spacing from SDI western ramp terminal to D2459

Figure 4-6 – Option 3 - Ramp spacing from SDI western ramp terminal to D2459

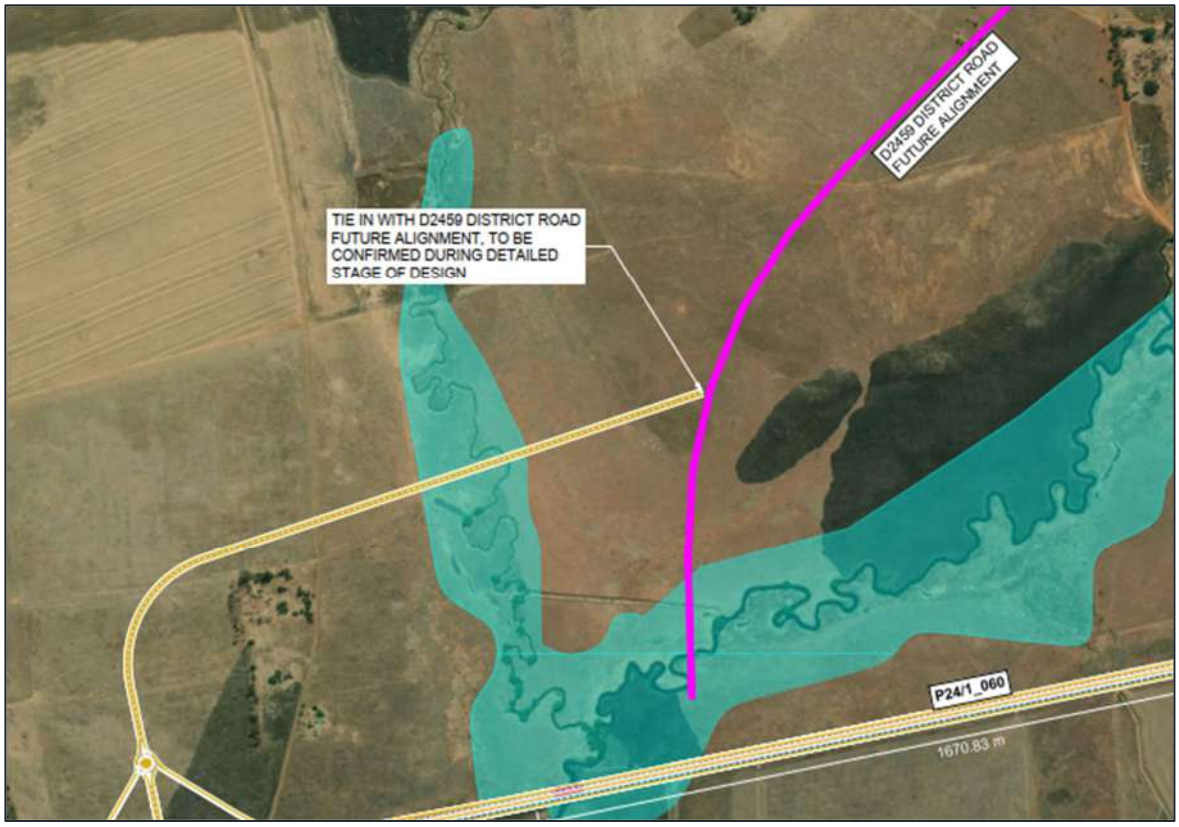


Figure 4-7 – Option 3 Realignment of northern extension of D2459

4.5 CONCLUSION AND RECOMMENDATION

The proposed grade separated junction on the western realignment of the D2459 (Option 3) is the most favourable option due to the lesser impact on the watercourse of the southern and northern realigned sections of the D2459 and the ramps, the expected lower cost, and it is located the furthest from the N1 SDI western ramp terminal roundabout.

5 EXISTING AND PLANNED PROVINCIAL ROAD NETWORK

This chapter covers both existing and planned major National and Provincial road network. These routes are illustrated in Figure 5-1 and discussed in detail.

- Section 5.1: Existing key transport infrastructure – A review of the current road network.
- Section 5.2: Planned Provincial road network – An outline of future road developments required for the Vaal Aerotropolis Phase 1.

5.1 EXISTING KEY TRANSPORT INFRASTRUCTURE

The N1 highway within the project area is a critical transportation route facilitating local and regional connectivity. This includes the P155/1 (R57) partial cloverleaf interchange, two overpasses (P24/1 and the P155/1 - Future K170/K176), and a rail underpass as shown in Figure 5-1.

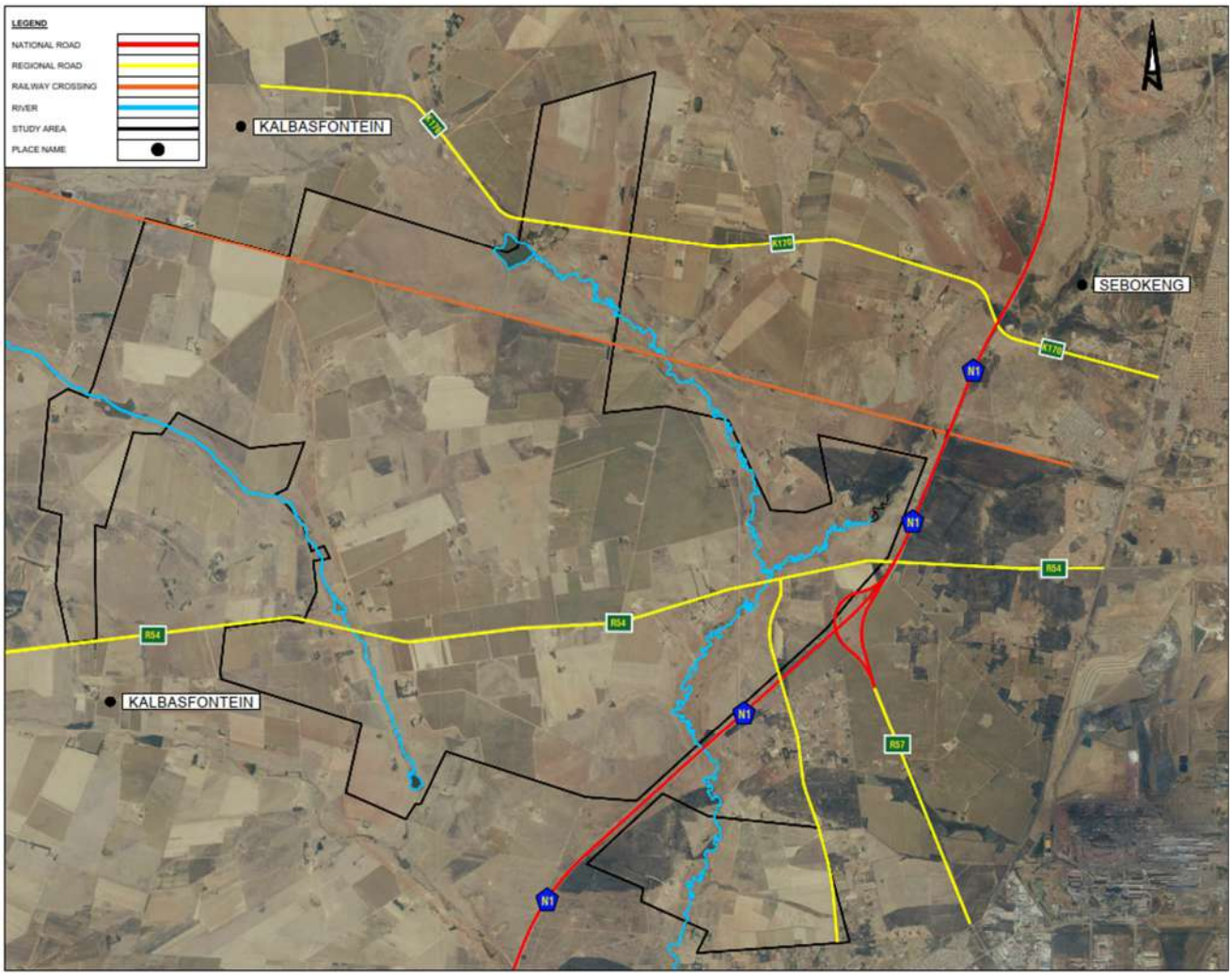


Figure 5-1 – Alignment of the existing major road network

5.1.1. N1/P155-1 (R57) Partial Cloverleaf Interchange

Design and Functionality:

The P155/1 interchange is the only existing interchange on this section of the N1. The configuration is a partial cloverleaf design. Refer to Figure 5-2.

- East-to-North Movement: A northbound loop, overpass and on-ramp carries traffic on the P155/1 westbound from Vanderbijlpark to the N1. The loop merges with the northbound carriageway of the N1, facilitating movement towards Johannesburg.
- North-to-East Movement. A southbound off-ramp carries vehicles traveling south on the N1 to the P155/1 eastbound to Vanderbijlpark.
- Key Role: The interchange is pivotal for directing traffic efficiently between the N1, Sebokeng, and Vanderbijlpark (located east of the N1), enabling uninterrupted north-south and east-west flows.

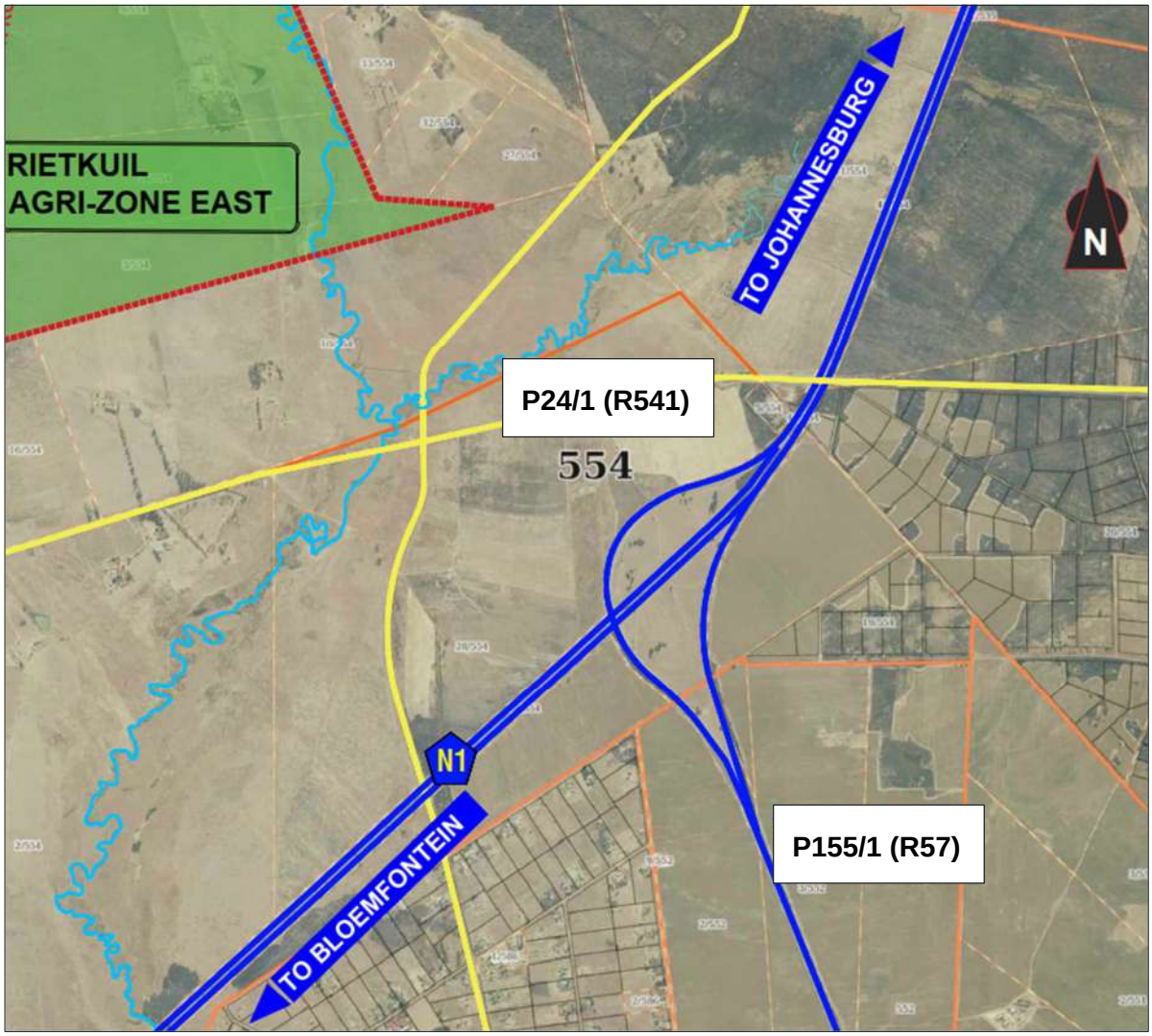


Figure 5-2 – N1/P155-1 Existing Partial Cloverleaf interchange

5.1.2. N1 – P24/1 (R541) Overpass

Location and Functionality:
The P24/1 overpass is situated 0.25km north of the N1/P155/1 northbound on-ramp. It is an east-west connecter between Vanderbijlpark and Sebokeng to the east and Potchefstroom in North-West Province to the west.

Key Role: This overpass ensures uninterrupted movement for east-west traffic across the N1, supporting both local commuters and regional connectivity. It does not provide access to the N1.

5.1.3. N1 – D1017 (K170/K176) Overpass

Location and Functionality:
The D1017 (Future K170/K176) overpass is located approximately 4.5 km north of the P24/1 overpass, it connects Fochville to the west with Sebokeng, east of the N1.

Key Role: This overpass serves as a secondary east-west link, primarily catering to local traffic, and supports movement between peri-urban and urban zones without affecting the N1's primary traffic flow. It does not provide access to the N1, but is planned to with a conventional diamond access interchange.

5.1.4. N1 Rail Underpass

A rail underpass is located approximately 2.2 km north of the P24/1 overpass, the N1 crosses over the dual electrified railway line via an overpass (rail underpass).

5.2 PLANNED MAJOR ROAD NETWORK

This chapter discusses the planned road network, including the major routes proposed by Gauteng Department of Roads and Transport, and supporting district roads. The planned road network consists of:

- PWV Routes – High-capacity Class 1 roads designed for provincial and inter-provincial connectivity.
- K-Routes – Class 2 roads to connect to the Class 1 network to enhance regional access and integration with major corridors.
- Access and System interchanges to facilitate movements between the national and Provincial Class 1 and Class 2 routes.

These planned routes are shown in Figure 5-3.

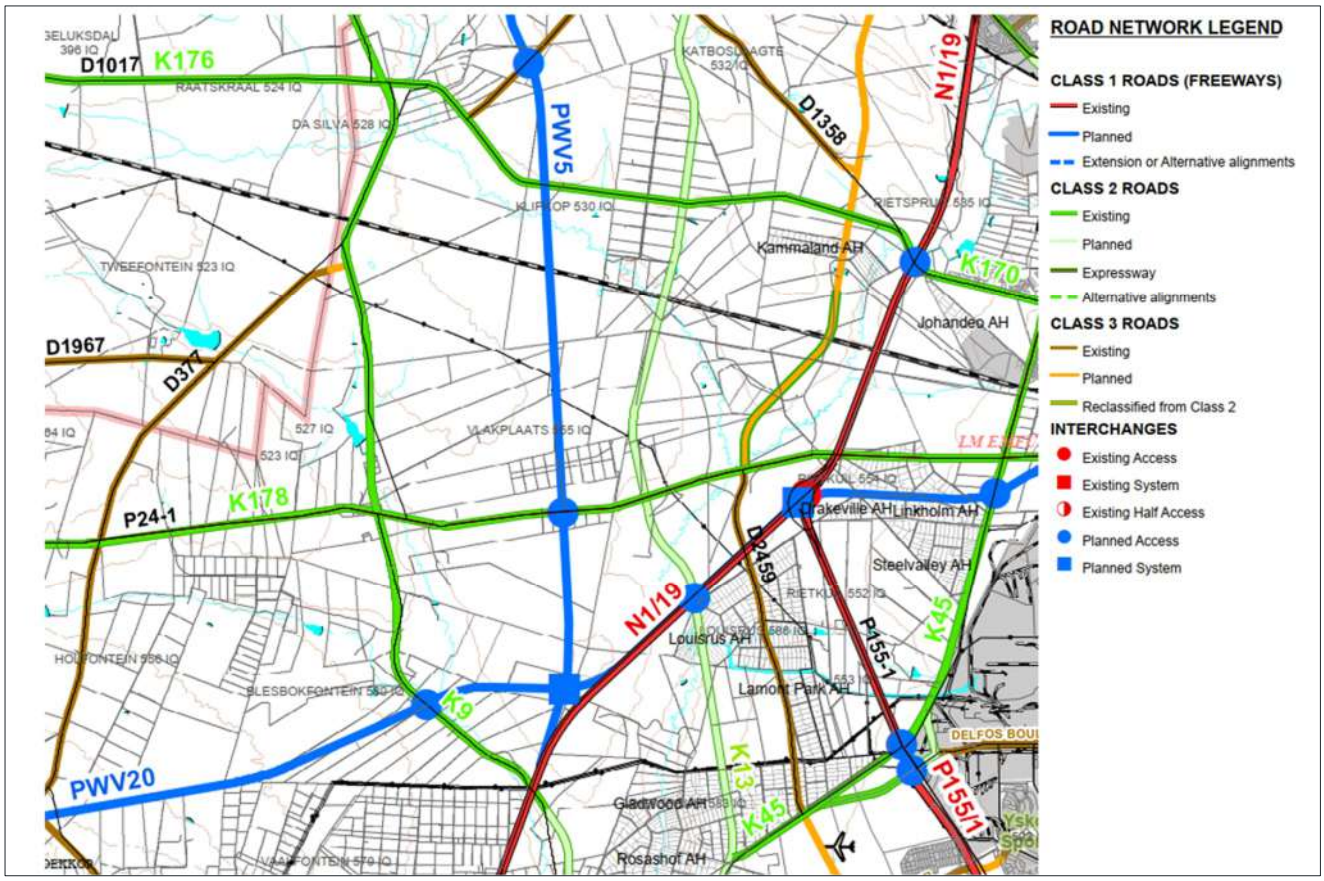


Figure 5-3 – Planned Gauteng Major Route Network (May 2010)

5.2.1. PWV Routes: Major Connecting Roads Proposed by Gautrans

<u>PWV5</u>

- The PWV5 is a planned north-south freeway that will serve as a major mobility corridor.
- It is planned to connect with the N1 and PWV20, forming a major systems interchange.
- The PWV5 will have an access interchange with the K178 route, located north of the proposed PWV20 interchange.

<u>PWV20</u>

- The PWV20 is a planned east-west freeway that will support cross-regional connectivity.
- It is designed to integrate with the N1 through system interchanges at the PWV5 and at the P55/1 (R57), facilitating seamless traffic flow between national and provincial roads.
- This freeway will enhance access to Sebokeng, Louisrus AH, and surrounding areas.
- Note, SANRAL has stated that the double loading of the N1 with the PWV20 traffic from the PWV5 to the N1/P155 interchanges could be problematic, and might necessitate the review of the Gauteng strategic road network plan in this area. This may include a realignment of the PWV20 to not join a section of the N1, thereby negating the need for the N1/PWV5/PWV20 interchange.

5.2.2. K-Routes: Supporting Regional Connectivity

K13

- The K13 is a planned north-south Class 2 road designed to support urban and regional mobility.
- It is planned to feature three major junction in the study area:
  - N1 Access interchange – Connecting the route to the national freeway. SANRAL has rejected this interchange due to interchange spacing requirements that will not be met.
  - K178 junction – Providing access to the Class 2 network.
  - K176 junction – Providing access to the Class 2 network.

K178 Route (P24/1 - R54)

- This is an existing route which overpasses the N1. It will serve as the primary connection of the Vaal Aerotropolis to the N1, and to the west and the eastern areas such as Sebokeng and Vanderbijlpark.
- It is proposed to construct the road to K-road standard from east of the N1 interchange, and west of Access 2 to the Airport. The P24/1 will be the link to the northern portion of the N1 SDI.

D2459

- A Class 3 road, it is partially built from the P24/1, it crosses the N1 at an overpass with no access to the N1, and terminates at a T-junction on the P129/1 (R553).
- It will be the link between the Vaal Aerotropolis and the southern portion of the N1 SDI.

P24/1 & D2459 grade separated junction

- A grade separated junction is proposed to link the upgraded P24/1 to the D2459. The purpose of grade separation is for sufficient capacity to support the Phase 1 Aerotropolis traffic and to accommodate background traffic growth.
- A conventional narrow diamond is proposed with the D2459 an overpass over the P24/1, with roundabout ramp terminals. Refer to Chapter 4 for the assessment and recommendations.

5.3 DESIGN CRITERIA

5.3.1. N1 FREEWAY

The geometric design of the N1 highway, including the proposed SDI interchange and access points, has been evaluated for compliance with the applicable design criteria. This chapter provides a detailed discussion of both the existing and proposed design standards.

The following design standards are referred to the design and optioneering process.

- SANRAL Geometric Design Guideline

- AASHTO 2016 6th Edition of a policy on Geometric Design of Highways and Streets.

Existing cross-section

The existing cross-section of the N1 is a dual carriageway with a north and southbound carriageway that comprises of two lanes with an inner and outer surfaced shoulder. The normal surfaced width is 10.7m and varies at ramp terminals.

The two carriageways are separated by a 20m wide median that forms a shallow V-shaped drainage canal.

The existing cross-section details of the N1 and the P155/1 interchange is shown in Figure 5-4, and the parameters are shown in Table 5-1.

Figure 5-4 – Existing cross-section of the N1 and P155/1 ramps

Table 5-1 – Existing N1 Cross-section geometrics

Existing N1 Cross-section element width		
Northbound Carriageway		
Outer shoulder width	**Lande widths**	**Inner Shoulder Width**
3m	3.7m x 2 normal carriageway and 3.7m x 3 at ramp terminals	Varies between 0.3m and 0.5m

South Bound Carriageway		
Outer Shoulder width	**Lane widths**	**Inner Shoulder Width**
3m	3.7m x 2 normal carriageway and 3.7m x 3 at ramp terminals	Varies between 0.3m and 0.5m
N1 to P155/1 Southbound Off-ramp		
2m	3.7m x 2 normal carriageway	1m
P155/1 Overpass Loop On-ramp		
2m	3.7m x 2 normal carriageway	1m

Horizontal and Vertical alignment

As built and survey information is currently unavailable. Consequently, a detailed analysis of the horizontal and vertical alignment, including parameters such as sight distance, superelevation, etc. could not be conducted. However, the design criteria for the N1 and the interchange ramps, based on the posted speed limit, is set at 120 km/h and 100 km/hr respectively. The vertical alignment of the N1 and interchange ramps is expected to conform to these standards. Detailed analysis of the existing design criteria is to be explored in detail in the next project stages.

5.3.2. P24/1 (R541) - Future K178

It is proposed to upgrade a portion of P24/1 to K-road standard from east of the proposed N1 split diamond interchange to west of the proposed Access 2 to the Vaal Aerotropolis. The proposed cross-section is a divided dual carriageway with 2 lanes per direction.

A high-level preliminary design was requested by Province to assess the future road alignment and connectivity to the northern portion of the proposed split diamond interchange. Only a Route Determination report is available for this section of the future K178.

The geometric design of this road section, including the planned N1 interchange ramp terminals has been evaluated for compliance with the applicable design criteria. This section provides a detailed discussion of both the existing and proposed design standards.

The following design standards are referred to the design and optioneering process.

- TRH26
- GDPTRW (2004)
- AASHTO 2016 6th Edition of a policy on Geometric Design of Highways and Streets.

Existing cross-section

The existing cross-section of the P24/1 is a single carriageway with 1 lane per direction and unsurfaced shoulders. The normal surfaced width is approximately 7.0m.

The existing cross-section is shown in Figure 5-5, and the parameters are shown in Table 5-2.

P24/1 (westbound) at the N1 overpass	P24/1 (westbound) at the D2459 junction

Figure 5-5 – Existing P24/1 cross-section

Table 5-2 – Existing P24/1 cross-section geometric details

Existing R54 cross-section element width		
Outer shoulder width	**Lane widths**	**Inner Shoulder Width**
Unsurfaced Variable width	3.5m x 2 lanes Single carriageway	N/a

Proposed cross-section

A conventional divided dual carriageway with 2 lanes per direction is proposed. Refer to Figure 5-6 for an extract of the cross-section as per the Route Determination report.

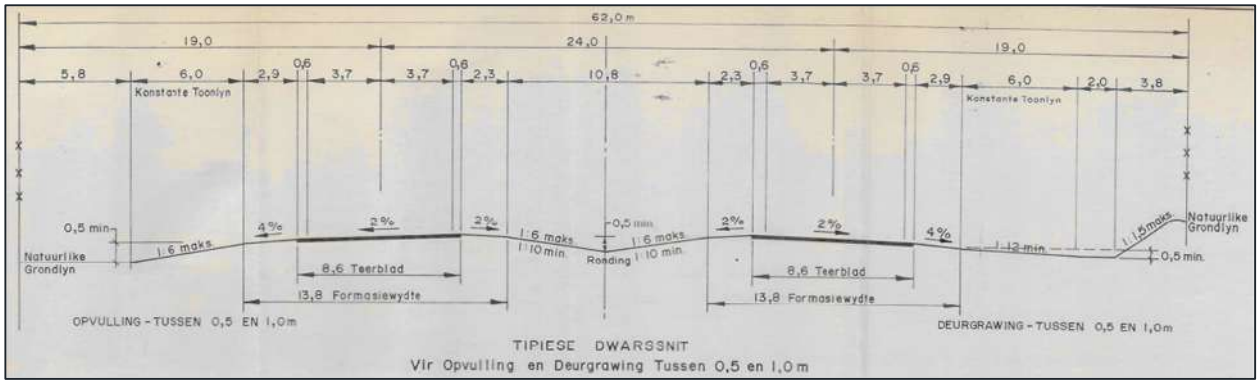


Figure 5-6 – Standard cross-section

Further Design Work

The long sections of the P24/1 west of the D2459 grade separated junction, and the ramps of the P24/1 / D2459 grade separated junction will be developed during detail design stage, and is pending the approval of the option of junction to be approved in principle by Province.

Design Decisions

Refer to Appendix A for the preliminary design drawings of the section of the future P24/1 from east of the N1/P24/1 roundabout to west of the P24/1 / D2459 garde separated junction.

Refer to Table 5-3 for the Decision Register of all the preliminary designs.

Table 5-3 – Design decision register: N1SDI, P24/1 & P24/1 / D2459 junction

Ref	Date	Owner/Designer	Issue Requiring Decision	Proposed Actions/Solutions	Related Guidance/Standard(s)	Option Selected / Incorporated Into Design	Agreed By	Resulting Action	Client to be Informed?
1	2025/10/16	Kiran Krishnan Ranjith Ramu Benson Mathew	The interruption of the traffic during the construction phase of the P24/1 road	Option A - Widen the existing P24/1 road symmetrically on both sides of the current alignment. This method may lead to traffic disruptions during construction and requires verification of land availability on both sides of the carriageway.		No	Gerhard Davel Christo Bredenhann	The design is developed based on Option B, maintaining the existing road as much as possible and proposing the new carriageway on one side of the existing carriageway	Yes
				Option B - Widen the P24/1 road on one side of the existing carriageway, maintaining the current alignment to minimize traffic disruption during construction. Land availability must be assessed in the proposed direction of expansion to ensure feasibility.		Yes			
2	2025/10/16	Kiran Krishnan Ranjith Ramu Benson Mathew	Cross-section values for the dual carriageway roads (K-Roads)	It is decided to adopt the 4-lane stage cross-sectional parameters as the standard typical cross section for rural dual carriageway roads, within the minimum 62-meter road reserve (GTP 2/9), as specified in the 'Typical Plans for Road Design 2019, Volume 1 of 2'	Typical Plans for Road Design 2019, Volume 1 of 2 Road design manual - Gauteng Provincial Government	Yes	Gerhard Davel Christo Bredenhann	Design is developed based on the 4-lane stage typical cross section for rural dual carriageway roads, within the minimum 62-meter road reserve based on GTP 2/9	Yes
3	2025/10/16	Kiran Krishnan Ranjith Ramu Benson Mathew	Discrepancy in design speed between the P24/1 file and the GTP 7/3 guidelines—the P24/1 file indicates a design speed of 120 km/h, whereas GTP 7/3 specifies 100 km/h for Dual carriageway roads (K-Roads)	It is decided to use a design speed of 100kmph as per GTP 7/3 against Rural Dual Carriageway Road (K-Roads)	Typical Plans for Road Design 2019, Volume 1 of 2 Road design manual - Gauteng Provincial Government	Yes	Gerhard Davel Christo Bredenhann	Design is developed assuming the design speed as 100kmph	Yes
4	2025/11/11	Kiran Krishnan Ranjith Ramu Benson Mathew	Cross-section details for the tie-in from the proposed P24/1 dual carriageway road to the existing single carriageway road	It is decided to adopt the typical transition from double to single carriageway (GTP 6/2) standard detail as specified in the 'Typical Plans for Road Design 2019, Volume 1 of 2'	Typical Plans for Road Design 2019, Volume 1 of 2 Road design manual - Gauteng Provincial Government	Yes	Gerhard Davel Christo Bredenhann	The transition from dual carriageway to single carriageway is developed based on GTP 6/2 standard detail	Yes
5	2025/11/11	Kiran Krishnan Ranjith Ramu Benson Mathew	Design standard to be adopted for the design of the roundabouts	The decision has been made to adopt the CD 116 – Geometric Design of Roundabouts from the DMRB, ensuring that all design parameters are consolidated in a single reference	CD 116 Geometric design of roundabouts	Yes	Gerhard Davel Christo Bredenhann	All the design parameters related to the roundabouts are designed based CD 116 standard	Yes

6	2025/11/11	Kiran Krishnan Ranjith Ramu Benson Mathew	An entry path radius exceeding 100m may lead to higher vehicle entry speeds into the roundabout, potentially compromising safety	It is decided to increase the ICD of the roundabouts on the P24/1 dual carriageway to 75m to reduce the entry path radius to less than 100m which will force the vehicle to slow when it enters the roundabout Further optimisation of the size of the roundabout will be carried out during the detailed design stage	CD 116 Geometric design of roundabouts	Yes	Gerhard Davel Christo Bredenhann	The roundabout on the proposed P24/1 dual carriageway road is designed to 75m ICD Further optimisation of the size of the roundabout will be carried out during the detailed design stage	Yes
7	2025/11/11	Kiran Krishnan Ranjith Ramu Benson Mathew	The proposed placement of the roundabouts along the R54 dual carriageway falls on an embankment, which is likely to elevate construction costs	It is decided to relocate the roundabouts to an at-grade position, away from embankments, in order to reduce construction costs		Yes	Gerhard Davel Christo Bredenhann	The roundabout position is fixed away from the embankments	Yes
8	2025/11/11	Kiran Krishnan Ranjith Ramu Benson Mathew	The SRTM-exported 3D survey does not reflect the actual condition at the site	It is decided to use the SRTM exported data at this stage for high-level tie-in checks Detailed check will be done during the detailed design stage once topo survey is available		Yes	Gerhard Davel Christo Bredenhann	The mainline profile and tie-ins are developed based on the SRTM exported data	Yes
9	2025/11/11	Kiran Krishnan Ranjith Ramu Benson Mathew	Design details (Horizontal and Vertical) for the ramps connecting the N1 highway	It is decided to choose the design speed, radius of the curve, cross-section, and gradients of the ramps connecting the N1 highway based on the TRH 17 geometric design of rural roads standards	TRH 17 - Geometric design of rural roads	Yes	Gerhard Davel Christo Bredenhann	The ramps connecting the N1 highways are designed based on the TRH 17 Design Speed:90 km/h (Table 10.4 TRH 17, against the through road speed of 120 km/h) Minimum horizontal radius:270m (Table 10.6, TRH 17) Minimum K value, 87 for crest and 51 for sag (Table 10.9.1(a)) Minimum length of vertical curve:60m (Table 10.9.1(b)) Ramp cross-section: two lane (4m each), shoulders with width of 2m Maximum Gradient - 8% (Cl:10.9 TRH 17)	Yes
10	2025/11/11	Kiran Krishnan Ranjith Ramu Benson Mathew	Design details (Horizontal and Vertical) for the ramps connecting the R54 road	It is decided to choose the design speed, radius of the curve, cross-section, and gradients of the ramps connecting the P24/1 road based on the typical plans for road design 2019 volume 1 of 2 by Gauteng province	Typical Plans for Road Design 2019, Volume 1 of 2 Road design manual - Gauteng Provincial Government	Yes	Gerhard Davel Christo Bredenhann	The ramps connecting the R54 road is developed based on the typical plans for road design 2019 volume 1 of 2 by Gauteng province Design Speed:80km/h (GTP 7/3) Minimum curve radius:250m (GTP 7/3) Maximum gradient: 8% (GTP 7/3) K values, Crest:33, Sag:26 (GTP 7/3) Minimum curve length: 140m (GTP 7/3)	Yes

11	2025/11/11	Kiran Krishnan Ranjith Ramu Benson Mathew	Difficulty in manoeuvring the WB15 around the roundabout with 40m ICD and 5.4m circulatory carriageway width	It is decided to provide a 2m apron on the roundabout for the smooth manoeuvring of the WB15 as per GTP 18/1-1	Typical Plans for Road Design 2019, Volume 2 of 2 Road design manual - Gauteng Provincial Government	Yes	Gerhard Davel Christo Bredenhann	An apron with a width of 2m is proposed for the 40m ICD roundabout junction between the R54 road and the District road	Yes
12	2025/11/11	Kiran Krishnan Ranjith Ramu Benson Mathew	Required length of dual lane on the ramp connecting N1 highway and R54 road	Based on the transport modelling team's calculations, a minimum dual lane length of 60 meters has been designated for the ramps connecting the N1 highway and the P24/1 road.		Yes	Gerhard Davel Christo Bredenhann	All the dual lanes on the ramps are designed to have more than 60m in Length The length can be further optimised during the detailed design stage.	Yes

5.4 CONCLUSION

The proposed road upgrade of a section of the P 24/1 to K-road standard meets all the required road design standards. The detail design of the road section will reconfirm all geometric standards.

6 VAAL AEROTROPOLIS PHASE 1 TRAFFIC FLOW ASSESSMENT

6.1 BACKGROUND

WSP has prepared a full Transportation Impact Assessment (TIA) for Phase 1 of the Vaal Aerotropolis. The report is in draft status pending the approval of the N1 split diamond interchange, and will be submitted to the relevant authorities (Emfuleni, SANRAL, Gauteng Department of Roads and Transport) for approval as part of the land-use application process.

The TIA assessed the Phase 1 traffic generation and impact on the road network for both the N1 access interchange options detailed in this report. A summary of the N/P24/1/D2459 split diamond interchange traffic assessment is included here for information.

The Emfuleni Local Municipality confirmed that only Phase 1 of the Vaal Aerotropolis needs to be assessed in the TIA, as the future phases of the Aerotropolis development is in the medium to long term.

Emfuleni Local Municipality confirmed that only the opening year (2033) traffic of the Vaal Aerotropolis Phase 1 needs to be assess in the TIA. This is due to the medium to long term planning horizon for the Phase 2 (in 30 years) and Phase 3 (in 60 years) development of the Aerotropolis.

6.2 AIRPORT TRIP GENERATION PHASE 1

The following table shows the trip summary of each land use for Phase 1 of the Airport and surrounding development.

Table 6-1 – Vaal Aerotropolis Phase Development Trips (weekday peak hours)

LAND USE	WEEKDAY AM PEAK			WEEKDAY PM PEAK		
	IN	OUT	TOTAL	IN	OUT	TOTAL
PASSENGER TERMINAL	1 989	1 654	3 643	1 791	1 944	3 735
TRADE ZONE	591	324	915	359	556	915
AIRPORT CITY	54	19	73	120	140	260
AGRIZONE	85	15	100	15	85	100
Total trips	**2720**	**2012**	**4731**	**2285**	**2725**	**5010**

Table 6-1shows that the proposed Phase 1 development will generate approximately 4731 vehicle trips during the weekday AM peak hour and 5010 vehicle trips during the weekday PM peak hour.

6.3 CURRENT TRAFFIC VOLUMES

Traffic surveys were undertaken on 22 October 2024. The surveys were classified and was from 6:00 to 18:00. Below is a summary of the current traffic volumes on the major roads.

- N1 (Between the K170 overpass and the R57 access interchange). The weekday peak hours traffic volumes along the N1 are 502 veh/hr (AM) and 572 veh/hr (PM) – northbound, and 612 veh/hr (AM) and 490 veh/hr (PM) – southbound.
- K170 (west of the N1) The weekday peak hours traffic volumes along the K170/K176 eastbound are 25 veh/hr (AM) and 36 veh/hr (PM) - (west of the N1). The weekday peak hours traffic volumes westbound is 24 veh/hr (AM) and 32 veh/hr (PM).
- R57 (East of the N1). The weekday peak hours traffic volumes along the R57 eastbound are 356 veh/hr (AM) and 333 veh/hr (PM). The weekday peak hours traffic volumes westbound is 355 veh/hr (AM) and 309 veh/hr (PM).
- R54 (West of the N1.). The weekday peak hours traffic volumes along the R57 eastbound are 59 veh/hr (AM) and 63 veh/hr (PM). The weekday peak hours traffic volumes westbound is 51 veh/hr (AM) and 46 veh/hr (PM).

6.4 FUTURE TRAFFIC VOLUME SCENARIOS

The 2024 background peak hour traffic volumes were subjected to a 2% growth rate to 2033, this is in line with an average growth rate expected for the study area. Refer to Figure 6-1 for the 2033 Phase 1 Development Trips (2033).

TRIP DISTRIBUTION AND ASSIGNMENT

- Assumptions with respect to the expected trip distribution were based on the location of the site access in relation to the surrounding road network; the existing traffic volumes, travel patterns as well as the land use nature of the proposed development.
- The implementation of the interchange will result in some additional trips that will access and exit the N1 at the two cross-roads. These volumes cannot be calculated without an in-depth regional traffic model, which is not deemed part of the scope of the TIA.
- The 2033 background traffic plus latent development trips plus total development traffic (Phase 1) volumes are shown in Figure 6-2.

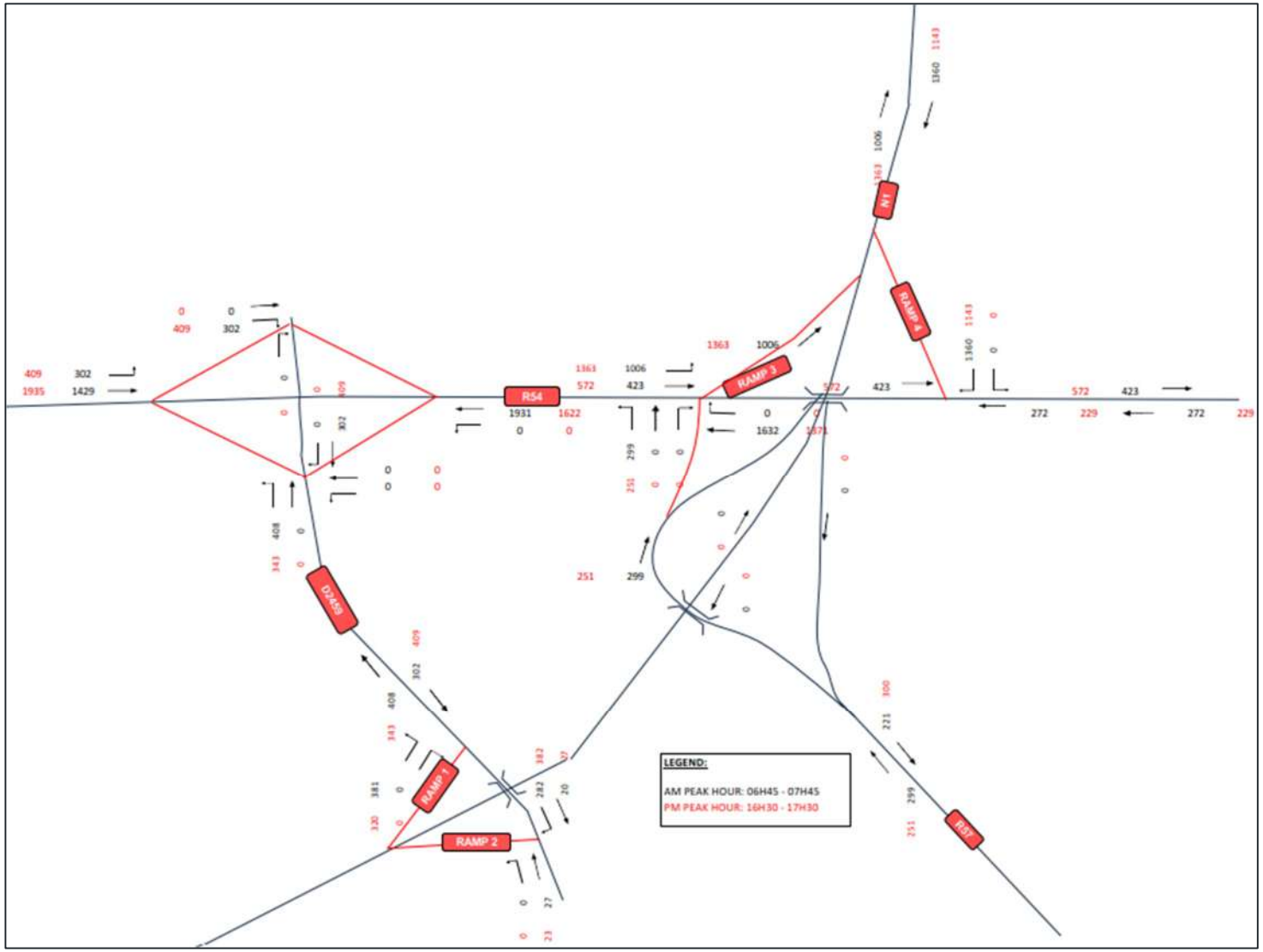


Figure 6-1 – Aerotropolis Phase 1: 2033 Development trips

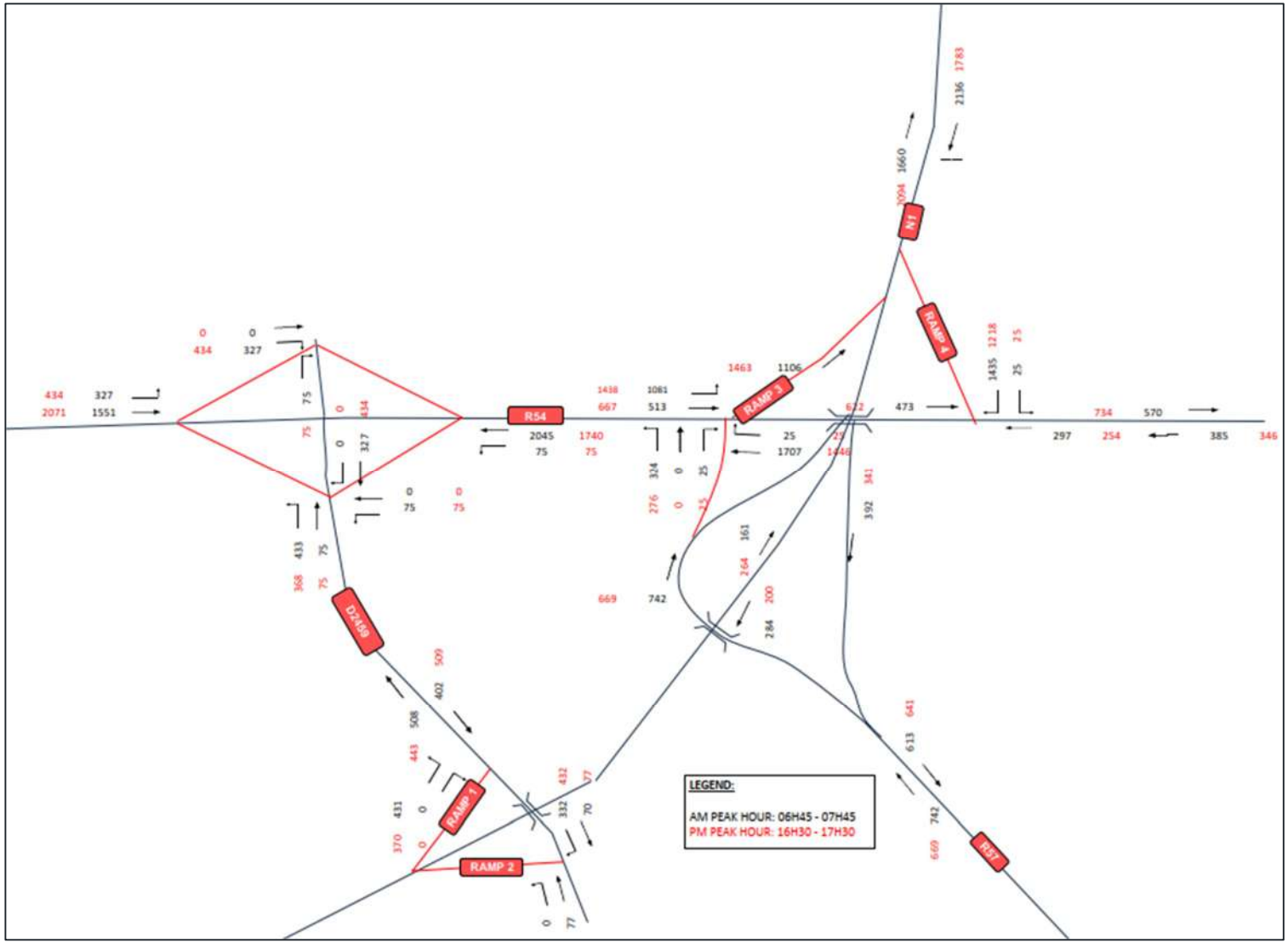
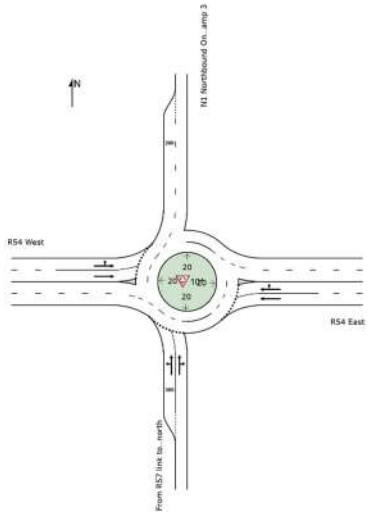
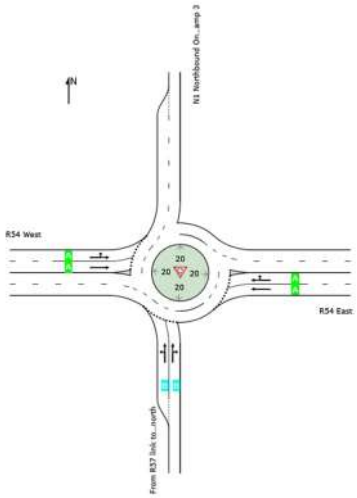
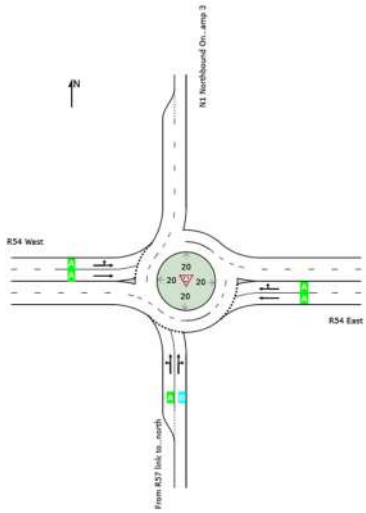


Figure 6-2 – Aerotropolis Phase 1: 2033 Background, latent and Development trips

6.5 N1 & P24/1 NORTHERN RAMP TERMINALS CAPACITY ANALYSIS

Refer to Table 6.2 and Table 6.3 for the 2033 capacity analysis results of the northern ramp terminals of the P24/1 with the N1 SDI.

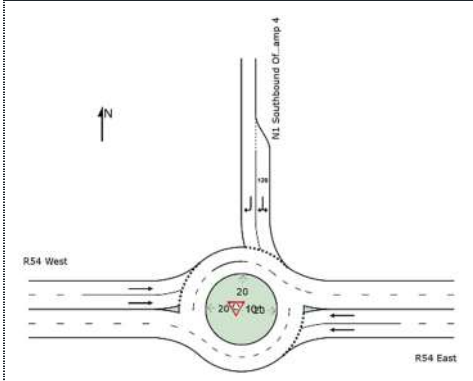
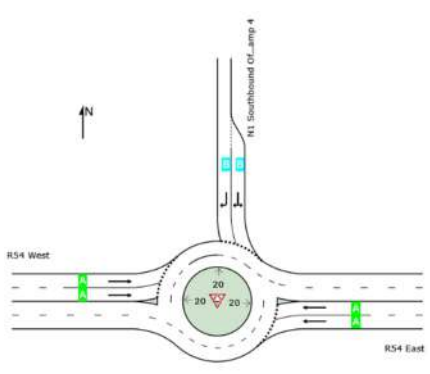
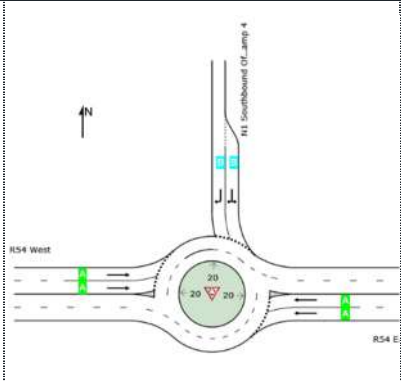
Table 6.2 - Capacity Analysis of P24/1 and N1 SDI Northbound on-ramp

INTERSECTION LAYOUT	LEVEL OF SERVICE (AM PEAK HOUR)	LEVEL OF SERVICE (PM PEAK HOUR)
		

CAPACITY ANALYSIS RESULTS

APPROACH		AM PEAK HOUR			PM PEAK HOUR			COMMENTS
		V/C	DELAYS (S)	LOS	V/C	DELAYS (S)	LOS	
SOUTH	LEFT	0.477	12.2	LOS B	0.369	9.4	LOS A	The intersection operates at an acceptable level of service for both the AM and PM peak hours with the proposed intersection layout.
	THROUGH	0.062	12.0	LOS B	0.059	10.7	LOS B	
	RIGHT	0.062	16.6	LOS B	0.059	15.4	LOS B	
	APPROACH	0.477	12.5	LOS B	0.369	9.9	LOS A	
EAST	THROUGH	0.562	4.1	LOS A	0.478	4.1	LOS A	
	RIGHT	0.562	8.7	LOS A	0.478	8.7	LOS A	
	APPROACH	0.562	4.1	LOS A	0.478	4.1	LOS A	
WEST	LEFT	0.736	4.8	LOS A	0.966	6.8	LOS A	
	THROUGH	0.445	4.4	LOS A	0.575	4.5	LOS A	
	APPROACH	0.736	4.7	LOS A	0.966	6.1	LOS A	
OVERALL		0.736	5.2	LOS A	0.966	5.7	LOS A	

Table 6.3 - Capacity Analysis of P24/1 and N1 SDI Southbound off-ramp

INTERSECTION LAYOUT	LEVEL OF SERVICE (AM PEAK HOUR)	LEVEL OF SERVICE (PM PEAK HOUR)
		

CAPACITY ANALYSIS RESULTS								
APPROACH		AM PEAK HOUR			PM PEAK HOUR			COMMENTS
		V/C	DELAYS (S)	LOS	V/C	DELAYS (S)	LOS	
EAST	THROUGH	0.314	8.8	LOS A	0.230	7.7	LOS A	The intersection operates at an acceptable level of service for both the AM and PM peak hours with the proposed intersection layout.
	APPROACH	0.314	8.8	LOS A	0.230	7.7	LOS A	
NORTH	LEFT	0.742	9.0	LOS A	0.680	9.0	LOS A	
	RIGHT	0.742	13.8	LOS B	0.680	13.8	LOS B	
	APPROACH	0.742	13.7	LOS B	0.680	13.7	LOS B	
WEST	THROUGH	0.154	4.1	LOS A	0.202	4.1	LOS A	
	APPROACH	0.154	4.1	LOS A	0.202	4.1	LOS A	
OVERALL		0.742	11.0	LOS B	0.680	10.2	LOS B	

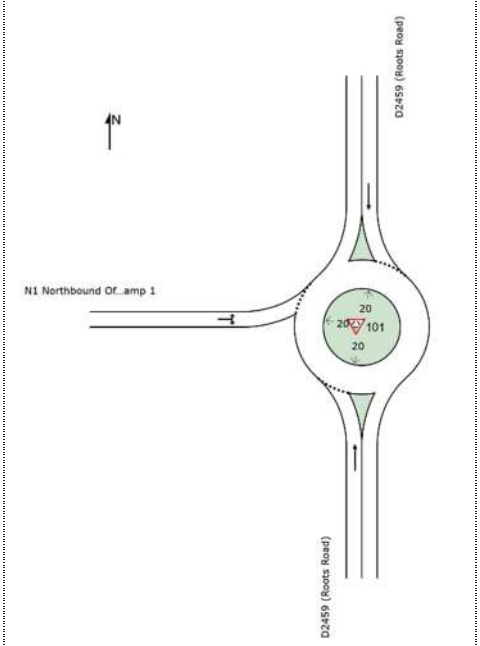
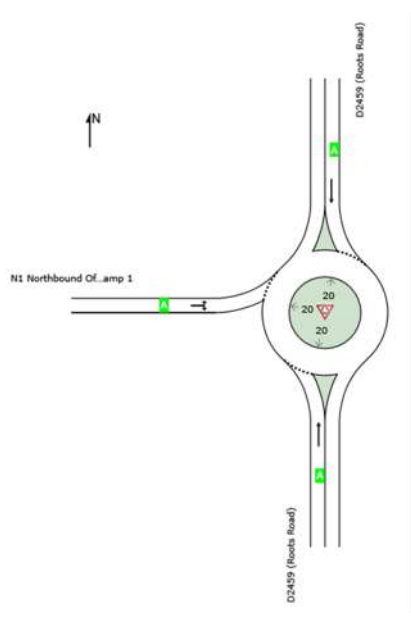
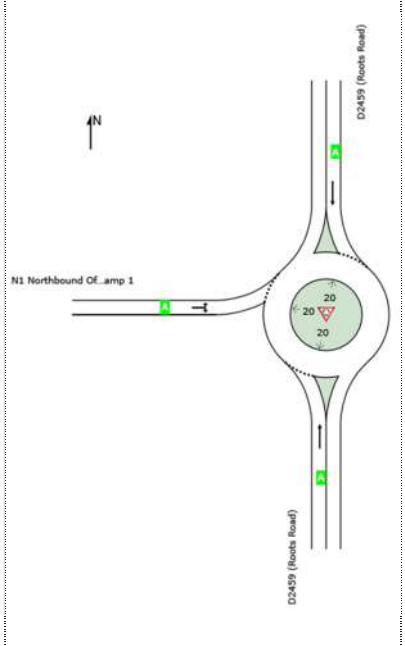
SUMMARY

The proposed dual lane roundabout ramp terminals of the N1 with the P24/1 will have ample capacity for the 2033 Phase 1 traffic of the Vaal Aerotropolis. Spare capacity will also be available for latent traffic demand in the study area that will utilise the interchange to access the N1.

6.6 N1 & D2459 SOUTHERN RAMP TERMINALS CAPACITY ANALYSIS

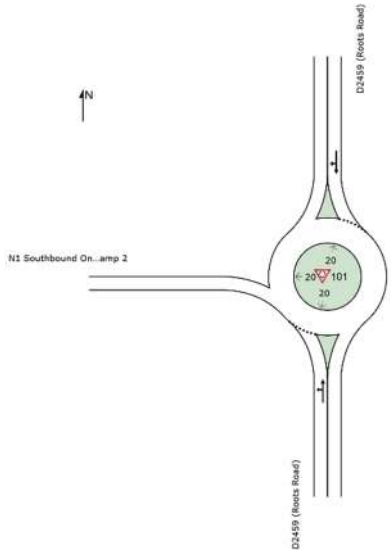
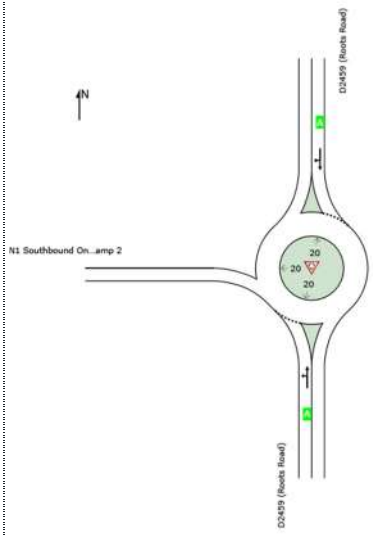
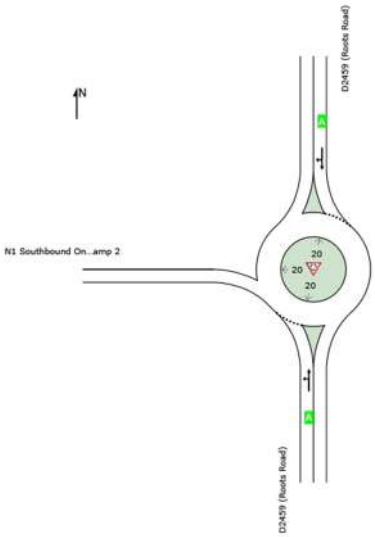
Refer to Table 6.4 and Table 6.5 for the 2033 capacity analysis results of the southern ramp terminals of the D2459 with the N1 SDI.

Table 6.4 - Capacity Analysis of the D2459 and N1 SDI Northbound off-ramp

INTERSECTION LAYOUT	LEVEL OF SERVICE (AM PEAK HOUR)	LEVEL OF SERVICE (PM PEAK HOUR)
		

CAPACITY ANALYSIS RESULTS								
APPROACH		AM PEAK HOUR			PM PEAK HOUR			COMMENTS
		V/C	DELAYS (S)	LOS	V/C	DELAYS (S)	LOS	
SOUTH	THROUGH	0.047	4.1	LOS A	0.045	4.1	LOS A	The intersection operates at an acceptable level of service for both the AM and PM peak hours with the proposed intersection layout.
	APPROACH	0.047	4.1	LOS A	0.045	4.1	LOS A	
NORTH	THROUGH	0.246	4.1	LOS A	0.311	4.1	LOS A	
	APPROACH	0.246	4.1	LOS A	0.311	4.1	LOS A	
WEST	LEFT	0.327	4.3	LOS A	0.281	4.3	LOS A	
	RIGHT	0.327	9.2	LOS A	0.281	9.1	LOS A	
	APPROACH	0.327	4.4	LOS A	0.281	4.3	LOS A	
OVERALL		0.327	4.2	LOS A	0.311	4.2	LOS A	

Table 6.5 - Capacity Analysis of the D2459 and N1 SDI Southbound on-ramp

INTERSECTION LAYOUT	LEVEL OF SERVICE (AM PEAK HOUR)	LEVEL OF SERVICE (PM PEAK HOUR)
		

CAPACITY ANALYSIS RESULTS								
APPROACH		AM PEAK HOUR			PM PEAK HOUR			COMMENTS
		V/C	DELAYS (S)	LOS	V/C	DELAYS (S)	LOS	
SOUTH	LEFT	0.079	5.6	LOS A	0.081	6.2	LOS A	The intersection operates at an acceptable level of service for both the AM and PM peak hours with the proposed intersection layout.
	THROUGH	0.079	5.8	LOS A	0.081	6.4	LOS A	
	APPROACH	0.079	5.8	LOS A	0.081	6.4	LOS A	
NORTH	THROUGH	0.245	4.1	LOS A	0.311	4.1	LOS A	
	RIGHT	0.245	8.7	LOS A	0.311	8.7	LOS A	
	APPROACH	0.245	7.9	LOS A	0.311	8.0	LOS A	
OVERALL		0.245	7.6	LOS A	0.311	7.8	LOS A	

SUMMARY

The proposed single lane roundabout ramp terminals of the N1 with the D2459 will have ample capacity for the 2033 Phase 1 traffic of the Vaal Aerotropolis. Spare capacity will also be available for latent traffic demand in the study area that will utilise the interchange to access the N1.

7 ENVIRONMENTAL SCREENING REPORT

7.1 INTRODUCTION

A Screening Report for an environmental authorization as required by the 2014 EIA regulations was undertaken to determine the site environmental sensitivity.

7.2 SCREENING REPORT N1/P24-1/D2459 SPLIT DIAMOND INTERCHANGE

Application Category: Infrastructure/Transport Services/Roads/Public

The following sections contain a summary of any development incentives, restrictions, exclusions or prohibitions that apply to the proposed development site as well as the most environmental sensitive features on the site based on the site sensitivity screening results for the application classification that was selected. The application classification selected for this report is: **Infrastructure/Transport Services/Roads/Public.**

The following summary of the development site environmental sensitivities is identified. Only the highest environmental sensitivity is indicated. The footprint environmental sensitivities for the proposed development footprint as identified, are indicative only and must be verified on site by a suitably qualified person before the specialist assessments identified below can be confirmed.

Table 7-1 - Development Area Environmental Sensitivity (N1/P24-1/D2459 SDI)

Theme	Very High Sensitivity	High Sensitivity	Medium Sensitivity	Low Sensitivity
Agriculture Theme	X			
Animal Species Theme		X		
Aquatic Biodiversity Theme	X			
Archaeological and Cultural Heritage Theme				X
Civil Aviation Theme		X		
Defence Theme				X
Palaeontology Theme			X	
Plant Species Theme			X	
Terrestrial Biodiversity Theme	X			

Animal Species Theme

The High Sensitivity to be noted in the Animal Species Theme shows the presence of *Aves-Typo capensis* (African Grass Owl). The species has an IUCN status of Vulnerable (VU) (an estimated, observed, suspected population decrease of 30% over the last 10 years).

Aquatic Biodiversity Theme

The Very High Sensitivity to be noted in the Aquatic Biodiversity Theme, shows the area to have '*Wetlands Channelled valley-bottom*' and *'rivers'*, which indicates a channelled valley-bottom wetland ecosystem situated within the area. The sensitivity map also indicates the river that runs nearby to the project.

Terrestrial Biodiversity Theme

The Very High Sensitivity represented in the sensitivity map regarding the Terrestrial Biodiversity Theme indicates the area of land to be in the '*National Protected Area Expansion Strategy'* (NPAES) area. It is a DFFE project that sets targets for protected area expansion, provides maps of the most important areas for protected area expansion, and makes recommendations on mechanisms for protected area expansion. The next area of sensitivity is the '*VU_Soweto Highveld Grassland'*, it is a vegetation type in South Africa that is considered vulnerable (VU) and is listed as a threatened ecosystem. The area also indicated as being in a CBA1, CBA2, ESA1 and ESA2 based on the vulnerable vegetation unit being the *Soweto Highveld Grassland*.

7.3 DESKTOP STUDY

The proposed interchange on the N1/R54/D2459 Split Diamond Interchange will entirely be located within the Soweto Highveld Grassland (Refer to Figure 7-1). This vegetation type is listed as Endangered. It is believed that due to historical agricultural activities in the area the vegetation may be disturbed and not representative of the vegetation type.

Figure 7-1 –N1/P24/1/D2459 SDI & P24/1/D2459 Interchange Vegetation Map

The study site is located within a Critical Biodiversity Area 1, Critical Biodiversity Area 2, Ecological Support Area 1 and Ecological Support Area 2 (Refer to Figure 7-2).

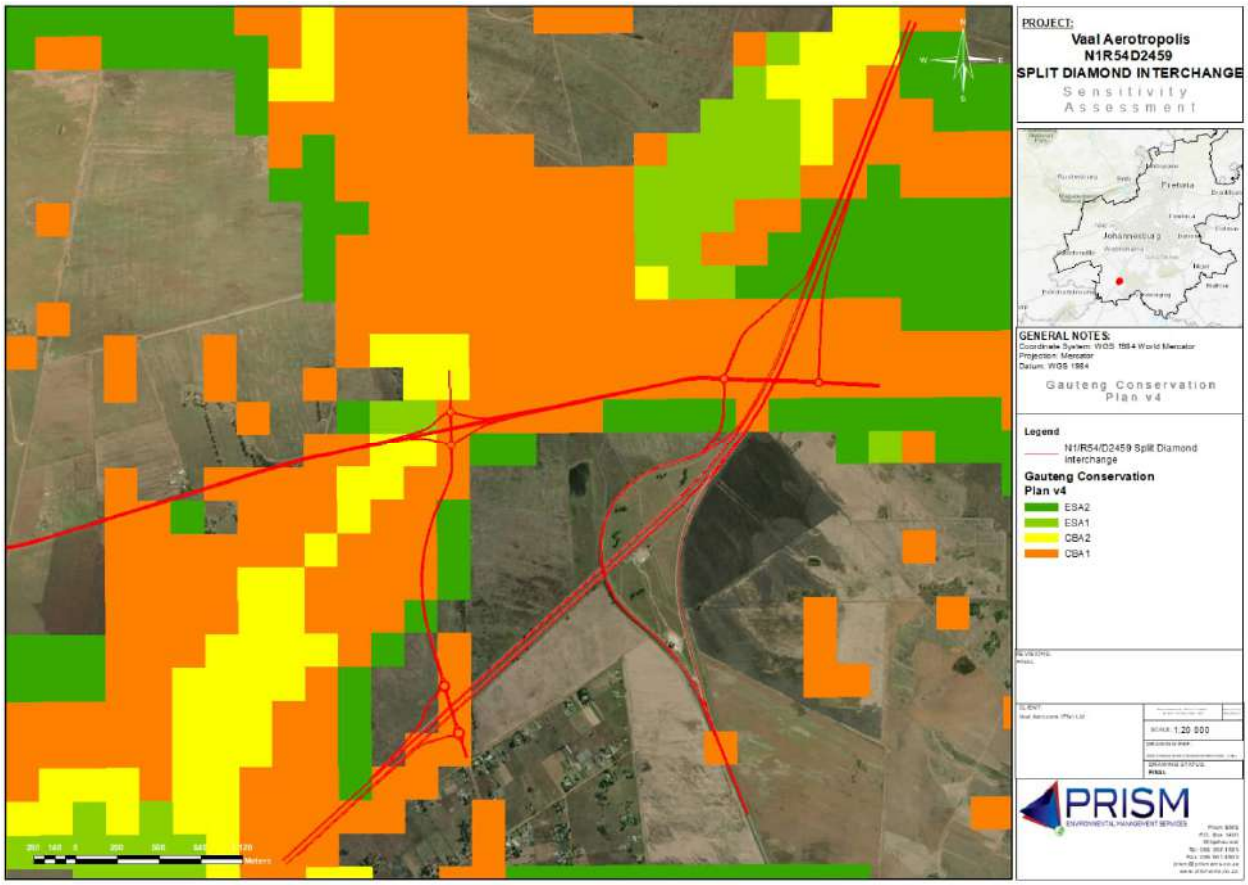


Figure 7-2 – N1/P24-1/D2459 Split Diamond Interchange CBA & ESA Map

The proposed intersection and road upgrade at the N1/P24-1/D2459 Split Diamond Interchange crosses a river and a wetland system (Refer to Figure 7-3).

The extent of the watercourse of the Rietspruit shown on Figure 7-3 is from the National Wetland database, and is indicative only. The full extent of the wetland system will have to be determined with a wetland delineation study.

Pending the outcome of the wetland delineation study, it may be considered to realign a section of the D2459 (as described in Chapter 4) and the location of the proposed grade separated junction further east or west, to avoid the wetland as far as possible.

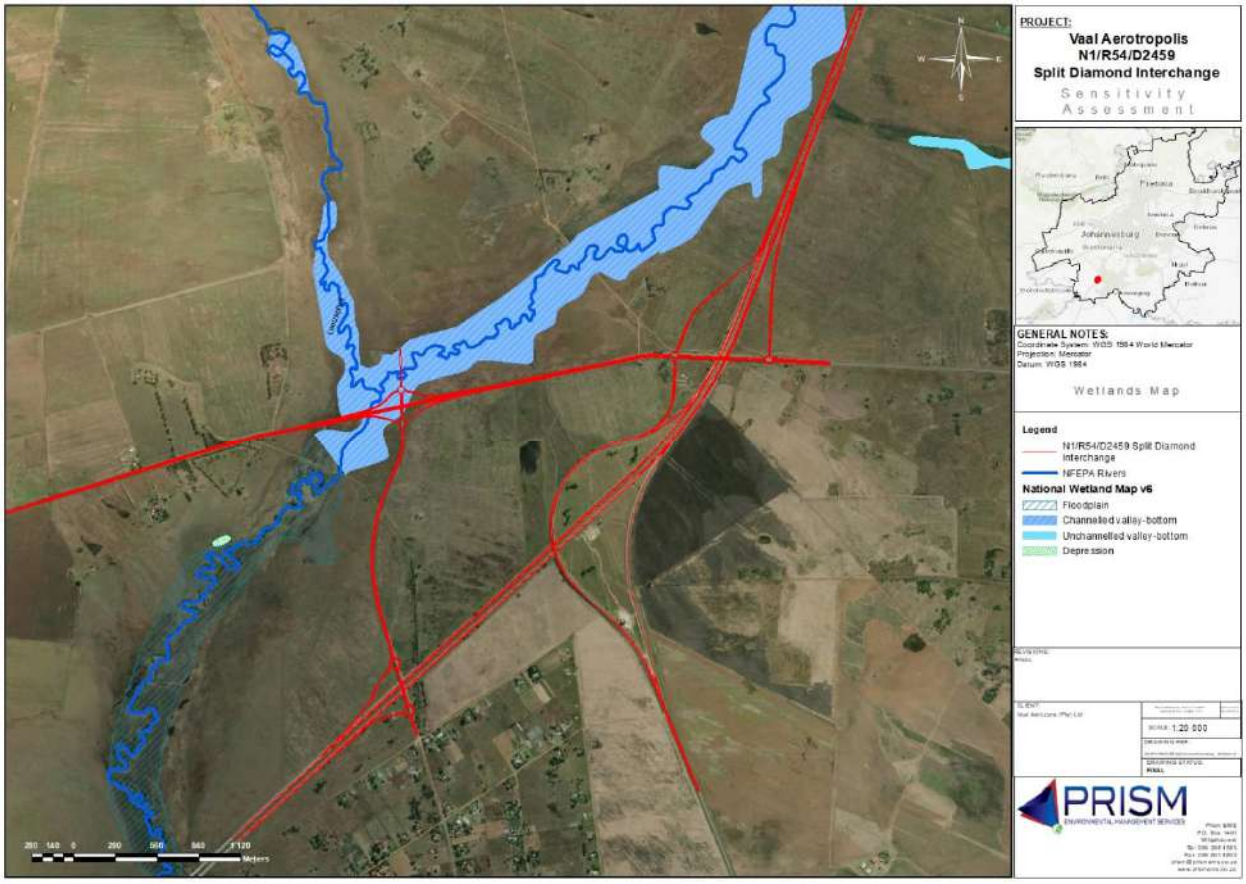


Figure 7-3 – N1/P24-1/D2459 Split Diamond Interchange Wetland Map

7.4 NATIONAL ENVIRONMENTAL MANAGEMENT ACT

In terms of the National Environmental Management Act, Act 107 of 1998 (NEMA), the following possible trigger activities in terms of the listing notices where considered:

Listing Notice	Activity Number	Type of Activity	Activity Description	Motivation why the activity is triggered
Listing Notice 1	12	The development of infrastructure	The development of: **(ii) infrastructure** or **structures** with a physical footprint of 100m² or more; (a) within a watercourse; (b) in front of a development setback; ***or*** (c) if no development setback exists, within 32m of a watercourse, measured from the edge of a watercourse;	The bridge infrastructure will have a physical footprint of more than 100m² within a watercourse.
Listing Notice 1	19	The **infilling** or depositing of any material of more than 10m³	The **infilling** or depositing of any material of more than 10m³ into, or the dredging, excavation, removal or moving of soil, sand, shells, shell grit, pebbles or rock of more than 10m³ from a watercourse	The bridge infrastructure will require infilling of material of more than 10m³.
Listing Notice 1	24	The development of a **road**	The development of a **road:** (ii) with a reserve wider than **13,5m**, or where no reserve exists where the road is wider than **8m**;	The road development will be wider than 13,5m.
Listing Notice 1	27	Clearance of vegetation	The clearance of an area of 1 hectare or more, but less than 20 hectares of indigenous vegetation, except where such clearance of indigenous vegetation is required for— (i) the undertaking of a linear activity; or	More than 1 ha of indigenous vegetation will be cleared.

			(ii) maintenance purposes undertaken in accordance with a maintenance management plan.	
Listing Notice 1	56	Road - expansion	The widening of a road by more than 6 metres, or the lengthening of a road by more than 1 kilometre— (i) where the existing reserve is wider than 13,5 meters; or (ii) where no reserve exists, where the existing road is wider than 8 metres; excluding where widening or lengthening occur inside urban areas.	The road expansion will be wider than 6 metres.
Listing Notice 3	12	Clearance of vegetation	The clearance of an area of 300 square metres or more of indigenous vegetation except where such clearance of indigenous vegetation is required for maintenance purposes undertaken in accordance with a maintenance management plan. c. Gauteng: ii. Within CBAs or ESAs identified in the Gauteng Conservation Plan or bioregional plans;	More than 300m^2 of indigenous vegetation will be cleared within a CBA.
Listing Notice 3	14	The development of infrastructure within a watercourse	The development of— (ii) infrastructure or structures with a physical footprint of 10m^2 or more; where such development occurs— (a) within a watercourse; (b) in front of a development setback; or (c) if no development setback has been adopted, within 32m of a watercourse, measured from the edge of a watercourse; excluding the development of infrastructure or structures within existing ports or harbours that will not increase the development footprint of the port or harbour.	The development of the bridge infrastructure will exceed 10m^2 and will be within a CBA, within a watercourse

			c. Gauteng; iv. Sites identified as CBAs or ESAs in the Gauteng Conservation Plan or in bioregional plans;	
Listing Notice 3	18	Roads - expansion	The widening of a road by more than 4 metres, or the lengthening of a road by more than 1 kilometre. c. Gauteng; iv. Sites identified as CBAs or ESAs in the Gauteng Conservation Plan or in bioregional plans;	The road expansion will be wider than 4m within a CBA
Listing Notice 3	23	The expansion of infrastructure within a watercourse	The expansion of (ii) infrastructure or structures where the physical footprint is expanded by 10m² or more; where such expansion occurs— (a) within a watercourse; (b) in front of a development setback adopted in the prescribed manner; or (c) if no development setback has been adopted, within 32m of a watercourse, measured from the edge of a watercourse; excluding the expansion of infrastructure or structures within existing ports or harbours that will not increase the development footprint of the port or harbour. c. Gauteng; iv. Sites identified as CBAs or ESAs in the Gauteng Conservation Plan or in bioregional plans;	The bridge infrastructure will be expanded by more than 10m^2 and within a CBA, within a watercourse

7.5 NATIONAL WATER ACT (NWA)

In terms of the National Water Act, Act 36 of 1998 (NWA), the following possible trigger activities under Section 21 of the NWA is considered:

Section 21 Activity Number	Activity Description	Motivation why the activity is triggered
c	Impeding or diverting the flow of water in a watercourse.	The construction of a bridge and road within the river and wetland system.
i	Altering the bed, banks, courses or characteristics of a watercourse.	The construction of a bridge and road within the river and wetland system.

Activities in terms of the Section 21 of the NWA will therefore be trigger and an application for a Water Use License (WUL) in terms of the NWA will be required.

8 IMPLEMENTATION PLAN (PHASING)

The implementation of the N1/P24-1/D2459 split diamond interchange and the upgrade of a section of the P24/1 will be undertaken in a single-phase**.** This decision ensures immediate and complete access to the Vaal Aerotropolis, facilitating efficient traffic flow for Phase 1 of the development. The project will encompass the full construction of the N1 SDI, and the required provincial road network upgrades for Phase 1, eliminating the need for segmented phases.

9 CONCLUSIONS AND RECOMMENDATIONS

9.1 NEW INTERCHANGES AND PROVINCIAL ROAD UPGRADE NEEDS

The Vaal Aerotropolis project requires effective road infrastructure to ensure seamless connectivity to the N1 highway and the regional Provincial road network.

A SANRAL proposed Split Diamond Access Interchange of the N1 with the P 24/1 and the D2459 has been developed to feasibility design level to test geometric, safety and spacing requirements. In addition, the upgrade of a portion of the P24/1 and a grade separated junction of the P24/1 and the D2459 has also been developed.

The purpose of this report is to obtain in-principle approval from the Gauteng Department of Roads and Transport for the N1 interchange, the upgrade of a portion of the P24/1 and a grade separated junction of the P24/1 and the D2459.

The in-principle approval will then form part of the N1 interchange application to SANRAL in a Fatal Flaw Report.

9.2 INTERCHANGE VIABILITY

The interchange options considered in this study are:

- N1-P24/1-D2459 split diamond interchange
- P24/1 -D2459 grade separated junction (Option 3)

Both interchange options have been found to be technically feasible and align with the Gauteng Department of Roads and Transport's planning framework and including SANRAL design criteria. The interchange will provide access to the Vaal Aerotropolis Phase 1, facilitate economic growth, and support the anticipated traffic demands associated with the airport and surrounding developments.

9.3 TRAFFIC ANALYSIS

A full Traffic Impact Assessment has been undertaken for the Vaal Aerotropolis Phase 1 for the 2033 opening year, as required by the Emfuleni Local Municipality. The TIA contains the capacity analysis of the N1 SDI and the grade separated junction of the P24/1 -D2459. The study confirms that the proposed road infrastructure will provide ample capacity for Phase of the Aerotropolis.

9.4 ENVIRONMENTAL CONSIDERATIONS

A preliminary environmental scan of the interchanges was undertaken, identifying key sensitivities in the study area. Both interchange options will require a detailed Environmental Impact Assessment (EIA) at design development stage to ensure compliance with regulatory requirements. The findings indicate that while the proposed locations intersect certain

environmentally sensitive zones, mitigation measures can be implemented to minimize negative impacts.

9.5 CONCLUSION

The P24/1 – and D2459 Split Diamond Interchange with the N1, and the P24/1 – D2459 grade separated junction (Option 3) are considered viable solutions for providing access to the Vaal Aerotropolis Phase 1 and for additional network capacity and flexibility.

To support the decision-making process, WSP has provided key information, including geometric and standards assessment, a traffic volume and capacity analysis, and a high-level environmental review.

The selected interchange will play a vital role in improving connectivity and supporting the long-term development of the Vaal Aerotropolis.

9.6 RECOMMENDATIONS

- The Traffic Impact Assessment will be finalised with the Provincial and or SANRAL in-principle approvals of the road infrastructure. The TIA will in due course be submitted to the Emfuleni Local Municipality as part of the land-use application of the Vaal Aerotropolis.

- A full Environmental Impact Assessment (EIA) will be conducted at design development stage for the approved option to ensure compliance with environmental regulations and to identify necessary mitigation strategies.

- WSP seeks the Gauteng Department of Roads and Transport in-principle approval for the N1/P24/1 and N1//D2459 SDI, and the P24/1 and D24659 garde separated junction (Option 3), as both are technically viable.

- WSP seeks the Gauteng Department of Roads and Transport in-principle approval for the upgrade of the P24/1 from a 2-lane single dual carriageway to K-route standard, divided dual carriageway with 2 lanes per direction from east of the N1 SDI up to the Vaal Aerotropolis accesses.

Appendix A

PRELIMINARY DESIGN DRAWINGS

Building 1, Maxwell Office Park
Magwa Crescent West, Waterfall City
Midrand, 1685
South Africa

wsp.com

CONFIDENTIAL

ANNEXURE P

Vaal Aerotropolis Design (Pty) Ltd

Vaal Aerotropolis - Land Preparation

Electrical Services Report_Rev 2

2026-05-29

43103108-ELEC-Rev2

Document distribution

Vaal Aerotropolis Design (Pty) Ltd
Vaal Aerotropolis - Land Preparation
Electrical Services Report

Report
2026-05-29
43103108-ELEC-Rev2

Prepared for

Vaal Aerotropolis Design (Pty) Ltd
PO Box 69535, Bryanston, 2021

Distributed to

Vaal Aerotropolis Design (Pty) Ltd
DBM Architects Jhb (Pty) Ltd
PRISM Environmental Management Services
MKona Consulting
Vaal Advanced Design Admin
Urban Dynamics Gauteng Inc.
Matla Quantity Surveyors
WSP Group Africa

Prepared by

WSP Group Africa (Pty) Ltd
Building 1, Maxwell Office Park, Magwa Crescent West, Waterfall City, Midrand,1685 South Africa
+27 11 361 1300

Quality control	Name	Date	Signature
Prepared by:	Khumbulani Mafasigodo	2026-05-29	
Reviewed by:	Siya Nxumalo	2026-05-29	
Approved by:	John Koketso Rammutla	2026-05-29	

Revisions

Rev	Date	Details
0	2025-01-31	Draft for Review
1	2025-04-08	Final – incorporating comments on draft report
2	2026-05-29	Revised to address environmental queries/ comments

Table of Contents

Executive summary **5**

1. Introduction **6**

1.1 Report Purpose 6
1.2 Background 6
1.3 Report Overview 6

2. Line Deviation (Distribution Scope) **7**

2.1 Scope of Works 7
2.2 Existing Load Flows Results 9
2.3 Programme 10
2.4 Cost Estimate 10
2.5 Budget Quote Requirements 11

3. Bulk Connection Supply - Dedicated Substation and Transmission Integration **13**

3.1 Phase 1 Supply Requirement and System Parameters 13
3.2 Network Integration Concept 13
3.3 Recommended Transmission Scope of Works/Monopoly Works 14
3.4 Distribution Level Works (132/11kV Vaal Airport Substation) 15
3.5 Line Infrastructure Olympus-Vaal Airport 132V Line (Standard) 16
3.6 Line Infrastructure Loop in Loop out Lochvaal – Scafell 132kV Line (Premium) 17
3.7 Contingency Results 18
3.8 Final Solution Fault Levels 18
3.9 Programme 19
3.10 Cost Estimate 19

4. Auxiliary Supply (Construction Phase) **21**

5. Engineering Integration Considerations **22**

6. Recommended Next Steps **23**

7. Conclusion **25**

List of Tables

Table 2-1: Summary of allocated Estimated Capital Costs 10
Table 2-2:Estimated Capital Cost of Standard Equipment on the Distribution System 11
Table 2-3: Summary of The Connection Charge Estimates, Fees Payable Upon Acceptance of The Cost Estimate Letter and Guarantees 11
Table 3-1:Summary of the Connection Charge Estimates, Fees Payable upon Acceptance of the Cost Estimate Letter and Guarantees 20

List of Figures

Figure 2-1: Proposed Rigi-SAR Tweenfontein Line Rebuild 8
Figure 2-2: 88kV Grid Line Loadings (%) 9
Figure 2-3: 88kV Grid Busbar Voltages (%) 9
Figure 2-4: Existing Fault Levels 10
Figure 3-1: Proposed Final Solution 14
Figure 3-2: Single Line Diagram of Proposed Integration Solution 15
Figure 3-3: Proposed SLD for the Vaal Airport Substation 17
Figure 3-4: 132kV Line Loadings (%) 18
Figure 3-5: 132kV Busbar Voltages (%) 18
Figure 3-6: Future Olympus Grid Network Fault Levels 19
Figure 3-7: Future Scafell Grid Network Fault levels 19
Figure 3-8: Future Rigi Grid Network Fault Levels 19
Figure 6-1: Proposed Rigi-Tweenfontein 88kV Rebuild and Bulk Connection Supply 132kV Lines 24

Appendices

Appendix A – Vaal Aerotropolis Masterplan
Appendix B – Line Deviation CEL
Appendix C – Bulk Connection CEL
Appendix D – Electrical Drawings

Executive summary

The electrical bulk supply strategy for the Vaal Aerotropolis development is underpinned by two (2) Cost Estimate Letters (CELs) issued by Eskom, covering:

- Bulk electrical supply connection,
- Line deviation and associated recoverable works.

Both CELs represent preliminary, non-binding engineering and cost assessments, issued solely to support a decision to proceed to the Budget Quote (BQ) stage (where detailed design, final scope definition, and cost certainty will be established). The CEL explicitly states that:

- It does not constitute an offer or contract, and
- All technical inputs and commercial assumptions lapse upon submission of a BQ request.

From an engineering perspective, this establishes that all scope, cost, timelines, and technical solutions remain subject to refinement during detailed design and BQ development.

1. Introduction

1.1 Report Purpose

This electrical services reports aims to document the electrical service requirements only of the new Vaal Aerotropolis and will form part of an Appendix to the overall Engineering Services Report for the Vaal Aerotropolis; which will to accompany the development's Environmental Impact Assessment (EIA) and planning applications. This report thus has the following objectives:

- To advise on the proposed development demands.
- To advise on the existing and planned bulk infrastructure capacities and timing.
- To propose high-level concept engineering designs for the proposed development.
- to document the interaction and liaison with the relevant service authorities (ESKOM)to establish all scope, cost, timelines, and technical solutions remain subject to refinement during detailed design and Bill of Quantities development.

1.2 Background

The electrical bulk supply strategy for the Vaal Aerotropolis development is underpinned by two (2) Cost Estimate Letters (CELs) issued by Eskom, covering:

- Bulk electrical supply connection,
- Line deviation and associated recoverable works.

Both CELs represent preliminary, non-binding engineering and cost assessments, issued solely to support a decision to proceed to the Budget Quote (BQ) stage (where detailed design, final scope definition, and cost certainty will be established). The CEL explicitly states that:

- It does not constitute an offer or contract, and
- All technical inputs and commercial assumptions lapse upon submission of a BQ request.

1.3 Report Overview

This Electrical Services Report discusses the line deviation (distribution scope) in section 2 and the bulk connection supply - dedicated substation and transmission integration in section 3. Auxiliary supply (construction phase) and engineering integration considerations are presented in sections 4 and 5 respectively. The recommended next steps are provided in section 6 and conclusions are drawn in section 7. All electrical drawings are included in Appendix D and indicated on the current Vaal Aerotropolis Masterplan, attached in Appendix A.

2. Line Deviation (Distribution Scope)

2.1 Scope of Works

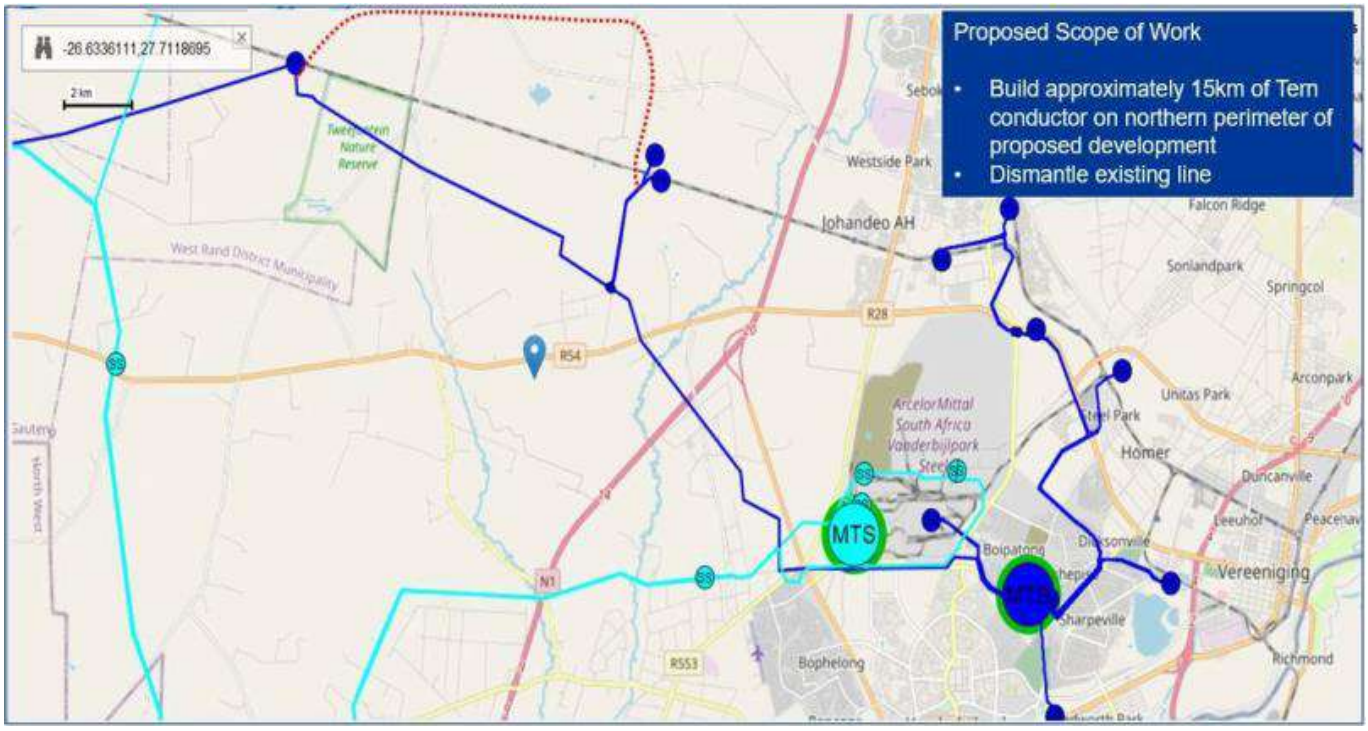
The line deviation CEL addresses the rerouting of the existing Rigi-SAR Tweenfontein 88 kV overhead line to accommodate the proposed development footprint. The preferred solution involves rebuilding approximately 15 km of Tern line along the development boundary, with tee-offs to Klipklop and SAR Katboslaagte.

The primary works are categorised as Eskom Connection Works, which include:

- Acquire and register servitudes and obtain all relevant environmental approvals.
- Obtain the line servitudes and environmental authorisations.
- Cancel existing servitudes for Rigi- SAR Tweenfontein 88kV line
- Cancel the existing servitudes
- Supply and build ~15km of Tern line from (27,6415, -26,5704) to (27.7445, -26.5907)
- Appoint a clerk of works to monitor project implementations.
- Test and commission and take over the assets.
- Identify all MV/LV transformers within developers' boundary.
- Dismantle ~48km of the existing MV line and equipment Elandsfontein Rural - Holfontein feeder from EH 89 30 to end of feeder.
- Dismantle 14km of existing MV line and equipment on Klipkop Cardoville feeder from KCA 87 22 2 to end of feeder.

These works are executed on the Distribution System (≤132 kV), forming part of Eskom's responsibility under connection works.

Figure 2-1: Proposed Rigi-SAR Tweenfontein Line Rebuild



Eskom has confirmed the implementation of a northern boundary realignment, whereby the existing transmission infrastructure will be relocated and reconstructed along the northern extent of the development. As indicated in Figure 2-1, the scope includes 15 km of new conductor installation along the northern corridor, coupled with the dismantling of the existing line traversing the site.

This approach ensures spatial segregation from the development footprint and resolves prior routing Aviation conflicts, with no material impact to cost or programme anticipated.

Monopoly Works

- Eskom will appoint a clerk of works to monitor the quality of the construction as well as the quality of material.
- Eskom will appoint a project manager to do site inspections and also monitoring of workmanship and materials/equipment.
- Eskom will monitor the Customer's environmental management in respect of the Contract Works
- Eskom will verify the design and equipment of the Contract Works
- Eskom will commission the metering, protection and the supervisory control and data acquisition system (SCADA).
- Eskom will monitor the installation of the Contract Works.
- Eskom will be responsible for any commissioning in respect of the Contract Works required after the Connection of the Electrical Installation to the Distribution System.
- Eskom will manage any outages required on the Distribution System and or Transmission System.
- Eskom will check and accept the route selection and will monitor the process of registration of the Servitudes in the name of Eskom.
- Eskom will effect the closing span to liven up the Connection Works as well as the optical fibre ground wire connection.

2.2 Existing Load Flows Results

The load flow results indicate that the majority of the existing 88 kV lines operate well within thermal limits under normal conditions.

Line	2025	2030	2035
Rigi SAR Tweefontein	35,74	65,04	81,07
Rigi SAR Katboslagte	8,85	8,85	8,75
Rigi Klipkop	9,31	38,87	55,16
SAR Tweefontein - Losberg	11,52	11,42	11,35
SAR Tweefontein - SAR Fochville	9,91	9,81	9,76

Figure 2-2: 88kV Grid Line Loadings (%)

The busbar voltage analysis shows that all nodes remain within acceptable operational limits, ranging between 0.96 p.u. and 1.00 p.u. across the study years.

Busbar	2025	2030	2035
Rigi	1,00	1,00	1,00
SAR Tweefontein	0,98	0,98	0,97
SAR Katboslagte	0,98	0,98	0,97
Klipkop	0,98	0,98	0,97
Losberg	0,97	0,97	0,96
SAR Fochville	0,97	0,97	0,96

Figure 2-3: 88kV Grid Busbar Voltages (%)

The existing fault level assessment indicates that fault currents remain within breaker ratings (typically 31.5 kA) across the network.

Study Year			2025		2030		2035	
Bus Bar Name	Nominal Voltage (kV)	Breaker Rating (kA)	3 Phase (kA)	Single Phase (kA)	3 Phase (kA)	Single Phase (kA)	3 Phase (kA)	Single Phase (kA)
SAR Tweefontein	88kV	31.5	3.13	1.905	3.13	1.905	3.13	1.905
SAR Fochville	88kV	31.5	2.124	1.271	2.124	1.271	2.124	1.271
Losberg	88kV	31.5	2.054	1.228	2.054	1.228	2.054	1.228
Klipklop	88kV	18.4	4.795	3.004	4.795	3.004	4.795	3.004
SAR Katbppslagte	88kV	31.5	5.031	3.165	5.031	3.165	5.031	3.165

Figure 2-4: Existing Fault Levels

2.3 Programme

The estimated connection works duration is **30 months**.

This duration is indicative only and is dependent on approvals, servitudes, and environmental compliance. It will be confirmed during the Budget Quote stage.

2.4 Cost Estimate

The Eskom issued cost estimate defines the capital expenditure associated with the provision of a standard distribution network connection, executed under a utility delivered Eskom build model.

The total estimated capital cost for the connection amounts to R25.71 million (excluding VAT) and R29.57 million (including VAT). This value is inclusive of escalation and applicable overheads and represents the full scope of works required to establish the network supply point and associated infrastructure.

Table 2-1: Summary of allocated Estimated Capital Costs

Cost Item	Excl. VAT	Incl. VAT
Pre-Project Investigation **(This is a standard cost based on the Cost Estimate Fee amount)**	R 19 724,97	R 22 683,72
Estimated Capital Cost for Standard Connection	R 25 689 125.50	R 29 542 494.33
Estimated Capital Cost for Premium Connection	R	R
Total Estimated Capital Cost	R 25 708 850.47	R 29 565 178.04

This cost is primarily made up of:

- Materials: R 12.51 million (incl. VAT)
- Labour: R 17.03 million (incl. VAT)

Table 2-2:Estimated Capital Cost of Standard Equipment on the Distribution System

Cost Item	Total Cost	Pro-rated %	Cost Excl. VAT	Cost Incl. VAT
Material	R 10 879 730.25	100%	R 10 879 730.25	R 12 511 689.79
Labour	R 14 809 395.25	100%	R 14 809 395.25	R 17 030 804.54
Total	R 25 689 125.50	100%	R 25 689 125.50	R 29 542 494.33

This cost structure confirms that the connection works are primarily driven by installation, construction, and commissioning activities, with significant on-site execution effort required for integration into the existing distribution network.

2.5 Budget Quote Requirements

The cost estimate indicates a total connection charge of approximately R29.57 million (incl. VAT) for the provision of a standard Eskom distribution network connection.

A preliminary cost estimation fee (CEF) has already been settled, resulting in a remaining connection balance of approximately R29.57 million (incl. VAT) payable upon acceptance of the cost estimate.

To proceed to the next project phase, a distribution quotation fee of approximately R4.70 million (incl. VAT) is required. This fee enables progression into the Budget Quotation (BQ) phase, which includes:

- Detailed design development
- Environmental and route assessments
- Finalisation of connection costs and scope

Table 2-3: Summary of The Connection Charge Estimates, Fees Payable Upon Acceptance of The Cost Estimate Letter and Guarantees

Connection Charge Estimate	Excl. VAT	Incl. VAT
CEF/Pre-Project Investigation Charge	R19 724,97	R22 683,72
Estimated Distribution Standard Connection Charge	R 25 689 126,00	R 29 542 494,90
Estimated Distribution Premium Connection Charge	R 0,00	R 0,00
Estimated Transmission Standard Connection Charge	R 0,00	R0,00
Estimated Transmission Premium Connection Charge	R 0,00	R 0,00
SUBTOTAL: CONNECTION CHARGE ESTIMATE	R 25 708 850,97	R 29 542 494,90
Less Cost Estimate Fee (already Paid)	R 19 724,97	R 22 683,72
BALANCE: CONNECTION CHARGES ESTIMATE*	R 25 689 126,00	R 29 565 178,62
FEES PAYABLE UPON ACCEPTANCE OF THE COST ESTIMATER LETTER		

Distribution Quotation Fee	R 4 086 757.00	R 4 699 770.55
Transmission Quotation Fee		
Total Quotation Fee	**R 4 086 757.00**	**R 4 699 770.55**
GUARANTEES		
Electricity Accounts Guarantee / Security Amount	R 0,00	
Early Termination Guarantee Amount	R 0,00	

3. Bulk Connection Supply - Dedicated Substation and Transmission Integration

The ultimate electrical demand for the full Vaal Aerotropolis development is estimated at approximately 50 MVA, based on projected long-term development requirements. However, the current first phase of development is limited to an initial 20 MVA supply request, aligning with near-term load requirements.

Eskom's proposed solution accommodates this phased growth strategy through the provision of a 132/11 kV bulk intake substation configured with three transformer bays, of which:

- Two (2) 40MVA transformers are to be installed initially to satisfy the Phase 1 demand (20 MVA), and
- The third (3) transformer position is reserved for future installation, allowing capacity expansion toward the ultimate demand of approximately 50 MVA without major substation redesign.

3.1 Phase 1 Supply Requirement and System Parameters

The development requires a dedicated bulk electrical supply, defined as:

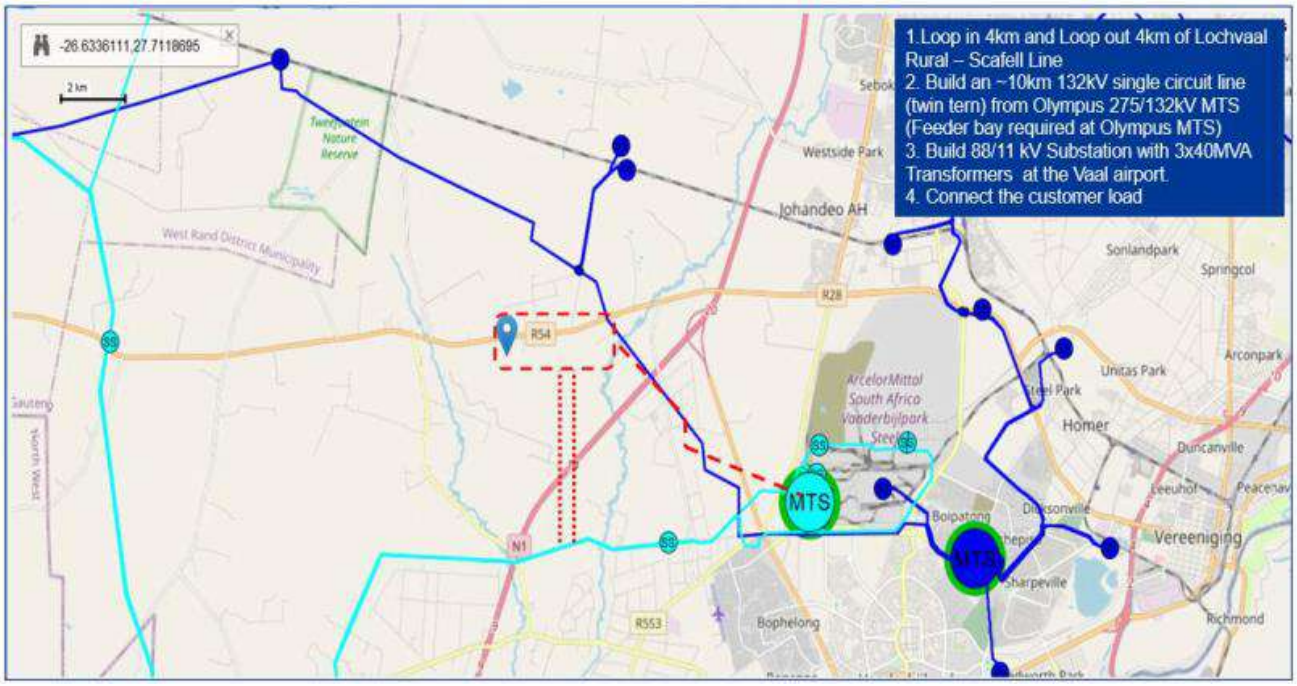
- Notified Maximum Demand (NMD): 20,000 kVA
- Connection Voltage Level: 11 kV (delivery)
- Upstream connection level: 132 kV transmission/distribution interface

This establishes a high-voltage bulk intake architecture, requiring both transmission and distribution infrastructure. This configuration provides a scalable, utility compliant bulk supply solution, enabling staged infrastructure deployment while maintaining alignment with ultimate load requirements.

3.2 Network Integration Concept

The recommended Eskom solution is a 132 kV based connection strategy. The proposed solution entails building approximately ~10 km 132 kV single circuit overhead line (tern) from Olympus MTS 275/132 kV and new substation 132/11 kV. In order to ensure a premium supply, a loop in loop out (LILO) from the existing Scafell -Lochvaal 132kV line is also proposed.

Figure 3-1: Proposed Final Solution



3.3 Recommended Transmission Scope of Works/Monopoly Works

The recommended solution for bulk supply connection is at 132 kV. The detailed recommended scope of work is as follows:

Upstream scope of work at Olympus Substation:

- None

Shared scope of work at Olympus Substation:

- Extend 132 kV yard
- Extend 132 kV busbar

Dedicated scope of work at Olympus Substation:

- Establish and equip 1 x 132 kV feeder bay

Upstream scope of work at Scafell Substation:

- None

Shared scope of work at Scafell Substation:

- None

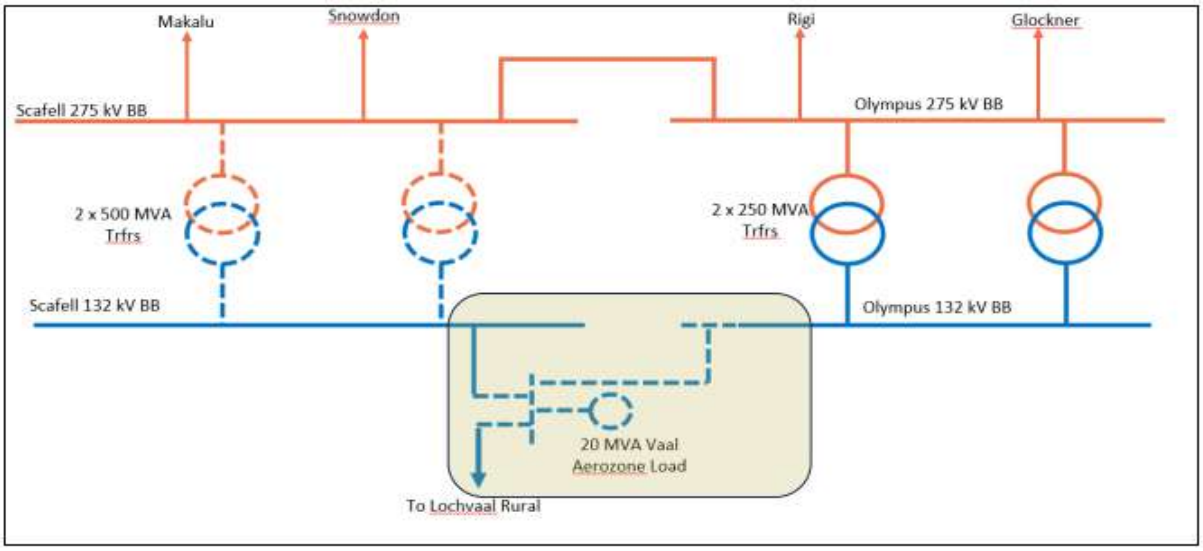
Dedicated scope of work at Scafell Substation:

- Upgrade protection scheme so that it is compatible with the feeder protection scheme that Distribution will install to integrate Vaal Aerozone load.

- Change the labels on Lochvaal Rural 132 kV feeder.

The single line diagram of the proposed connection solution, showing proposed connection solution at Olympus Substation and Scafell Substation is shown below.

Figure 3-2: Single Line Diagram of Proposed Integration Solution



3.4 Distribution Level Works (132/11kV Vaal Airport Substation)

Primary Plant Scope of Work:

- Acquire and register servitudes and obtain all relevant environmental approvals.
- Design, supply and build a 132/11 kV substation consisting of:
  - 3 Trfr bays
  - 6 fully equipped Line bays
  - Control room with 6 MV breakers
- Appoint a clerk of works to monitor project implementations.
- Build 3 x 132/11 kV transformer bays
- Supply and Install 3 x 40 MVA 132/11 kV transformers, Breakers, VT's,CT's and isolators for the all

  the transformer bays.
- Install 3 x 11kV Meter panels
- Test and commission and take over the assets.
- Build a control room, install high risk security fence, lighting, and lightning masts.

Control Plant Scope of Work

Protection

- Install, test and commission 2 x 132kV Feeders using the 5FZD# Line Differential/Impedance Schemes. (2 x CT/JB's & 2 x VT/JB's).
- Install, test and commission 132kV Bus Bar Protection using the 5BZ# Hi-Impedance Bus Zone

Protection Scheme.

- Install, test and commission 3 x 132/11kV 40MVA Transformers using the 5TM# Transformer
- Protection and the Tap Change Control Schemes. (3 x CT/JB's & 3 x
- VT/JB's)
- Install, test and commission 3 x 11kV Meter Panel Feeders using the 5RF# Feeder Protection Schemes.

Metering

- Install, test and commission the 132kV Stats Metering Panel. (2 x Feeders)
- Install, test and commission the 132kV Tariff Metering Panel. (3 x 11kV Meter Panel Feeders)
- Install 1 x Quality of Supply Module.

SCADA

- Test and commission the RTU with a 2 Vertical IDF. DNP3 Protocol to be used.

DC

- Install, test and commission the AC/DC Distribution Board.
- Install, test and commission the 110V 30A Battery Charger with 85 x VTX1 185A/H Battery Bank.

Telecoms

- Project Co-ordinator to order MSAP and associated equipment from the Telecoms Contracts Manager Sandile Mathebula.

Security

- Install, test and commission the Substation Security Alarm and CCTV systems.

Tx Interdependent Job:

- Apply to Eskom Transmission for 1 x 132kV Feeder bays for Vaal Airport 132/11 kV Substation

3.5 Line Infrastructure Olympus-Vaal Airport 132V Line (Standard)

Primary Plant Scope of Work:

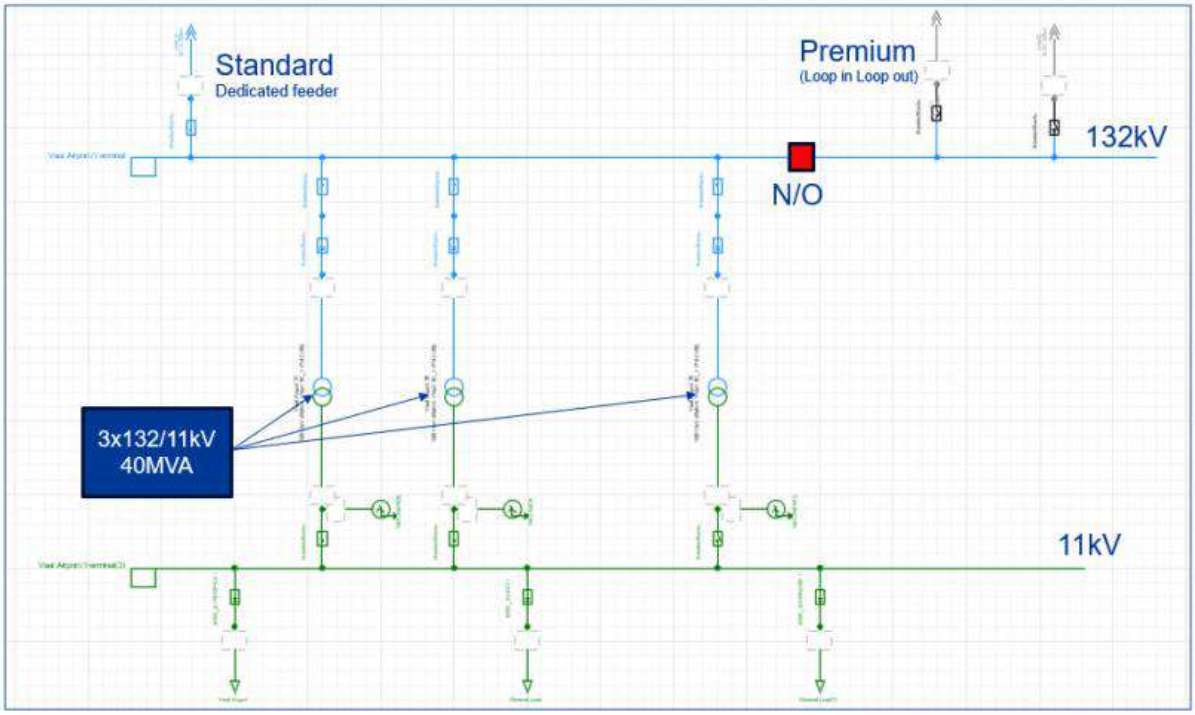
- Acquire and register servitudes for the line.
- Design, supply and build the proposed 1 x ~10 km 132kV tern single circuit line.
- Appoint a clerk of works to monitor project implementations.

Control Plant Scope of Work

Telecoms

- Project Co-ordinator to arrange with Telecoms Contracts Manager Sandile Mathebula w.r.t. the OPGW
- Fibre Optic to be installed on the new 10km Olympus – Vaal Airport SS 132kV Line.

Figure 3-3: Proposed SLD for the Vaal Airport Substation



3.6 Line Infrastructure Loop in Loop out Lochvaal – Scafell 132kV Line (Premium)

Primary Plant Scope of Work:

- Acquire and register servitudes for the line.
- Loop in approximately 4km Tern line from Lochvaal Scafell line to Customer substation.
- Loop out approximately 4km Tern line from customer substation to Lochvaal Scafell Line.

Telecoms

- Project Co-ordinator to arrange with Telecoms Contracts Manager Sandile Mathebula w.r.t. the OPGW.
- Fibre Optic to be installed on the new 4km LILO 132kV Line from Vaal Airport to the Scafell - Loch Vaal Rural 132kV Line.
- Project Co-ordinator to arrange with Telecoms Contracts Manager Sandile Mathebula w.r.t. the 48 Core OPGW, ADSS or Skywrapp Fibre Optic to be installed on the Scafell - Lochvaal Rural 132kV Line from the LI point to Olympus MTS which is approximately 10km length. The preferred option to be determined at design stage.

3.7 Contingency Results

Under N - 1 contingency conditions, the load will be maintained via the 132 kV LILO configuration, ensuring continued supply without interruption. The results confirm that the network will remain operationally compliant under single contingency scenarios.

The contingency analysis indicates that all 132 kV lines operate well within thermal limits. This confirms adequate network capacity and no overloading under contingency conditions.

Figure 3-4: 132kV Line Loadings (%)

Line	2025	2030	2035
AIRPORT- LOCHVAAL	10,25	10,22	10,22
Argon-Olympus 132_1 S1	0,94	0,94	0,94
Argon-Olympus 132_1 S2	0,48	0,48	0,48
Argon-Olympus 132_2 S1	0,94	0,94	0,94
Argon-Oxygen 132_1	0,44	0,44	0,44
Lochvaal Rural-Tee_Tahiti 132_1	0,24	0,24	0,24
Lochvall Rural-Scafell 132_1 S1	35,47	35,37	35,36
Lochvall Rural-Scafell 132_1 S2	35,85	35,76	35,75
Lochvall Rural-Scafell 132_1 S2_b	35,84	35,74	35,73
Lochvall Rural-Scafell 132_1 S2_d	35,84	35,75	35,73
Olympus-AIRPORT1	23,21	23,21	23,21
Oxygen-Tee_Lochvaal Rural 132_1 S1	0,01	0,01	0,01
Oxygen-Tee_Lochvaal Rural 132_1 S2	0,03	0,03	0,03
Oxygen-Vanderbijl North 132_1 S2	0,42	0,42	0,42
SCAFELL-AIRPORT	20,5	20,5	20,5
Scafell-Tahiti 132_1 S1	7,30	8,42	9,86

Busbar voltages will remain within acceptable limits, generally between 0.99 p.u. and 1.01 p.u., demonstrating stable voltage levels across the network under contingency operation, with no voltage violations identified.

Figure 3-5: 132kV Busbar Voltages (%)

Busbar	2025	2030	2035
ARGON	100,00	100,00	100,00
LOCHVAAL RURAL	99,69	99,39	99,33
OXYGEN	99,99	99,99	99,99
TAHITI	101,07	100,68	100,50
Vaal Airport	0,97	0,97	0,97

3.8 Final Solution Fault Levels

The fault level assessment indicates that all busbar fault levels across the Olympus, Scafell, and Rigi networks remain within the respective breaker ratings for the 2025 - 2035 study period.

The highest fault levels are observed at key nodes such as Vaal Airport (11 kV and 132 kV) and selected 132 kV substations; however, these remain within the acceptable interrupting capacities.

Overall, the results confirm that the proposed network configuration does not introduce fault level exceedances and is technically compliant with existing protection and switchgear ratings under both present and future conditions.

Figure 3-6: Future Olympus Grid Network Fault Levels

Study Year				2025		2030		2035	
Bus Bar Name		Nominal Voltage (kV)	Breaker Rating (kA)	3 Phase (kA)	Single Phase (kA)	3 Phase (kA)	Single Phase (kA)	3 Phase (kA)	Single Phase (kA)
Argon 132kV BB		132kV	31.5	12.225	14.471	12.225	14.471	12.225	14.471
Oxygen 132kV BB		132kV	31.5	12.043	14.082	12.043	14.082	12.043	14.082
Vanderbijl North		132kV	31.5	11.356	12.051	11.356	12.051	11.356	12.051
Vanderbijl Blow		132kV	31.5	12.797	15.603	12.797	15.603	12.797	15.603
Vanderbijl Reduction		132kV	25	12.086	13.989	12.086	13.989	12.086	13.989
Vaal Airport		132kV	40	13.95	17.86	13.95	17.86	13.95	17.86
Vaal Airport		11kV	40	35.06	1.12	35.06	1.12	35.06	1.12

Figure 3-7: Future Scafell Grid Network Fault levels

Study Year			2025		2030		2035	
Bus Bar Name	Nominal Voltage (kV)	Breaker Rating (kA)	3 Phase (kA)	Single Phase (kA)	3 Phase (kA)	Single Phase (kA)	3 Phase (kA)	Single Phase (kA)
Scafell BB	132kV	40	14.901	15.037	14.901	15.037	14.901	15.037
Lochvaal Rural	132kV	25	5.123	3.938	5.123	3.938	5.123	3.938
Tahiti	132kV	40	9.089	7.758	9.089	7.758	9.089	7.758
Fochville Munic	132kV	31.5	9.797	7.826	9.797	7.826	9.797	7.826
Fochville Rural	11kV	31.5	5.279	0.28	5.279	0.28	5.279	0.28

Figure 3-8: Future Rigi Grid Network Fault Levels

Study Year				2025		2030		2035	
Bus Bar Name		Nominal Voltage (kV)	Breaker Rating (kA)	3 Phase (kA)	Single Phase (kA)	3 Phase (kA)	Single Phase (kA)	3 Phase (kA)	Single Phase (kA)
SAR Tweefontein		88kV	31.5	3.13	1.905	3.13	1.905	3.13	1.905
SAR Fochville		88kV	31.5	2.124	1.271	2.124	1.271	2.124	1.271
Losberg		88kV	31.5	2.054	1.228	2.054	1.228	2.054	1.228
Klipklop		88kV	25	4.795	3.004	4.795	3.004	4.795	3.004
SAR Katbppslagte		88kV	31.5	5.031	3.165	5.031	3.165	5.031	3.165
Vaal Airport		88kV	40	28.62	31.02	28.62	31.02	28.62	31.02
Vaal Airport		11kV	40	35.45	1.67	35.45	1.67	35.45	1.67

3.9 Programme

Estimated timeline is approximately **36 months**. The programme includes design, approvals, procurement, construction and commissioning.

3.10 Cost Estimate

The table 8 below presents the total estimated connection cost, comprising both distribution (R100.6 M incl. VAT) and transmission (R71.3 M incl. VAT) works, resulting in a total connection estimate of R197.9 M (incl. VAT).

After accounting for the already paid CEF, the full balance (R197.85 M incl. VAT) remains payable upon acceptance of the cost estimate.

In addition, to proceed with Eskom's detailed design phase BQ, a quotation fee of R29.77 M (incl. VAT) is required, covering both distribution and transmission studies under Eskom's scope.

Table 3-1:Summary of the Connection Charge Estimates, Fees Payable upon Acceptance of the Cost Estimate Letter and Guarantees

Connection Charge Estimate	**Excl. VAT**	**Incl. VAT**
CEF/Pre-Project Investigation Charge	R 66 991,30	R 77 040,00
Estimated Distribution Standard Connection Charge	R 87 533 095,00	R 100 633 059,25
Estimated Distribution Premium Connection Charge	R 22 502 876,00	R 25 878 307,40
Estimated Transmission Standard Connection Charge	R 62 011 760,00	R 71 313 524,00
Estimated Transmission Premium Connection Charge	R 0,00	R 0,00
SUBTOTAL: CONNECTION CHARGE ESTIMATE	**R 172 114 722,30**	**R 197 931 930,65**
Less Cost Estimate Fee (already Paid)	R 66 991,30	R 77 039,99
BALANCE: CONNECTION CHARGES ESTIMATE*	**R 172 047 731,00**	**R 197 854 890,65**
FEES PAYABLE UPON ACCEPTANCE OF THE COST ESTIMATER LETTER		
Distribution Quotation Fee	R 23 774 020,00	R 27 340 123,00
Transmission Quotation Fee	R 2 115 940,00	R 2 433 331,00
Total Quotation Fee	**R 25 889 960,00**	**R 29 773 454,00**
GUARANTEES		
Electricity Accounts Guarantee / Security Amount	R 43 606 000,00	
Early Termination Guarantee Amount	R 25 714 000,00	

4. Auxiliary Supply (Construction Phase)

Provision of construction (auxiliary) supply requires submission of a temporary supply application to Eskom. The applicable process is determined by the requested capacity:

- >1 MVA - treated as a major supply application, requiring full technical assessment and approvals.
- <1 MVA - processed via the minor supply application route.

The supply will typically be derived from the nearest suitable distribution network tie-in point, subject to Eskom capacity and connection feasibility.

Upon submission, Eskom will issue the application forms and technical requirements, after which WSP must complete and return the documentation for processing and initiation of the connection works.

5. Engineering Integration Considerations

The project comprises an integrated transmission and distribution connection, requiring coordinated planning, protection, and control between Eskom Transmission and Distribution systems. The connection philosophy is based on a standard NRS 048 compliant solution, with provisions for a premium supply configuration to enhance reliability.

Key project risks are primarily commercial (non-binding estimates and scope changes at BQ stage), programme related (30/36-month delivery timelines requiring alignment), and technical (integration alignment with Eskom network and evolving scope definition).

All estimates are based on high level assumptions, with design and cost parameters subject to refinement during detailed design and the Budget Quotation phase.

6. Recommended Next Steps

The Eskom connection strategy establishes a technically viable high-voltage supply solution capable of meeting the project's long-term demand requirements. However, the solution remains preliminary, with key technical and commercial elements subject to confirmation during subsequent project phases.

It is recommended to proceed with submission of the Request for Budget Quote (BQ) and settlement of the required quotation fees to enable:

- Detailed design development
- Environmental studies
- Final cost determination

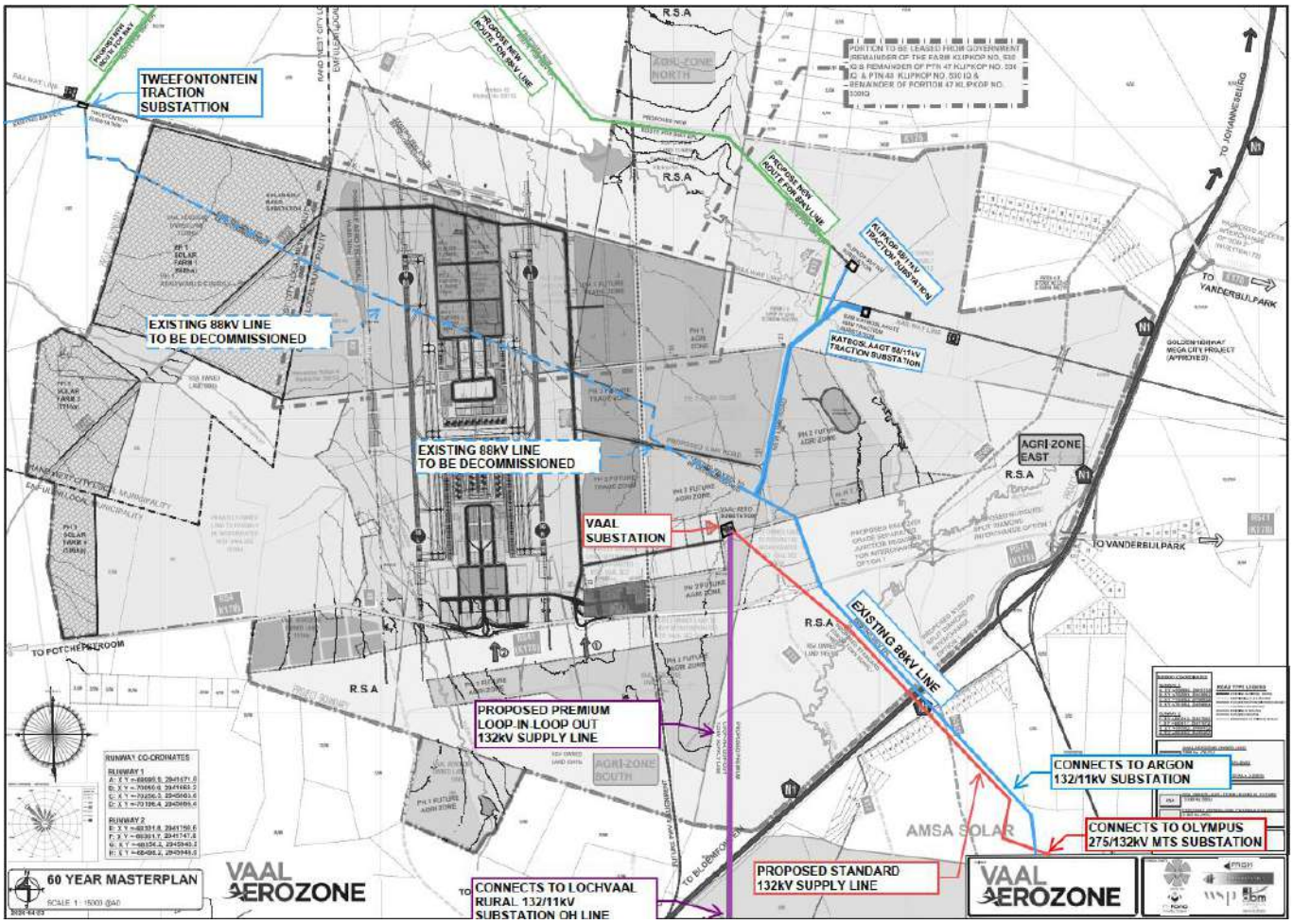
Further technical engagement with Eskom is required to:

- Confirm the final bulk supply configuration
- Align programme assumptions and delivery timelines

Following payment of the quotation fees, engagement will be initiated with Eskom and key stakeholders to assess the potential utilisation of the existing EIA approvals and determine the applicability of Prism for any additional environmental requirements.

These actions are required to achieve cost certainty, design finalisation, and implementation readiness for the project electrical infrastructure.

Figure 6-1: Proposed Rigi-Tweenfontein 88kV Rebuild and Bulk Connection Supply 132kV Lines



7. Conclusion

The electrical services strategy for the Vaal Aerotropolis development confirms that a robust, scalable, and technically compliant bulk supply solution can be achieved through the combined implementation of the line deviation works and the proposed 132/11 kV bulk intake substation integrated into the Eskom transmission network.

The line deviation scope provides a practical and coordinated solution to accommodate the development footprint, ensuring that existing 88 kV infrastructure is appropriately realigned without compromising network performance, safety, or reliability. The associated load flow, voltage, and fault level analyses confirm that the existing distribution network remains within acceptable operational limits, with no critical constraints identified.

The bulk supply strategy, centred on a phased 132 kV integration, demonstrates strong alignment with both immediate and ultimate demand requirements (20 MVA to ~50 MVA). The proposed configuration, comprising a dedicated substation, new transmission line infrastructure, and a LILO connection, ensures:

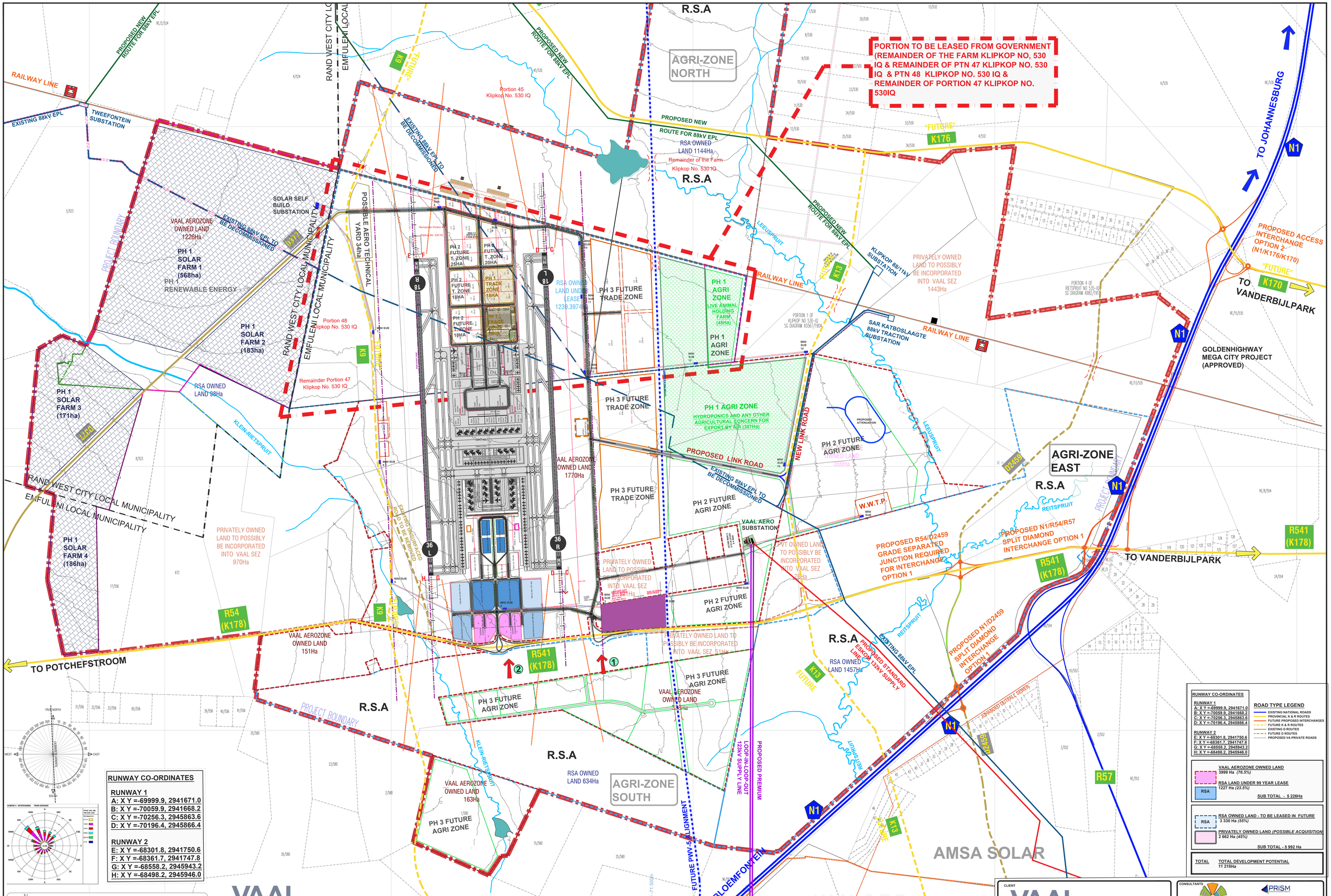
- Adequate network capacity,
- Compliance with thermal, voltage, and fault level limits,
- Resilience under contingency (N-1) conditions, and
- Flexibility for future expansion without major redesign.

While the proposed solution is technically sound, it is important to recognise that all current scope, costs, and programme estimates remain preliminary, as they are based on Eskom Cost Estimate Letters (CELs). These will require further refinement and confirmation during the Budget Quotation (BQ) stage, where detailed design, environmental approvals, and final cost certainty will be established.

From a programme and commercial perspective, the development must account for long lead implementation timelines (approximately 30–36 months) and significant capital investment requirements across both distribution and transmission scopes. Early progression to the BQ stage is therefore critical to maintaining project momentum and aligning infrastructure delivery with the broader development programme.

In conclusion, the proposed electrical infrastructure solution is feasible, scalable, and aligned with Eskom requirements, providing a sound foundation for enabling the Vaal Aerotropolis development. The successful implementation of this strategy will depend on timely progression to detailed design, continued stakeholder engagement with Eskom, and proactive management of environmental, servitude, and commercial processes.

Appendix A – Vaal Aerotropolis Masterplan


PORTION TO BE LEASED FROM GOVERNMENT (REMAINDER OF THE FARM KLIPKOP NO. 530 IQ & REMAINDER OF PTN 47 KLIPKOP NO. 530 IQ & PTN 48 KLIPKOP NO. 530 IQ & REMAINDER OF PORTION 47 KLIPKOP NO. 530IQ
R.S.A
AGRI-ZONE NORTH
AGRI-ZONE EAST
AGRI-ZONE SOUTH
AMSA SOLAR
VAAL S.E.Z
RAND WEST CITY LOCAL MUNICIPALITY
EMFULENI LOCAL MUNICIPALITY
PROJECT BOUNDARY
RAILWAY LINE
EXISTING 88kV EPL
TWEEFONTEIN SUBSTATION
PROPOSED NEW ROUTE FOR 88kV EPL
EXISTING 88kV EPL TO BE DECOMMISSIONED
SOLAR SELF BUILD SUBSTATION
VAAL AEROZONE OWNED LAND 1226Ha
PH 1 SOLAR FARM 1 (568ha)
PH 1 RENEWABLE ENERGY
PH 1 SOLAR FARM 2 (183ha)
PH 1 SOLAR FARM 3 (171ha)
PH 1 SOLAR FARM 4 (186ha)
POSSIBLE AERO TECHNICAL YARD 34Ha
RSA OWNED LAND 98Ha
KLEIN-RIETSPRUIT
Portion 45 Klipkop No. 530 IQ
Portion 48 Klipkop No. 530 IQ
Remainder Portion 47 Klipkop No. 530 IQ
RSA OWNED LAND 1144Ha
Remainder of the Farm Klipkop No. 530 IQ
LEEUSPRUIT
KLIPKOP 88/11kV SUBSTATION
PRIVATELY OWNED LAND TO POSSIBLY BE INCORPORATED INTO VAAL SEZ 1443Ha
SAR KATBOSLAAGTE 88kV TRACTION SUBSTATION
PROPOSED ACCESS INTERCHANGE OPTION 2 (N1/K176/K170)
TO JOHANNESBURG
TO VANDERBIJLPARK
GOLDENHIGHWAY MEGA CITY PROJECT (APPROVED)
PH 1 AGRI ZONE
LIVE ANIMAL HOLDING FARM (48Ha)
PH 3 FUTURE TRADE ZONE
PH 2 FUTURE T. ZONE 25HA
PH 3 FUTURE T. ZONE 20HA
PH 2 FUTURE T. ZONE 18HA
PH 1 TRADE ZONE 18HA
RSA OWNED LAND UNDER LEASE 1239.3974Ha
PH 1 AGRI ZONE
HYDROPONICS AND ANY OTHER AGRICULTURAL CONCERN FOR EXPORT BY AIR (307Ha)
PROPOSED LINK ROAD
NEW LINK ROAD
PROPOSED ATTENUATION
PH 2 FUTURE AGRI ZONE
VAAL AEROZONE OWNED LAND 1770Ha
VAAL AERO SUBSTATION
W.W.T.P.
PRIVATELY OWNED LAND TO POSSIBLY BE INCORPORATED INTO VAAL SEZ 970Ha
PRIVATELY OWNED LAND TO POSSIBLY BE INCORPORATED INTO VAAL SEZ 51Ha
PRIVATELY OWNED LAND TO POSSIBLY BE INCORPORATED INTO VAAL SEZ 76Ha
PROPOSED R54/D2459 GRADE SEPARATED JUNCTION REQUIRED FOR INTERCHANGE OPTION 1
PROPOSED N1/R54/R57 SPLIT DIAMOND INTERCHANGE OPTION 1
PROPOSED N11/D2459 SPLIT DIAMOND INTERCHANGE OPTION 1
PROPOSED STANDARD ESKOM 132kV SUPPLY LINE
EXISTING 88kV EPL
REITSPRUIT
RSA OWNED LAND 1457Ha
VAAL AEROZONE OWNED LAND 151Ha
VAAL AEROZONE OWNED LAND 333Ha
PH 3 FUTURE AGRI ZONE
RSA OWNED LAND 634Ha
VAAL AEROZONE OWNED LAND 163Ha
LOOP-IN-LOOP-OUT 132kV SUPPLY LINE
PROPOSED PREMIUM
FUTURE PWV-9 ALIGNMENT
TO BLOEMFONTEIN
TO LINDEQUESDRIFT
TO POTCHEFSTROOM
TO VANDERBIJLPARK
R54 (K178)
R541 (K178)
R57
N1
K176
K170
K13
K9
D2459
RUNWAY CO-ORDINATES
RUNWAY 1
A: X Y =-69999.9, 2941671.0
B: X Y =-70059.9, 2941668.2
C: X Y =-70256.3, 2945863.6
D: X Y =-70196.4, 2945866.4
RUNWAY 2
E: X Y =-68301.8, 2941750.6
F: X Y =-68361.7, 2941747.8
G: X Y =-68558.2, 2945943.2
H: X Y =-68498.2, 2945946.0
ROAD TYPE LEGEND
EXISTING NATIONAL ROADS
PROVINCIAL K & R ROUTES
FUTURE PROPOSED INTERCHANGES
FUTURE K & R ROUTES
EXISTING D ROUTES
FUTURE D ROUTES
PROPOSED VA PRIVATE ROADS
VAAL AEROZONE OWNED LAND
3999 Ha (76.5%)
RSA LAND UNDER 99 YEAR LEASE
1227 Ha (23.5%)
SUB TOTAL - 5 226Ha
RSA OWNED LAND - TO BE LEASED IN FUTURE
3 330 Ha (55%)
PRIVATELY OWNED LAND (POSSIBLE ACQUISITION)
2 662 Ha (45%)
SUB TOTAL - 5 992 Ha
TOTAL
TOTAL DEVELOPMENT POTENTIAL
11 218Ha
60 YEAR MASTERPLAN
SCALE 1 : 15000 @A0
2026-04-23
VAAL AEROZONE
CLIENT
CONSULTANTS
PRISM
BRIAN DYNAMICS
M-Kona
wsp
dbm

Appendix B – Line Deviation CEL

Eskom

Mr. Siya Nxumalo
Electrical Engineer
Vaal Aerozone (Pty) Ltd
P O Box 35465
MENLO PARK
0102

18 May 2026
Stoffel Makale
Tel: 011 516 7036
Quote Ref No:
VDL1004623733

Dear Mr Nxumalo

COST ESTIMATE LETTER FOR LINE DEVIATION AT PORTION 15 (A PORTION OF PORTION 1) VLAKPLAATS 555 NEW DEVELOPMENT, VANDERBIJLPARK

Thank you for your application for a line deviation to the Electrical Installation.

Eskom has assessed your requirements and herewith provides an estimate of the cost of providing the Works and the Connection. It is based on engineering assumptions and provided in order to assist in making a decision whether or not you should proceed to request a Budget Quote.

This Cost Estimate Letter is not an offer for a contract. It is purely illustrative and in anticipation of a request for a Budget Quote. No information contained in this Cost Estimate Letter shall be deemed to form part of any contract between Eskom and the Customer.

Furthermore, if based on this Cost Estimate Letter a Request for Budget Quote is submitted to Eskom, any information recorded in this Cost Estimate Letter will lapse immediately (even if a Budget Quote is eventually not provided or accepted) and Eskom will not be bound to perform in terms of this Cost Estimate Letter in any way.

The provision of a Budget Quote related to any portion of the Eskom related cost not covered through the Connection Charge, is subject to such funding being included in Eskom's budget and approval for the investment being obtained through Eskom's governance processes.

Eskom will require certain documents and Approvals, set out herein, and payment of a Distribution Quotation Fee and if applicable a Transmission Quotation Fee, in order to provide a Budget Quote.

1. DEFINITIONS AND INTERPRETATION

1.1 Notwithstanding that this Clause 1 deals with interpretation, where any sub-clauses hereof contain operative provisions, effect shall be given thereto as set out herein.

1.2 The following capitalised words and expressions shall have the meanings as assigned to them and cognate expressions shall have corresponding meanings:

1.2.1 **'Act'** means the Electricity Regulation Act of 2006, including any regulations issued pursuant thereto, as amended or re-enacted from time to time;

1.2.2 **'Approvals'** means any permission, permit, approval, consent, licence, authorisation, registration, grant, acknowledgement, exemption or agreement required to be obtained from any Government Authority;

1.2.3 **'Approved Credit Rating for South African Financial Institutions'** means (i) at least one investment grade long-term unsecured local currency debt rating by a rating agency which is at or better than 'BBB-' (as determined by Standard and Poor's Rating Group or Fitch Ratings), 'Baa3' (as determined by Moody's Investor Services, Inc.); or (ii) long-term unsecured local currency debt rating not worse than the highest South Africa's sovereign local currency debt rating; or (iii) South African Long-term National Scale Rating no worse than 'zaA-' (as determined by Standard & Poor's) or 'A-(zaf)' (as determined by Fitch Ratings) or 'A3.za' (as determined by Moody's Investor Services, Inc.) or (iv) equivalent rating to any of

the above ratings (as determined by a rating agency approved by Eskom);

1.2.4 **'Approved Credit Rating for Non-South African Financial Institutions'** means (i) at least one investment grade long-term unsecured foreign currency debt rating by a rating agency which is at or better than 'BBB-' (as determined by Standard and Poor's Rating Group or Fitch Ratings), 'Baa3' (as determined by Moody's Investor Services, Inc.); or (ii) long-term unsecured foreign currency debt rating not worse than the highest South Africa's sovereign foreign currency debt rating; or (iii) equivalent rating to any of the above ratings (as determined by a rating agency approved by Eskom);

1.2.5 **'Approved Credit Rating for South African Holding Companies'** means (i) at least one investment grade long-term unsecured local currency debt rating by a rating agency which is at or better than 'BBB-' (as determined by Standard & Poor's or Fitch Ratings) or 'Baa3' (as determined by Moody's Investor Services, Inc); or (ii) long-term unsecured local currency debt rating not worse than the highest South Africa's sovereign local currency debt rating; or (iii) South African long-term national scale rating no worse than 'zaA-' (as determined by Standard & Poor's) or 'A-(zaf)' (as determined by Fitch Ratings) or 'A3.za' (as determined by Moody's Investor Services, Inc) or (iv) equivalent rating to any of the above ratings *(as determined by a rating agency approved by* Eskom);

1.2.6 **'Approved Credit Rating for Non-South African Holding Companies'** means (i) at least one investment grade long-term unsecured foreign currency debt rating by a rating agency which is at or better than 'BBB-' (as determined by Standard & Poor's or Fitch Ratings) or 'Baa3' (as determined by Moody's Investor Services, Inc); or (ii) long-term unsecured foreign currency debt rating not worse than the highest South Africa's sovereign foreign currency debt rating; or (iii) equivalent rating to any of the above ratings (as determined by a rating agency approved by Eskom);

1.2.7 **'Budget Quote'** means the budget quote, with its appendices, to be issued by Eskom to the Customer;

1.2.8 **'Business Day'** means any day other than Saturday, Sunday or an official public holiday in South Africa;

1.2.9 **'Capital Allowance'** means the customer's contribution to cost of connection for both dedicated connection assets and/or upstream assets, to be recovered from customers through future network charges;

1.2.10 **'Capital Costs'** means the total actual capital costs of the Eskom Works but excluding the costs of the Monopoly Works;

1.2.11 **'Code(s)'** means the Distribution Code, the South African Grid Code, the Grid Connection code for Renewable Power Plants or any other code, published by NERSA, as applicable to Eskom and/or the Customer;

1.2.12 **'Connection'** means the physical connection of the Electrical Installation to the Distribution System and/or the Transmission System;

1.2.13 **'Connection Charge'** means, subject to adjustment, the total Standard Connection Charge and the Premium Connection Charge recouped or to be recouped by Eskom from the Customer for the cost of the Eskom Works comprising the Capital Costs, a contribution to shared costs, and if applicable, the Monopoly Works Cost, less the Capital Allowance calculated in compliance with the Code(s);

1.2.14 **'Connection Charge Estimate'** means the total estimated Connection Charge as set out in Table 1 of Annexure G (Financial Specifications) before adjustments for scope changes, inflation, force majeure and foreign exchange and commodity prices;

1.2.15 **'Connection Charge Guarantee'** means a Guarantee issued for an amount equal to the Connection Charge Guarantee Amount which amount will be set out in the Budget Quote;

1.2.16 **'Connection Charge Guarantee Amount'** means (a) initially, an amount equal to the balance

of the Connection Charge Estimate as set out in Table 1 of Annexure G (Financial Specifications), and (b) thereafter, the amount in paragraph (a) adjusted by reference to (i) deductions for any instalments received by Eskom in the preceding year pursuant to the Budget Quote and (ii) deductions or additions resulting from any adjustments made by Eskom pursuant to the Budget Quote in the preceding year;

1.2.17 **'Connection Charge Payment Schedule'** means the schedule of Connection Charge instalments and corresponding instalment payment dates to be set out in the Budget Quote, as amended by Eskom from time to time on written notice to the Customer pursuant to the Budget Quote;

1.2.18 **'Connection Rights-of-Way'** means all rights-of-way and rights of access over, across, into or from any land that will be required to lay any distribution facilities, plant, equipment, lines, cables or wires included in the Connection Works, including any alternative rights-of-way and rights of access if Eskom's preferred rights-of-way and rights of access are not available on terms and conditions that Eskom considers commercially reasonable and technically feasible;

1.2.19 **'Connection Works'** means the planning, financing, insuring, land rights acquisition, design, engineering, procurement, supply, fabrication, construction, erecting, installation, inspection of the electricity network infrastructure comprised in the Connection and all activities and requirements ancillary to these, and includes the Customer Connection Works and the Eskom Connection Works;

1.2.20 **'Contract Works'** means the portion of the Eskom Connection Works to be undertaken by the Customer in accordance with the conditions of the Self-Build Agreement to be concluded between the Customer and Eskom;

1.2.21 **'Contract Works Equipment'** means the plant, facilities, equipment and assets, which together comprises the portion of the Connection to be supplied by the Customer in accordance with the conditions of the Self-Build Agreement to be concluded between the Customer and Eskom. The Contract Works Equipment shall include any and all machinery, apparatus and materials that would ordinarily form part of a Network, such as telecommunication equipment, even if such machinery, apparatus or material may be removed without materially affecting the operation or reliability of the Network;

1.2.22 **'Contract Works Security'** means a Guarantee issued in favour of Eskom for an amount equal to 10% (ten percent) of the estimated value of the Contract Works;

1.2.23 **'Cost Estimate Fee'** means the portion of the Connection Charge paid by the Customer and received by Eskom for the issue of the Cost Estimate Letter, the value of which is set out in Part A of Annexure G (Financial Specifications);

1.2.24 **'Cost Estimate Letter'** means this letter, with its annexures, issued by Eskom to the Customer with a non-binding estimation of the costs of the works to Connect the Electrical Installation to the Distribution System;

1.2.25 **'Customer'** means the legal person or entity as set out in Annexures B (Connection Application) and C (Customer Details and Description of Electrical Installation);

1.2.26 **'Customer Connection Equipment'** means the Customer's equipment, as described in Annexure E, as agreed between Eskom and the Customer, which shall be constructed, owned, operated and maintained by the Customer;

1.2.27 **'Customer Connection Works'** means the works as described in Annexure E, to be carried out on the Customer side of the Point of Supply, save as may otherwise be provided herein, and all related activities by which the Customer Connection Equipment shall establish a Connection between the Electrical Installation and the Distribution System and/or Transmission System;

1.2.28 **'Distribution'** means the regulated business unit through which Eskom constructs, owns, operates and maintains Eskom's Distribution System in accordance with its Licence and the Code(s);

1.2.29 '**Distribution Code'** means the set of documents titled South African Distribution Code published by NERSA, as amended, modified, extended, replaced or re-enacted from time to time;

1.2.30 **'Distribution Connection Charges'** means that portion of the Connection Charge associated with the Distribution System, which may comprise of a Distribution Standard Connection Charge and a Distribution Premium Connection Charge;

1.2.31 **'Distribution Monopoly Works'** means those Monopoly Works associated with the Distribution System;

1.2.32 **'Distribution Premium Connection Charge'** means that portion of the Connection Charge associated with a Premium Connection and the Distribution System;

1.2.33 **'Distribution Quotation Fee'** means the portion of the Distribution Connection Charge to be paid by the Customer to Eskom for the issue of the Budget Quote, the value of which is set out in Annexure G (Financial Specifications) and will be valid for a period of 12 months from the date of this Cost Estimate Letter;

1.2.34 **'Distribution Standard Connection Charge'** means that portion of the Connection Charge associated with a Standard Connection and the Distribution System;

1.2.35 **'Distribution System'** means Eskom's network infrastructure consisting of assets operating at a nominal voltage of 132 kV or less, not classified as transmission transformation equipment;

1.2.36 **'EA'** means environmental authorisation(s);

1.2.37 **'Early Termination Guarantee'** means a Guarantee issued for an amount equal to the Early Termination Guarantee Amount;

1.2.38 **'Early Termination Guarantee Amount'** means a) initially an amount as set out in Annexure G (Financial Specifications), b) thereafter an amount as adjusted by Eskom on written notice to the Customer in accordance with the terms and conditions of Budget Quote; and c) thereafter such adjusted amount reduced annually by one tenth (1/10th) with effect from the fourth (4th) year following the Commencement Date (as defined in the Electricity Supply Agreement);

1.2.39 **'Electrical Installation'** means the electrical equipment and installation of the Customer where electrical supply is taken, as more fully described in Annexure C;

1.2.40 **'Electricity Accounts Guarantee'** means a Guarantee issued for an amount equal to the Electricity Accounts Guarantee Amount;

1.2.41 **'Electricity Accounts Guarantee Amount'** means a) initially an amount as set out in Part B of Annexure G (Financial Specifications) and b) thereafter an amount as varied by Eskom on written notice to the Customer in accordance with the ESA;

1.2.42 **'Electricity Regulation Act'** means the Electricity Regulation Act, No. 4 of 2006;

1.2.43 **'Electricity Supply Agreement'** or **'ESA'** means the agreement, including all appendices, entered into between Eskom and the Customer, in respect of the supply of electricity by Eskom to the Customer and the Connection to the Distribution System and/or the Transmission System;

1.2.44 **'Eskom'** means Eskom Holdings SOC Ltd (Registration Number 2002/015527/30);

1.2.45 **'Eskom Connection Equipment'** means the equipment and assets to Connect the Electrical Installation to the Distribution System and/or the Transmission System as described in the Electricity Supply Agreement, which shall be owned, operated and maintained by Eskom;

1.2.46 **'Eskom Connection Works'** means the works required to be constructed, changed or enabled on the Distribution System and/or the Transmission System side of the Point of Delivery, save as may be otherwise provided herein, and all related activities by which the Eskom Connection Equipment shall establish a Connection between the Point/s of Delivery and the Distribution System and/or the Transmission System, including if applicable the

Monopoly Works and the Contract Works;

1.2.47 **'Eskom Equipment'** means the plant, facilities, equipment and assets set forth in Annexure E (Eskom Connection Works) to the Budget Quote which shall be constructed by Eskom in accordance with the Budget Quote and owned, operated and maintained by Eskom;

1.2.48 **'Eskom Works'** means the works as described in Annexure E (Eskom Connection Works) comprising of the Eskom Connection Works but excluding the Contract Works;

1.2.49 **'Estimated Capital Costs'** means the estimated Capital Costs as set out in Annexure F (Estimated Capital Costs);

1.2.50 **'Estimated Monopoly Works Charge'** means the estimated Monopoly Works Charge as set out in Part C of Annexure G (Financial Specifications);

1.2.51 **'Guarantee'** means a guarantee substantially in a form acceptable to Eskom and initially for the amount stated therein, which (i) is issued by a financial institution which (a) holds an Approved Credit Rating and (b) is registered under applicable Law to carry on business in South Africa and (ii) constitutes an on demand, unconditional and irrevocable commitment to pay by the financial institution by which it is issued;

1.2.52 **'HV'** means high voltage;

1.2.53 **'Law'** means any law, order, rule, regulation or code of any Governmental Authority of the Republic of South Africa or the promulgation or introduction of any law, order, rule, regulation or code by any Governmental Authority of the Republic of South Africa;

1.2.54 **'Licences'** means the licence(s) issued by the NERSA to Eskom in terms of the Electricity Regulation Act;

1.2.55 **'Maximum Demand'** has the meaning as ascribed to it in the Schedule of Standard Prices;

1.2.56 **'Monopoly Works'** means those works forming part of the Eskom Connection Works which remain Eskom's responsibility under the Self-Build Agreement to ensure a standard of work that meets Eskom 's quality of supply, reliability and safety standards;

1.2.57 **'Monopoly Works Charge'** means the charge recouped or to be recouped by Eskom from the CUSTOMER for the Monopoly Works Cost;

1.2.58 **Monopoly Works Cost** means the cost of the Monopoly Works;

1.2.59 **'NERSA'** means the National Energy Regulator of South Africa or its successor-in-title established in terms of the National Energy Regulator Act, No 40 of 2004;

1.2.60 **'Notified Maximum Demand'** means the Maximum Demand notified in writing by the Customer and accepted by Eskom, as more fully described in Annexure "D" (*Technical Specifications*);

1.2.61 **'NRS 048'** means the quality of supply specification issued by the South African Bureau of Standards, as revised from time to time or as replaced by a national standard;

1.2.62 **'Parties'** means Eskom and the Customer, and the word **'Party'** shall be construed accordingly;

1.2.63 **'Point(s) of delivery** or **'POD'** has the meaning as ascribed to it in the Electricity Supply Agreement;

1.2.64 **'Point(s) of Supply (POS)'** means the electrical nodes on the Distribution System where the Customer's electrical equipment is physically connected to Eskom's electrical equipment. The location of the Point(s) of Connection is described in Annexure C (Customer/Technical Details and Location of the Electrical Installation);

1.2.65 **'PPI'** means the index published from time to time by Statistics South Africa, which is referred to as the "Production Price Index for final manufactured goods" in statistical release P0142.1 or such other index as may be determined by Statistics South Africa to replace or supersede that index;

1.2.66 **'Premium Connection'** means a connection made or to be made between the Electrical Installation and Eskom's network based on the customer's requirements, that are in excess of the specifications of a Standard Connection to provide for a more reliable and secure connection and includes the acquisition and installation of the Premium Equipment;

1.2.67 **'Premium Connection Charge'** means that portion of the Connection Charge payable for costs associated with the Premium Connection included in the scope of the Eskom Connection Works to meet customer specific requirements in excess of what is considered as the least life-cycle cost investment;

1.2.68 **'Premium Equipment'** means the equipment to be constructed, or to be installed if the Customer elects a Premium Connection and is in addition to and/or in place of the equipment installed in the case of a Standard Connection. Where applicable, the Premium Equipment shall comprise the equipment listed in Annexure E (Eskom Connection Works);

1.2.69 **'Pre-project Investigation Charge'** means the charge recouped by Eskom from the Customer for the Pre-project Investigation Cost;

1.2.70 **'Pre-project Investigation Cost'** means the cost charged to cover the investigation work prior to and including the issuing of the cost estimate letter or the budget quotation in case of applications that follow the major short process where the Cost Estimate Letter is not issued to the Customer. This is a standard charge based on the Cost Estimate Fee amount for the applicable supply size category;

1.2.71 **'Property'** means the Customer's property described in Annexure "C" (*Customer Details, Description of Electrical Installation and Property*) on which a supply of electricity is required by the Customer;

1.2.72 **'Reasonable and Prudent Operator'** means a person seeking in good faith to perform its contractual obligations and, in so doing and in the general conduct of its undertaking, exercising that degree of skill, diligence, prudence, responsibility and foresight which would reasonably and ordinarily be expected from a skilled and appropriately experienced person, developer, contractor, owner or operator internationally, who is complying with all applicable Laws, engaged in the same or a similar type of undertaking, in the same or similar circumstances and conditions, and any references herein to the 'Standards of a Reasonable and Prudent Operator' shall be construed accordingly;

1.2.73 **'Request for Budget Quote'** means the request for the Budget Quote letter in the form attached hereto as Annexure A to be completed by the Customer and submitted to Eskom;

1.2.74 **'Schedule of Standard Prices'** means Eskom's published tariffs, charges and the NMD Rules, applicable to Customers as approved by NERSA and as amended from time to time;

1.2.75 **'Self-Build'** means the planning, financing, insuring, land rights acquisition, design, engineering, procurement, supply, fabrication, construction, erection, installation, inspection, pre-commissioning, testing, completion and commissioning of the Contract Works by the Customer, and on completion of the Contract Works the handover of the plant, facilities, equipment, assets and related designs, material guarantees/ warranties, deeds and other documentation by the Customer to Eskom;

1.2.76 **'Self-Build Agreement'** means the agreement between Eskom and the Customer pertaining to the Contract Works to be undertaken by the Customer, and the Monopoly Works falling under the responsibility of Eskom;

1.2.77 '**South African Grid Code**' means the set of documents entitled "South African Grid Code" published by NERSA as amended, modified, extended, replaced or re-enacted from time to time;

1.2.78 **'Standard Connection'** means a connection made to or to be made between the Electrical Installation and Eskom's network based on the lowest life-cycle costs design that meets the specifications in terms of NRS 048 and the Distribution Code for a technically acceptable solution;

1.2.79 **'Standard Connection Charge'** means that portion of the Connection Charge that is payable

for costs associated with the Standard Connection;

1.2.80 **'Standard Equipment'** means the equipment to be constructed or to be installed if the Customer elects a Standard Connection. The Standard Equipment shall comprise the equipment listed in Annexure E (Eskom Connection Works);

1.2.81 **'Transformation Capacity Charge'** means the charge included in the Transmission Connection Charge for the use of transmission transformation assets that are dedicated to a customer or to a group of customers. The transmission transformation assets may be new or existing and would have been paid for fully or partially by customers either through Transmission Connection Charges or through Transmission Use of System charges;

1.2.82 **'Transmission Connection Charges'** means that portion of the Connection Charge associated with the Transmission System, which may comprise of the Transmission Standard Connection Charge and the Transmission Premium Connection Charge;

1.2.83 **'Transmission Monopoly Works'** means those Monopoly Works associated with the Transmission System;

1.2.84 **'Transmission Premium Connection Charge'** means that portion of the Connection Charge associated with a Premium Connection and the Transmission System;

1.2.85 **'Transmission Quotation Fee'** means the portion of the Transmission Connection Charge to be paid by the Customer to Eskom for the issue of the Budget Quote, the value of which is set out in Annexure G (Financial Specifications) and will be valid for a period of 12 months from the date of this Cost Estimate letter, where after the value will be revised by Eskom;

1.2.86 **'Transmission Standard Connection Charge'** means that portion of the Connection Charge associated with a Standard Connection and the Transmission System;

1.2.87 **'Transmission System'** means all Eskom's lines and substation equipment where the nominal voltage is above 132 kV. All other equipment operating at lower voltages are either part of the Distribution System or classified as transmission transformation equipment;

1.2.88 **'VAT'** means the value added tax levied in terms of the VAT Act; and

1.2.89 **'VAT Act'** means the Value Added Tax Act, No. 89 of 1991.

1.3 In this Cost Estimate Letter, unless a contrary intention clearly appears:-

1.3.1 the headings to the clauses and sub-clauses in this Cost Estimate Letter are for the purpose of convenience and reference only, and shall not be used in the interpretation, modification, amplification of any clause thereof;

1.3.2 words and expressions defined in this Cost Estimate Letter shall bear the same meanings in the Annexures to this Cost Estimate Letter unless specifically defined in those Annexures;

1.3.3 any words or expressions for which no meanings have been ascribed in this Cost Estimate Letter shall have the meanings ascribed to them in the Act or, in the absence of such meanings, the meanings ascribed to them in the Code(s);

1.3.4 words and expressions importing:

a. any one gender includes the other gender;
b. the singular includes the plural and vice versa;
c. natural persons include juristic persons and vice versa;

1.3.5 any reference to any law shall include any amendments, modifications, extensions, replacements or re-enactments thereof then in force;

1.3.6 any reference to 'this Cost Estimate Letter' shall mean this Cost Estimate Letter together with its Annexures as amended, modified or supplemented;

1.3.7 any reference to 'writing' or 'written' shall include all methods of reproducing words in a legible and non-transitory form;

1.3.8 any reference to ‘persons’ shall include individuals, firms and corporations, joint ventures, trusts, unincorporated associations and organisations, partnerships and any other entities, in each case whether or not having a separate legal personality; and

1.3.9 any reference to either ‘Party’ or ‘any person’ shall include its legal successors and permitted assignees;

1.3.10 in the computation of periods of time from a specified day to a later specified day, 'from' means from and including and 'until' or 'to' means to and including;

1.3.11 any reference in this Cost Estimate Letter to a ‘Clause’ or ‘sub-clause’ is a reference to a clause or sub-clause contained in this Cost Estimate Letter;

1.3.12 any reference to 'Clause', ‘Annexure’ and ‘Part’ are references to the relevant clause, annexure and part, respectively, of this Cost Estimate Letter, references to 'Annex' are to the relevant annex to an Annexure of this Cost Estimate Letter, references to 'Paragraph' are to the relevant paragraph in an Annexure or Annex to this Cost Estimate Letter;

1.3.13 where figures are referred to in numerals and in words, if there is any conflict between them the words shall prevail;

1.3.14 any reference to number of days shall be a reference to calendar days unless Business Days are specified; and

1.3.15 the rule of construction that this Cost Estimate Letter shall be interpreted against the Party responsible for the drafting or preparation hereof, shall not apply.

2. TECHNICAL

2.1 The Notified Maximum Demand to be made available by Eskom at the Customer's Point(s) of Delivery shall be as set out in Annexure "D" (*Technical Specifications*).

2.2 The Electrical Installation, the Property and the nature of the Customer’s plant is described in Annexure "C" (*Customer Details, Description of Electrical Installation and Property*).

2.3 The location of the Customer’s Point(s) of Delivery and Point(s) of Supply is described in Annexure “D” (*Technical Specifications).*

2.4 The Customer shall provide the relevant protection, synchronising and control equipment at the Electrical Installation which is compatible with the protection standard required by Eskom and in accordance with the terms and conditions of the Electricity Supply Agreement and the Code(s).

2.5 Prior to the Connection, the Customer shall comply with all applicable Law including but not limited to those governing the electricity supply industry including regulations, the Code(s), directives and guidelines, failing which Eskom may refuse to allow the Connection, or disconnect the Connection until such time as there is compliance with such Law.

2.6 Network performance and quality of supply

2.6.1 Eskom is required to provide a standard of quality of supply, which complies with NRS 048. The Customer shall comply with the quality of supply limits determined in accordance with NRS 048.

2.6.2 Eskom will use its reasonable endeavours to furnish the Customer with a reliable network for the supply of electricity to the Customer. However, it is not practicable for Eskom to guarantee that the continuity and voltage quality at the Point(s) of Supply will always be maintained under all contingencies. It will be incumbent on the Customer to take adequate measures to protect its business and the Electrical Installation against any damage and / or losses arising from frequency deviations, loss of Connection or connection/supply interruptions, voltage variations (including voltage dips), voltage harmonics, inter-harmonics, voltage flicker, voltage unbalance, voltage swells and transients, undervoltages and overvoltages at the Point of Delivery.

2.6.3 Eskom generally contracts with Customers for a Standard Connection in terms of which no specific voltage dip or interruption limits will be specified in the contract. Indicative levels of voltage dip and interruption performance may be obtained on request from Eskom. In order to ensure greater levels of assurance on interruption (and in some cases dip) performance, customers may elect to:

2.6.3.1 pay for the necessary infrastructure required to provide a Connection with higher levels of reliability; or

2.6.3.2 pay for additional monitoring equipment to effect monitoring of performance at the Point of Delivery.

2.7 **Technical assumptions**

2.7.1 This Cost Estimate Letter is based on the information provided by the Customer in the application for this Cost Estimate Letter attached hereto as Annexure "B" (Connection Application) and assumes that the Connection Works to be constructed is for the Connection of the Electrical Installation and not for any other customer. If other customers are to be connected the cost to connect and the technical assumptions may change.

2.7.2 This Cost Estimate Letter is based on the technical assumptions as set out in Part C of Annexure "E" (Eskom Connection Works).

3. CONNECTION WORKS

3.1 **Customer Connection Works**

3.1.1 The Customer shall be responsible for the portion of the Connection Works comprising the Customer Connection Works.

3.2 **Contract Works**

3.2.1 If a Self-Build option is elected by the Customer, the Customer shall be responsible for the portion of the Connection Works comprising the Contract Works as set out in Part B.2 of Annexure "E" (Eskom Connection Works) and associated timelines in accordance with the terms and conditions of the Self-Build Agreement.

3.2.2 The Customer must indicate in the Request for the Budget Quote whether it elects to Self-build and must also indicate the estimated timeline to complete the Contract Works.

3.2.3 The approval of a Self-Build option by Eskom and the take-over of any Contract Works by Eskom will be subject to the conditions contained in Eskom's Standard for HV self-build projects (a copy of which will be made available on request), the Procedure for Self-build Projects in Transmission and the Self-build Agreement to be concluded, which inter alia shall include the following:

3.2.3.1 the Contract Works must be built according to the Eskom standards and specifications and Eskom will not under any circumstances take over and energise any asset that is not built according to the Eskom standards; and

3.2.3.2 the Customer shall pay all costs incurred by Eskom in relation to all Monopoly Works (see Annexure "F").

3.3 **Eskom Works**

3.3.1 Eskom shall be responsible for the portion of the Eskom Connection Works comprising the Eskom Works as set out in Annexure "E" (Eskom Connection Works).

3.3.2 If a Self-Build option is not elected by the Customer, the Eskom Works shall be as set out in Part A.1 of Annexure "E" (Eskom Connection Works).

3.3.3 If a Self-Build option is elected by the Customer, the Eskom Works shall be as set out in Part B.1 of Annexure "E" (Eskom Connection Works).

3.4 **Estimated Connection timelines**

3.4.1 Subject to the content of this Cost Estimate Letter and the conditions of any Budget Quote accepted later, the estimated period for the completion of the Eskom Connection Works, calculated from the commencement of construction by Eskom, where the Customer does not elect an option of Self-Build, is set out in Part A.2 of Annexure "E" (Eskom Connection Works). The estimated period provided in this Cost Estimate Letter is not binding on Eskom in any way.

3.4.2 Where the Customer elects an option of Self-Build, the connection timeline shall be determined by the Parties taking into consideration resource availability for commissioning and related activities.

3.5 **SCOPE OF WORKS**

3.5.1 At the Customer's option, to be exercised on acceptance of the Budget Quote, the Eskom Works may comprise:

3.5.1.1 a Standard Connection, comprising the Eskom Equipment described in Part A of Annexure "E" (*Eskom Works*); or

3.5.1.2 where applicable, a Standard Connection and a Premium Connection, comprising the Eskom Equipment described in Part A and Part B of Annexure "E" (*Eskom Works*).

4. FINANCIAL

4.1 **Total Estimated Capital Costs**

4.1.1 The total Estimated Capital Costs:

4.1.1.1 if the Customer does not elect to Self-Build, are set out in Part A of Annexure F (Estimated Capital Costs); or

4.1.1.2 if the Customer elects to Self-Build, are set out in Part B of Annexure F (Estimated Capital Costs).

4.2 **Connection Charge Estimate**

4.2.1 The Connection Charge Estimate:

4.2.1.1 if the Customer does not elect to Self-Build, is set out in Part B of Annexure G (Financial Specification); or

4.2.1.2 if the Customer elects to Self-Build, is set out in Part C of Annexure G (Financial Specification).

4.2.2 The Customer shall pay the Connection Charge Estimate in accordance with the Budget Quote.

4.3 **Connection Charge Guarantee**

4.3.1 If the Customer elects in its acceptance of the Budget Quote to pay the Connection Charge Estimate in instalments, the Customer shall deliver a Connection Charge Guarantee in accordance with the Budget Quote.

4.4 **Early Termination Guarantee**

4.4.1 Eskom will, in connecting the Electrical Installation to the Distribution System incur certain expenditures and costs, which are not directly recovered through the Connection Charge. In the event of an early termination of the project or the ESA, such costs shall be recovered by Eskom from the Early Termination Guarantee.

4.4.2 The Customer shall deliver an Early Termination Guarantee in accordance with the Budget Quote. The Early Termination Guarantee Amount is set out in Annexure G (Financial Specifications).

4.5 **Contract Works Security**

4.5.1 Where the Customer elects an option of Self-Build, the Customer shall deliver the Contract Works Security in accordance with the Budget Quote.

4.6 **Standard tariff details**

4.6.1.1 Subject to the provisions of the Electricity Regulation Act, the current prices of the standard tariff as specified in Annexure G (*Financial Specifications*) to be charged monthly are set

out in the Schedule of Standard Prices attached hereto as Annexure "H". These prices will be valid until Eskom's next price increase or tariff restructuring becomes operative.

4.6.1.2 The prices to be charged monthly are subject to the terms and conditions of the Electricity Supply Agreement.

4.7 **Electricity Accounts Guarantee**

4.7.1 The Customer shall provide an Electricity Accounts Guarantee, for the due payment of monthly electricity accounts in accordance with the terms of and conditions of the Electricity Supply Agreement. The Electricity Accounts Guarantee Amount is set out in Annexure "G" (*Financial Specifications)*. The security may be provided in cash or by means of a Guarantee.

5. BUDGET QUOTE

5.1 Eskom shall provide a Budget Quote to the Customer, provided that within 12 (twelve) months of the date of this Cost Estimate Letter the Customer complies with the Budget Quote application conditions set out in Clause 5.2 below.

5.2 **Budget Quote application conditions**

5.2.1 If the Customer wants Eskom to proceed to provide a Budget Quote the Customer must complete the Request for a Budget Quote, in the form attached to this Cost Estimate Letter as Annexure A and forward the request together with the Distribution Quotation Fee and/or the Transmission Quotation Fee where applicable and other required information and documentation.

5.3 **Cost Estimate Fee and quotation fees**

5.3.1 Eskom incurs costs in providing a Cost Estimate Letter. These costs are payable upfront as a Cost Estimate Fee before Eskom will proceed with the preparation of the Cost Estimate Letter.

5.3.2 Should a Budget Quote not be requested by the Customer, the Cost Estimate Fee will be forfeited.

5.3.3 Similarly, Eskom will incur costs, such as survey, environmental impact assessments, and detailed design, in providing a Budget Quote. These costs are payable upfront as a Distribution Quotation Fee and where applicable a Transmission Quotation Fee, before Eskom will proceed with the Budget Quote.

5.3.4 Should the Budget Quote not be accepted for any reason, the Cost Estimate Fee will be forfeited and any actual costs incurred by Eskom shall be set-off against any amounts paid in advance by the Customer and the balance refunded to the Customer.

5.3.5 Should the Customer require a revision of scope of the Connection after paying the Cost Estimate Fee and after receiving the Cost Estimate Letter, the Customer may be required to pay to Eskom another upfront cost estimate fee before another cost estimate letter will be provided.

6. LEGAL

6.1 Eskom may not connect the Electrical Installation to the Distribution System unless the Customer complies with the prevailing law in general. Any costs incurred by Eskom, at or after providing the Budget Quote, is payable by the Customer irrespective of whether these Approvals are obtained or not.

6.2 The Customer shall enter into a written Electricity Supply Agreement with Eskom in accordance with the Budget Quote.

6.3 Where the Customer elects to exercise the Self-Build option, the Customer shall enter into a written Self-Build Agreement with Eskom. If the Customer fails to construct the Contract Works in accordance with the required Eskom standards and specifications, Eskom will not be obligated to take ownership of these assets. In this instance, the Customer will be in breach of the Self-Build Agreement. Should the Customer fail to remedy its breach and meet the

requirements, Eskom may, in its sole discretion, provide to the Customer a new quotation to complete the project and take over the assets.

6.4 The Customer shall be liable to pay any taxes and/or levies relating to the subject matter hereof, which may be imposed in terms of any existing and/or future legislation or as approved by NERSA.

6.5 The terms and conditions of this Cost Estimate Letter are subject to the provisions of the Code(s), the Act(s) and the rules and regulations issued thereunder, and of Eskom's licences and Schedule of Standard Prices, as amended or re-enacted from time to time and any other applicable laws.

6.6 The information contained in this Cost Estimate Letter should not be used for anything other than its intended purpose. Eskom accepts no liability, contractual or otherwise, as a result of any reliance on this information and the Customer accordingly indemnifies Eskom against any liability emanating from the use of this information.

6.7 Eskom's bank account details for direct deposits or bank transfers shall be specified in the invoice issued by Eskom in respect of the Distribution Quotation Fee and the Transmission Quotation Fee, if applicable.

6.8 The Customer shall use the account number on the invoice as the reference number for the deposit or transfer. Please attach proof of payment to the completed Request for Budget Quote.

For any information, enquiries or confirmation, please contact **Stoffel Makale** at telephone number **(011) 516 7036.**

I thank you for the opportunity of allowing Eskom to provide this service and trust that your favourable written reply will reach this office shortly.

Yours sincerely

……

Solly Matebula

ACTING SENIOR MANAGER CUSTOMER SERVICE)

28/05/2026

……

Date

ANNEXURE A

REQUEST FOR BUDGET QUOTE

Mr. Siya Nxumalo
Electrical Engineer
Vaal Aerozone (Pty) Ltd
P O Box 35465
MENLO PARK
0102

Date: ……

Eskom Holdings SOC Ltd (Reg No: 2002/015527/30)
Mr Stoffel Makale
Key Accounts Relations Officer
Tel +27 16 362 9335
Fax +27 86 664 7182
P O Box 27
VEREENIGING
1930

Dear Mr Makale

REQUEST FOR BUDGET QUOTE FOR LINE DEVIATION AT PORTION 15(A PORTION OF PORTION 1) VLAKPLAATS 555 NEW DEVELOPMENT, VANDERBIJLPARK

I have read and understood the terms of the Cost Estimate Letter dated **18 May 2026**, reference number **VDL1004623733**. I hereby request Eskom to prepare a Budget Quote for my consideration.

I acknowledge that I intend to exercise the **Self-Build option** and herewith submit an application to do so. *OR*

I do not intend to exercise the Self-Build option *[strike through the option which is not applicable]*.

If I have elected the Self-Build option above, the estimated timeline to complete the Contract Works is ……. calendar months.

Please provide an invoice for the following:

Description	**Cost**	**Select**
Distribution Quotation Fee	R 4 086 757.00 + VAT = R 4 699 770.55	
Transmission Quotation Fee	R 0.00 + VAT = R 0.00	
Total Quotation Fee	**R 4 086 757.00 + VAT = R 4 699 770.55**	

Please find herewith also the documentation/information required by Eskom as set out in the Cost Estimate Letter to proceed with the Budget Quote.

[List the information and attach proof to this letter]

I acknowledge that Eskom will release the project for the Budget Quote phase when all of the following conditions are met:

- Request for Budget Quote letter received
- Distribution Quotation Fee and/or Transmission Quotation Fee paid

All future correspondence must be addressed as follows:

_____

_____code_____

Signed for and on behalf of …… on ..... 20…. by …….. in my capacity as …… (who confirms that I am duly authorised).

……

ANNEXURE B

CONNECTION APPLICATION

Eskom

Documentation needed are as follows:

1. ID Copies of Directors
2. Power of attorney/ Letter of Resolution authorising signatory to sign
3. ID copy of signatory.
4. VAT certificate.
5. CIPC/CC/Trust/etc Registration Certificate/ Company registration certificate
6. Certificate Of Compliance
7. Proof of ownership

ELECTRICITY SUPPLY APPLICATION FORM FOR (LARGE POWER USERS) LPU CUSTOMERS

1. Company Details

Company Name	Vaal Aerozone (PTY) LTD	"Trading As" name	Vaal Aerozone
Company registration number	2017/498408/07	VAT Number	4220292785
		Core Product/Service (e.g. Coal/Ferrochrome)	Aviation
Core Product/Service Description	Electrical Bulk Service	Industry Association Membership (e.g. EIUG/COM)	Aviation
Corporate Office name	Vaal Aerozone (PTY) LTD		

2. Contact Details

Business Tel Number	+27 (11) 568-1547	Business Fax Number	-
E-mail Address	marcel@plumarigroup.co.za	Website Address	
Postal Address	P.O Box 35465 Menlo Park Pretoria Gauteng	Physical Contact Address	1st Floor, Building 2, Needwood Office Park, Cnr Cedar Boulevard, Cedar Rd
Code	2191	Code	2191

Eskom Holdings Limited Reg No 2002/015527/06

1

Please provide the nearest existing Eskom Subsation	Olympus MTS, Riggi, and NW7		Title deed/Property name and number	Vaal Aerozone
GPS Co-ordinates	Latitude	-71309.8	Use/Occupy property as:	Commercial Airport
	Longitude	2947148.7		

4. Technical Details

Existing Notified Maximum Demand (MVA)	N/A	New Notified Maximum Demand (MVA)	Supply Voltage	
Preferred Electricity Tariff		Expected Life of Operation	Transformer rating (MVA)	
Standard Supply (Y/N)		Premium Supply (Y/N)	If Yes - Premium Transformer or Premium Line or Premium Line & Transformer	
Large equipment ratings (motors, etc) Existing 88kV overhead transmission line feeding to SAR Tweefontein 88kV Traction Substation.		Amount/number	Additional Information The application is for the relocation of an existing 88kV overhead transmission line to enable land preparation for the development of the Vaal Aerotropolis airport. The relocation is essential to clear the designated area for airport infrastructure and ensure compliance with aviation safety and planning requirements. The identification of a new servitude of the relocated overhead line shall be required, pending approval from Eskom Land department. In addition to the 88kV line, other existing electrical services, such as medium voltage (MV) overhead and underground lines, low voltage (LV) distribution networks, mini-substations, and street lighting infrastructure, may also need to be decommissioned or	

		relocated. All works will be carried out in accordance with applicable technical, environmental, and regulatory standards, with coordination ongoing with relevant stakeholders and authorities to secure the necessary approvals
Will the supply be used for the resale of electricity as defined by NERSA's Guidelines on Electricity Resale? Y/N	N	

Eskom Holdings Limited Reg No 2002/015527/06

3

5. Officials to be contacted for Power Supply Project

Official 1: Who will be duly authorised to sign for and on behalf of the Customer and quotation should be address to (e.g. Acceptance letters/Electricity Supply Agreement)	
Title , Name & Surname	Mr. Marcel De Beer
Designation	Project Liaison
E-mail	marcel@plumarigroup.co.za
Telephone	+27 (11) 568-1547
Fax	
Cell phone	082 336 4280
Official 1: Technical Person	
Title , Name & Surname	Mr. Siya Nxumalo
Designation	Electrical Engineer
E-mail	Siyabonga.nxumalo@wsp.com
Telephone	+27 11 300 6109
Fax	
Cell phone	065 945 4646

Official 2: Financial Person	
Title , Name & Surname	Ms **Chantell Basson**
Designation	Bookeeper
E-mail	chantell@plumarigroup.co.za
Telephone	+ 27 (0) 11 431 4092
Fax	
Cell phone	

Eskom Holdings Limited Reg No 2002/015527/06

4

6. Undertaking

I hereby certify the correctness of figures/data/information/documents furnished herewith. I also undertake to give further particulars as required by the Eskom from time to time.

Title , Name & Surname	MR Siya Nxumalo
Designation	Electrical Engineer
E-mail	Siyabonga.nxumalo@wsp.com
Telephone	
Fax	
Cell phone	065 945 4646
Signature:	
Date	2025/05/23

7. The following fields will be completed by Eskom

Eskom Customer Services - Region		Eskom Distribution Region	
Technical Service Centre		Field Service Area	

7. **The following fields will be completed by Eskom**

Eskom Customer Services - Region		Eskom Distribution Region	
Technical Service Centre		Field Service Area	
Customer Service Area		Project reference number	

Eskom representative official (Title , Name & Surname)	
Designation	
E-mail	
Telephone	
Fax	
Cell phone	
Signature:	
Date	

ANNEXURE C

CUSTOMER DETAILS, DESCRIPTION OF ELECTRICAL INSTALLATION AND PROPERTY

Table 1		
1.1	Customer	**Vaal Aerozone (Pty) Ltd**
1.2	Description of Property	**N/A**
1.3	Description of Electrical Installation	**N/A**
1.4	Nature of Customer's plant	**N/A**

ANNEXURE D

TECHNICAL SPECIFICATIONS

Part A – Technical Information

Table 1		
1.1	Notified Maximum Demand	**N/A**
1.2	Declared Voltage	N/A
1.3	Nominal Voltage	**N/A**
1.4	Customer's Point of Delivery	**N/A**
1.5	Customer's Point of Supply	**N/A**
1.6	Estimated Period for the completion of the Eskom Works	**30 Months**
1.7	Estimated Period for the completion of the Contract Works (if applicable)	**N/A**
1.8	Estimated Period for the completion of the remaining Monopoly Works (if applicable)	**N/A**
1.9	Estimated Period for the completion of the Eskom Connection Works	**30 Months**

Part B – Assumptions

1. From time to time Eskom may have a shortage of generation capacity and may not be able to meet the energy and capacity required by all its customers.

2. Load-Curtailment:

2.1 When entering into any later contract with Eskom, such contract will include provisions to the effect that Eskom shall have the right, for purposes of the efficient operation and extension of Eskom's generation, transmission and distribution systems and also in emergencies, to temporarily interrupt the supply to you.

2.2 You will be required to collaborate in determining the portion of your load which will be reduced through Eskom's load curtailment and/or manual load-shedding and/or under-frequency load-shedding schemes, or by other means, if Eskom should experience a shortage of generation and/or transmission and/or distribution capacity.

ANNEXURE E

ESKOM CONNECTION WORKS

PART A: SELF-BUILD OPTION NOT ELECTED BY CUSTOMER (ESKOM BUILD)

A.1 Eskom Works

A.1.1 Eskom Equipment

A.1.1 Standard Equipment on the Transmission System

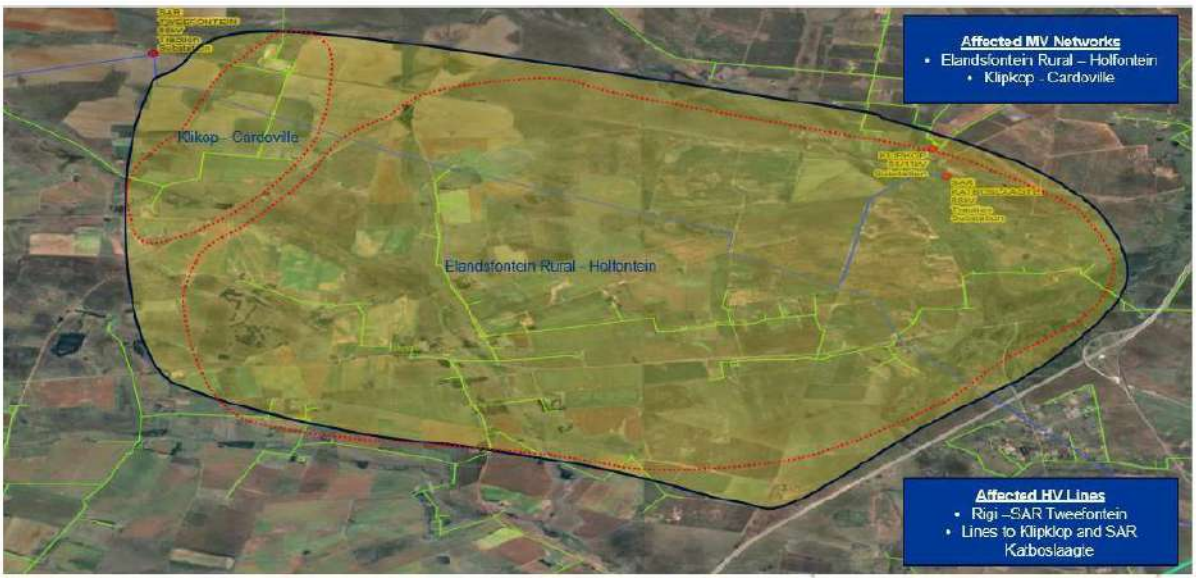
Job 1 : Rigi – SAR Tweefontein Line Rebuild

Primary Plant Scope of Work:

- Acquire and register servitudes and obtain all relevant environmental approvals.
- Obtain the line servitudes and environmental authorisations.
- Cancel existing servitudes for Rigi- SAR Tweefontein 88kV line
- Cancel the existing servitudes
- Supply and build ~15km of Tern line from (27,6415 , -26,5704) to (27.7445, -26.5907)
- Appoint a clerk of works to monitor project implementations.
- Test and commission and take over the assets.

Job 2: Elandsfontein Rural – Holfontein MV Line Dismantle

Job 2: MV Line Dismantle



Scope of Work

- Confirm acquisition of land by developer
- Identify all MV/LV transformers within developers boundary
- Dismantle ~48km of the existing MV line and equipment Elandsfontein Rural – Holfontein feeder from EH 89 30 to end of feeder
- Dismantle 14km of existing MV line and equipment on Klipkop Cardoville feeder from KCA 87 22 2 to end of feeder
- Appoint a clerk of works to monitor project implementations.

A.1.2 Premium Equipment on the Transmission System

A.1.3 Standard Equipment on the Distribution System

A.1.4 Premium Equipment on the Distribution System

A.2 Estimated Period

A.2.1 The estimated period for the completion of the Eskom Works, calculated from the commencement date of the Eskom Works, shall be 30 months.

PART B: SELF-BUILD OPTION ELECTED BY CUSTOMER

B.1 Eskom Works

B.1.1 Eskom Equipment

B.1.1.1 Standard Equipment on the Transmission System

B.1.1.2 Premium Equipment on the Transmission System

B.1.1.3 Standard Equipment on the Distribution System

B.1.1.4 Premium Equipment on the Distribution System

B.1.2 Monopoly Works

B.1.2.1 Eskom will appoint a clerk of works to monitor the quality of the construction as well as the quality of material.
B.1.2.2 Eskom will appoint a project manager to do site inspections and also monitoring of workmanship and materials/equipment.
B.1.2.3 Eskom will monitor the Customer's environmental management in respect of the Contract Works
B.1.2.4 Eskom will verify the design and equipment of the Contract Works
B.1.2.5 Eskom will commission the metering, protection and the supervisory control and data acquisition system (SCADA), which will be installed by the Customer in terms of the Self-Build Agreement.
B.1.2.6 Eskom will monitor the installation of the Contract Works.
B.1.2.7 Eskom will be responsible for any commissioning in respect of the Contract Works required after the Connection of the Electrical Installation to the Distribution System.

B.1.2.8 Eskom will manage any outages required on the Distribution System and or Transmission System.

B.1.2.9 Eskom will check and accept the route selection and will monitor the process of registration of the Servitudes in the name of Eskom.

B.1.3.10 Eskom will effect the closing span to liven up the Connection Works as well as the optical fibre ground wire connection.

B.2 Contract Works

B.2.1 Contract Works Equipment

B.2.1.1 Standard Equipment on the Transmission System

B.2.1.2 Premium Equipment on the Transmission System

B.2.1.3 Standard Equipment on the Distribution System

B.2.1.4 Premium Equipment on the Distribution System

PART C: TECHNICAL ASSUMPTIONS-N/A

ANNEXURE F

ESTIMATED COSTS AND MONOPOLY WORKS

PART A: SELF-BUILD OPTION NOT ELECTED BY CUSTOMER (ESKOM BUILD)

The estimated costs associated with the Eskom Works, including escalation and overheads are as follows:

Table 1 (a) Summary of allocated Estimated Capital Costs

Cost Item	Excl. VAT	Incl. VAT
Pre-Project Investigation Cost (This is a standard cost based on the Cost Estimate Fee amount)	**R 19 724,97**	**R 22 683,72**
Estimated Capital Cost for a Standard Connection	R 25 689 125.50	R 29 542 494.33
Estimated Capital Cost for a Premium Connection	R0,00	R0,00
Total Estimated Capital Costs	**R 25 708 850.47**	**R 29 565 178.04**

Table 1 (b) Estimated Capital Cost of Standard Equipment on the Distribution System

Cost item	Total Cost	Pro-rated %	Cost Excl. VAT	Cost Incl. VAT
Material	R 10 879 730.25	100%	R 10 879 730.25	R 12 511 689.79
Labour	R 14 809 395.25	100%	R 14 809 395.25	R 17 030 804.54
Total	**R 25 689 125.50**	100%	**R 25 689 125.50**	**R 29 542 494.33**

Table 1 (c) Estimated Capital Cost of Premium Equipment on the Distribution System

Cost item e.g.	Total Cost	Pro-rated %	Cost Excl. VAT	Cost Incl. VAT
1 Transformer	**R0,00**	**N/A**	**R0,00**	**R0,00**
10 km 132 kV line	**R0,00**	**N/A**	**R0,00**	**R0,00**
Protection	**R0,00**	**N/A**	**R0,00**	**R0,00**
Total	**R0,00**	**N/A**	**R0,00**	**R0,00**

Table 1 (d) Estimated Capital cost of Standard Equipment on the Transmission System

Cost item e.g.	Total	Pro-rated %	Cost Excl. VAT	Cost Incl. VAT
Metering	**R0,00**	**N/A**	**R0,00**	**R0,00**
1 Transformer	**R0,00**	**N/A**	**R0,00**	**R0,00**
10 km 400 kV line	**R0,00**	**N/A**	**R0,00**	**R0,00**
Protection	**R0,00**	**N/A**	**R0,00**	**R0,00**
Transformation Capacity Charge	**R0,00**	**N/A**	**R0,00**	**R0,00**
Total	**R0,00**	**N/A**	**R0,00**	**R0,00**

Table 1 (e) Estimated Capital Cost of Premium Equipment on the Transmission System

Cost item e.g.	Total	Pro-rated %	Cost Excl. VAT	Cost Incl. VAT
1 Transformer	**R0,00**	**N/A**	**R0,00**	**R0,00**
10 km 400 kV line	**R0,00**	**N/A**	**R0,00**	**R0,00**
Protection	**R0,00**	**N/A**	**R0,00**	**R0,00**
Total	**R0,00**	**N/A**	**R0,00**	**R0,00**

Table 2 Amount of estimated Capital Costs linked to each foreign currency

The Base Rates as at May 2026 are as follows:

Currencies:		**Amount of Estimated Dedicated Capital Costs linked to each foreign currency**
US Dollars / ZAR	**R0,00**	**R0,00**
Euro / ZAR	**R0,00**	**R0,00**
Canadian Dollar / ZAR	**R0,00**	**R0,00**
Swiss Frank / ZAR	**R0,00**	**R0,00**
Swedish Krone / ZAR	**R0,00**	**R0,00**
Japanese Yen	**R0,00**	**R0,00**
Commodities:		**Estimated total amount of commodity**
Construction Steel	**R0,00**	**R0,00**
Aluminum	**R0,00**	**R0,00**
Copper	**R0,00**	**R0,00**
Transformer Oil	**R0,00**	**R0,00**
Core steel	**R0,00**	**R0,00**

PART B: <u>SELF-BUILD OPTION</u> ELECTED BY CUSTOMER N/A

The estimated costs associated with the Eskom Works, including escalation and overheads are as follows:

Table 1 (a) Summary of allocated Estimated Capital Costs

Cost Item	Excl. VAT	Incl. VAT
Pre-Project Investigation Cost (This is a standard cost based on the Cost Estimate Fee amount)	**R0,00**	**R0,00**
Estimated Capital Cost for a Standard Connection	**R0,00**	**R0,00**
Estimated Capital Cost for a Premium Connection	**R0,00**	**R0,00**
Total Estimated Capital Costs	**R0,00**	**R0,00**
Estimated Monopoly Works Cost	**R0,00**	**R0,00**
Total estimated costs	**R0,00**	**R0,00**

Table 1 (b) Estimated Capital Cost of Standard Equipment on the Distribution System

Cost item e.g.	Total Cost	Pro-rated %	Cost Excl. VAT	Cost Incl. VAT
1 Transformer			**R0,00**	**R0,00**
10 km 132 kV line			**R0,00**	**R0,00**
Protection			**R0,00**	**R0,00**
Total			**R0,00**	**R0,00**

Table 1 (c) Estimated Capital Cost of Premium Equipment on the Distribution System

Cost item e.g.	Total Cost	Pro-rated %	Cost Excl. VAT	Cost Incl. VAT
1 Transformer			**R0,00**	**R0,00**
10 km 132 kV line			**R0,00**	**R0,00**
Protection			**R0,00**	**R0,00**
Total			**R0,00**	**R0,00**

Table 1 (d) Estimated Capital cost of Standard Equipment on the Transmission System)

Cost item e.g.	Total	Pro-rated %	Cost Excl. VAT	Cost Incl. VAT
Metering			**R0,00**	**R0,00**
1 Transformer			**R0,00**	**R0,00**
10 km 400 kV line			**R0,00**	**R0,00**
Protection			**R0,00**	**R0,00**

Transformation Capacity Charge			**R0,00**	**R0,00**
Total			**R0,00**	**R0,00**

Table 1 (e) Estimated Capital Cost of Premium Equipment on the Transmission System

Cost item e.g.	Total	Pro-rated %	Cost Excl. VAT	Cost Incl. VAT
1 Transformer			**R0,00**	**R0,00**
10 km 400 kV line			**R0,00**	**R0,00**
Protection			**R0,00**	**R0,00**
Total			**R0,00**	**R0,00**

2 Estimated Monopoly Works Cost

Table 2 (a) Summary of Estimated Monopoly Works Cost

Cost Item	Excl VAT	Incl VAT
Pre-Project Investigation Cost Estimate	**R0,00**	**R0,00**
Estimated Monopoly Works Cost associated with Standard Equipment	**R0,00**	**R0,00**
Estimated Monopoly Works Cost associated with Premium Equipment	**R0,00**	**R0,00**
Total	**R0,00**	**R0,00**

Table 2 (b) Estimated Monopoly Works Cost associated with Standard Equipment

Cost item e.g.	Excl VAT	Incl VAT
Route/Site Selection Checking & Acceptance	**R0,00**	**R0,00**
Verification of Design	**R0,00**	**R0,00**
Project Management Fees • Project Manager/Coordinator • Clerk Of Works (Quality Assurance and Monitoring)	**R0,00**	**R0,00**
Commissioning	**R0,00**	**R0,00**
Total	**R0,00**	**R0,00**

Table 2 (c) Estimated Monopoly Works Cost associated with Premium Equipment

Cost item e.g.	Excl VAT	Incl VAT
Route/Site Selection Checking & Acceptance	**R0,00**	**R0,00**
Verification of Design	**R0,00**	**R0,00**
Project Management Fees • Project Manager/Coordinator • Clerk Of Works (Quality Assurance and Monitoring)	**R0,00**	**R0,00**
Commissioning	**R0,00**	**R0,00**

Total	**R0,00**	**R0,00**

Table 3 Amount of estimated Capital Costs linked to each foreign currency

The Base Rates as at May 2026 are as follows:

Currencies:		**Amount of Estimated Dedicated Capital Costs linked to each foreign currency**
US Dollars / ZAR	**R 0,00**	**R 0,00**
Euro / ZAR	**R 0,00**	**R 0,00**
Canadian Dollar / ZAR	**R 0,00**	**R 0,00**
Swiss Frank / ZAR	**R 0,00**	**R 0,00**
Swedish Krone / ZAR	**R 0,00**	**R 0,00**
Japanese Yen	**R 0,00**	**R 0,00**
Commodities:		**Estimated total amount of commodity**
Construction Steel	**R 0,00**	**R 0,00**
Aluminum	**R 0,00**	**R 0,00**
Copper	**R 0,00**	**R 0,00**
Transformer Oil	**R 0,00**	**R 0,00**
Core steel	**R 0,00**	**R 0,00**

ANNEXURE G

FINANCIAL SPECIFICATIONS

PART A: COST ESTIMATE FEE ALREADY PAID BY THE CUSTOMER

DATE COST ESTIMATE FEE AMOUNT PAID	Excl. VAT	Incl. VAT
06/11/2025	R19 724.97	R22 683.71

TARIFF

APPLICABLE TARIFF		
1.1	Tariff applicable	**N/A**

PART B: SELF-BUILD OPTION NOT ELECTED BY THE CUSTOMER (ESKOM BUILD)

Table 1 SUMMARY OF THE CONNECTION CHARGE ESTIMATES, FEES PAYABLE UPON ACCEPTANCE OF THE COST ESTIMATE LETTER AND GUARANTEES

Connection Charge Estimate	Excl. VAT	Incl. VAT
CEF/Pre-Project Investigation Charge	R 19 724,97	R 22 683,72
Estimated Distribution Standard Connection Charge	R 25 689 126,00	R 29 542 494,90
Estimated Distribution Premium Connection Charge	R 0,00	R 0,00
Estimated Transmission Standard Connection Charge	R 0,00	R 0,00
Estimated Transmission Premium Connection Charge	R 0,00	R 0,00
SUBTOTAL: CONNECTION CHARGE ESTIMATE	**R 25 708 850,97**	**R 29 565 178,62**
Less Cost Estimate Fee (already paid)	R 19 724,97	R 22 683,72
BALANCE: CONNECTION CHARGE ESTIMATE*	**R 25 689 126,00**	**R 29 542 494,90**
FEES PAYABLE UPON ACCEPTANCE OF THE COST ESTIMATE LETTER		
Distribution Quotation Fee	**R 4 086 757.00**	**R 4 699 770.55**
Transmission Quotation Fee	R 0,00	R 0,00
Total Quotation Fee	**R 4 086 757.00**	**R 4 699 770.55**
GUARANTEES		
Electricity Accounts Guarantee / Security Amount		R 0,00
Early Termination Guarantee Amount		R 0,00

PART C: SELF-BUILD OPTION ELECTED BY CUSTOMER N/A

Table 1 SUMMARY OF THE CONNECTION CHARGE ESTIMATES, FEES PAYABLE UPON ACCEPTANCE OF THE COST ESTIMATE LETTER AND GUARANTEES

Connection Charge Estimate	**Excl. VAT**	**Incl. VAT**
CEF/Pre-Project Investigation Charge	R 0,00	R 0,00
Estimated Distribution Standard Connection Charge	R 0,00	R 0,00
Estimated Distribution Premium Connection Charge	R 0,00	R 0,00
Estimated Transmission Standard Connection Charge	R 0,00	R 0,00
Estimated Transmission Premium Connection Charge	R 0,00	R 0,00
Estimated Monopoly Works Charge	R 0,00	R 0,00
SUBTOTAL: CONNECTION CHARGE ESTIMATE	**R 0,00**	**R 0,00**
Less Cost Estimate Fee (already paid)	R 0,00	R 0,00
BALANCE: CONNECTION CHARGE ESTIMATE*	**R 0,00**	**R 0,00**
FEES PAYABLE UPON ACCEPTANCE OF THE COST ESTIMATE LETTER		
Distribution Quotation Fee	R 0,00	R 0,00
Transmission Quotation Fee	R 0,00	R 0,00
Total Quotation Fee	R 0,00	R 0,00
GUARANTEES		
Electricity Accounts Guarantee / Security Amount		R 0,00
Early Termination Guarantee Amount		R 0,00

*

The factors to be used in the final calculation of the Connection Charges, the Early Termination Guarantee Amount and the Connection Charge Guarantee Amount are:

1. Overheads 15 %
2. Escalation 3,2 % (Production Price Index)
3. Escalation Duration 0

Escalation in the cost of obtaining servitudes (costs to be based on the most recent value of the land)

ANNEXURE H

SCHEDULE OF STANDARD PRICES

N/A

Appendix C – Bulk Connection CEL

Eskom

Mr. Siya Nxumalo
Electrical Engineer
Vaal Aerozone (Pty) Ltd
P O Box 35465
MENLO PARK
0102

27 March 2026
Stoffel Makale
Tel: 011 516 7036
Quote Ref No:
VDL929105485

Dear Mr Nxumalo

COST ESTIMATE LETTER FOR NEW DEDICATED SUBSTATION SUPPLY OF 20000KVA AT PORTION 15(A PORTION OF PORTION 1) VLAKPLAATS 555, VANDERBIJLPARK

Thank you for your application for a new supply of 20000kVA to the Electrical Installation.

Eskom has assessed your requirements and herewith provides an estimate of the cost of providing the Works and the Connection. It is based on engineering assumptions and provided in order to assist in making a decision whether or not you should proceed to request a Budget Quote.

This Cost Estimate Letter is not an offer for a contract. It is purely illustrative and in anticipation of a request for a Budget Quote. No information contained in this Cost Estimate Letter shall be deemed to form part of any contract between Eskom and the Customer.

Furthermore, if based on this Cost Estimate Letter a Request for Budget Quote is submitted to Eskom, any information recorded in this Cost Estimate Letter will lapse immediately (even if a Budget Quote is eventually not provided or accepted) and Eskom will not be bound to perform in terms of this Cost Estimate Letter in any way.

The provision of a Budget Quote related to any portion of the Eskom related cost not covered through the Connection Charge, is subject to such funding being included in Eskom's budget and approval for the investment being obtained through Eskom's governance processes.

Eskom will require certain documents and Approvals, set out herein, and payment of a Distribution Quotation Fee and if applicable a Transmission Quotation Fee, in order to provide a Budget Quote.

1. DEFINITIONS AND INTERPRETATION

1.1 Notwithstanding that this Clause 1 deals with interpretation, where any sub-clauses hereof contain operative provisions, effect shall be given thereto as set out herein.

1.2 The following capitalised words and expressions shall have the meanings as assigned to them and cognate expressions shall have corresponding meanings:

1.2.1 **'Act'** means the Electricity Regulation Act of 2006, including any regulations issued pursuant thereto, as amended or re-enacted from time to time;

1.2.2 **'Approvals'** means any permission, permit, approval, consent, licence, authorisation, registration, grant, acknowledgement, exemption or agreement required to be obtained from any Government Authority;

1.2.3 **'Approved Credit Rating for South African Financial Institutions'** means (i) at least one investment grade long-term unsecured local currency debt rating by a rating agency which is at or better than 'BBB-' (as determined by Standard and Poor's Rating Group or Fitch Ratings), 'Baa3' (as determined by Moody's Investor Services, Inc.); or (ii) long-term unsecured local currency debt rating not worse than the highest South Africa's sovereign local currency debt rating; or (iii) South African Long-term National Scale Rating no worse than 'zaA-' (as determined by Standard & Poor's) or 'A-(zaf)' (as determined by Fitch Ratings) or 'A3.za' (as determined by Moody's Investor Services, Inc.) or (iv) equivalent rating to any of

the above ratings (as determined by a rating agency approved by Eskom);

1.2.4 **'Approved Credit Rating for Non-South African Financial Institutions'** means (i) at least one investment grade long-term unsecured foreign currency debt rating by a rating agency which is at or better than 'BBB-' (as determined by Standard and Poor's Rating Group or Fitch Ratings), 'Baa3' (as determined by Moody's Investor Services, Inc.); or (ii) long-term unsecured foreign currency debt rating not worse than the highest South Africa's sovereign foreign currency debt rating; or (iii) equivalent rating to any of the above ratings (as determined by a rating agency approved by Eskom);

1.2.5 **'Approved Credit Rating for South African Holding Companies'** means (i) at least one investment grade long-term unsecured local currency debt rating by a rating agency which is at or better than 'BBB-' (as determined by Standard & Poor's or Fitch Ratings) or 'Baa3' (as determined by Moody's Investor Services, Inc); or (ii) long-term unsecured local currency debt rating not worse than the highest South Africa's sovereign local currency debt rating; or (iii) South African long-term national scale rating no worse than 'zaA-' (as determined by Standard & Poor's) or 'A-(zaf)' (as determined by Fitch Ratings) or 'A3.za' (as determined by Moody's Investor Services, Inc) or (iv) equivalent rating to any of the above ratings *(as determined by a rating agency approved by* Eskom);

1.2.6 **'Approved Credit Rating for Non-South African Holding Companies'** means (i) at least one investment grade long-term unsecured foreign currency debt rating by a rating agency which is at or better than 'BBB-' (as determined by Standard & Poor's or Fitch Ratings) or 'Baa3' (as determined by Moody's Investor Services, Inc); or (ii) long-term unsecured foreign currency debt rating not worse than the highest South Africa's sovereign foreign currency debt rating; or (iii) equivalent rating to any of the above ratings (as determined by a rating agency approved by Eskom);

1.2.7 **'Budget Quote'** means the budget quote, with its appendices, to be issued by Eskom to the Customer;

1.2.8 **'Business Day'** means any day other than Saturday, Sunday or an official public holiday in South Africa;

1.2.9 **'Capital Allowance'** means the customer's contribution to cost of connection for both dedicated connection assets and/or upstream assets, to be recovered from customers through future network charges;

1.2.10 **'Capital Costs'** means the total actual capital costs of the Eskom Works but excluding the costs of the Monopoly Works;

1.2.11 **'Code(s)'** means the Distribution Code, the South African Grid Code, the Grid Connection code for Renewable Power Plants or any other code, published by NERSA, as applicable to Eskom and/or the Customer;

1.2.12 **'Connection'** means the physical connection of the Electrical Installation to the Distribution System and/or the Transmission System;

1.2.13 **'Connection Charge'** means, subject to adjustment, the total Standard Connection Charge and the Premium Connection Charge recouped or to be recouped by Eskom from the Customer for the cost of the Eskom Works comprising the Capital Costs, a contribution to shared costs, and if applicable, the Monopoly Works Cost, less the Capital Allowance calculated in compliance with the Code(s);

1.2.14 **'Connection Charge Estimate'** means the total estimated Connection Charge as set out in Table 1 of Annexure G (Financial Specifications) before adjustments for scope changes, inflation, force majeure and foreign exchange and commodity prices;

1.2.15 **'Connection Charge Guarantee'** means a Guarantee issued for an amount equal to the Connection Charge Guarantee Amount which amount will be set out in the Budget Quote;

1.2.16 **'Connection Charge Guarantee Amount'** means (a) initially, an amount equal to the balance

of the Connection Charge Estimate as set out in Table 1 of Annexure G (Financial Specifications), and (b) thereafter, the amount in paragraph (a) adjusted by reference to (i) deductions for any instalments received by Eskom in the preceding year pursuant to the Budget Quote and (ii) deductions or additions resulting from any adjustments made by Eskom pursuant to the Budget Quote in the preceding year;

1.2.17 **'Connection Charge Payment Schedule'** means the schedule of Connection Charge instalments and corresponding instalment payment dates to be set out in the Budget Quote, as amended by Eskom from time to time on written notice to the Customer pursuant to the Budget Quote;

1.2.18 **'Connection Rights-of-Way'** means all rights-of-way and rights of access over, across, into or from any land that will be required to lay any distribution facilities, plant, equipment, lines, cables or wires included in the Connection Works, including any alternative rights-of-way and rights of access if Eskom's preferred rights-of-way and rights of access are not available on terms and conditions that Eskom considers commercially reasonable and technically feasible;

1.2.19 **'Connection Works'** means the planning, financing, insuring, land rights acquisition, design, engineering, procurement, supply, fabrication, construction, erecting, installation, inspection of the electricity network infrastructure comprised in the Connection and all activities and requirements ancillary to these, and includes the Customer Connection Works and the Eskom Connection Works;

1.2.20 **'Contract Works'** means the portion of the Eskom Connection Works to be undertaken by the Customer in accordance with the conditions of the Self-Build Agreement to be concluded between the Customer and Eskom;

1.2.21 **'Contract Works Equipment'** means the plant, facilities, equipment and assets, which together comprises the portion of the Connection to be supplied by the Customer in accordance with the conditions of the Self-Build Agreement to be concluded between the Customer and Eskom. The Contract Works Equipment shall include any and all machinery, apparatus and materials that would ordinarily form part of a Network, such as telecommunication equipment, even if such machinery, apparatus or material may be removed without materially affecting the operation or reliability of the Network;

1.2.22 **'Contract Works Security'** means a Guarantee issued in favour of Eskom for an amount equal to 10% (ten percent) of the estimated value of the Contract Works;

1.2.23 **'Cost Estimate Fee'** means the portion of the Connection Charge paid by the Customer and received by Eskom for the issue of the Cost Estimate Letter, the value of which is set out in Part A of Annexure G (Financial Specifications);

1.2.24 **'Cost Estimate Letter'** means this letter, with its annexures, issued by Eskom to the Customer with a non-binding estimation of the costs of the works to Connect the Electrical Installation to the Distribution System;

1.2.25 **'Customer'** means the legal person or entity as set out in Annexures B (Connection Application) and C (Customer Details and Description of Electrical Installation);

1.2.26 **'Customer Connection Equipment'** means the Customer's equipment, as described in Annexure E, as agreed between Eskom and the Customer, which shall be constructed, owned, operated and maintained by the Customer;

1.2.27 **'Customer Connection Works'** means the works as described in Annexure E, to be carried out on the Customer side of the Point of Supply, save as may otherwise be provided herein, and all related activities by which the Customer Connection Equipment shall establish a Connection between the Electrical Installation and the Distribution System and/or Transmission System;

1.2.28 **'Distribution'** means the regulated business unit through which Eskom constructs, owns, operates and maintains Eskom's Distribution System in accordance with its Licence and the Code(s);

1.2.29 '**Distribution Code'** means the set of documents titled South African Distribution Code published by NERSA, as amended, modified, extended, replaced or re-enacted from time to time;

1.2.30 **'Distribution Connection Charges'** means that portion of the Connection Charge associated with the Distribution System, which may comprise of a Distribution Standard Connection Charge and a Distribution Premium Connection Charge;

1.2.31 **'Distribution Monopoly Works'** means those Monopoly Works associated with the Distribution System;

1.2.32 **'Distribution Premium Connection Charge'** means that portion of the Connection Charge associated with a Premium Connection and the Distribution System;

1.2.33 **'Distribution Quotation Fee'** means the portion of the Distribution Connection Charge to be paid by the Customer to Eskom for the issue of the Budget Quote, the value of which is set out in Annexure G (Financial Specifications) and will be valid for a period of 12 months from the date of this Cost Estimate Letter;

1.2.34 **'Distribution Standard Connection Charge'** means that portion of the Connection Charge associated with a Standard Connection and the Distribution System;

1.2.35 **'Distribution System'** means Eskom's network infrastructure consisting of assets operating at a nominal voltage of 132 kV or less, not classified as transmission transformation equipment;

1.2.36 **'EA'** means environmental authorisation(s);

1.2.37 **'Early Termination Guarantee'** means a Guarantee issued for an amount equal to the Early Termination Guarantee Amount;

1.2.38 **'Early Termination Guarantee Amount'** means a) initially an amount as set out in Annexure G (Financial Specifications), b) thereafter an amount as adjusted by Eskom on written notice to the Customer in accordance with the terms and conditions of Budget Quote; and c) thereafter such adjusted amount reduced annually by one tenth (1/10th) with effect from the fourth (4th) year following the Commencement Date (as defined in the Electricity Supply Agreement);

1.2.39 **'Electrical Installation'** means the electrical equipment and installation of the Customer where electrical supply is taken, as more fully described in Annexure C;

1.2.40 **'Electricity Accounts Guarantee'** means a Guarantee issued for an amount equal to the Electricity Accounts Guarantee Amount;

1.2.41 **'Electricity Accounts Guarantee Amount'** means a) initially an amount as set out in Part B of Annexure G (Financial Specifications) and b) thereafter an amount as varied by Eskom on written notice to the Customer in accordance with the ESA;

1.2.42 **'Electricity Regulation Act'** means the Electricity Regulation Act, No. 4 of 2006;

1.2.43 **'Electricity Supply Agreement'** or **'ESA'** means the agreement, including all appendices, entered into between Eskom and the Customer, in respect of the supply of electricity by Eskom to the Customer and the Connection to the Distribution System and/or the Transmission System;

1.2.44 **'Eskom'** means Eskom Holdings SOC Ltd (Registration Number 2002/015527/30);

1.2.45 **'Eskom Connection Equipment'** means the equipment and assets to Connect the Electrical Installation to the Distribution System and/or the Transmission System as described in the Electricity Supply Agreement, which shall be owned, operated and maintained by Eskom;

1.2.46 **'Eskom Connection Works'** means the works required to be constructed, changed or enabled on the Distribution System and/or the Transmission System side of the Point of Delivery, save as may be otherwise provided herein, and all related activities by which the Eskom Connection Equipment shall establish a Connection between the Point/s of Delivery and the Distribution System and/or the Transmission System, including if applicable the

Monopoly Works and the Contract Works;

1.2.47 **'Eskom Equipment'** means the plant, facilities, equipment and assets set forth in Annexure E (Eskom Connection Works) to the Budget Quote which shall be constructed by Eskom in accordance with the Budget Quote and owned, operated and maintained by Eskom;

1.2.48 **'Eskom Works'** means the works as described in Annexure E (Eskom Connection Works) comprising of the Eskom Connection Works but excluding the Contract Works;

1.2.49 **'Estimated Capital Costs'** means the estimated Capital Costs as set out in Annexure F (Estimated Capital Costs);

1.2.50 **'Estimated Monopoly Works Charge'** means the estimated Monopoly Works Charge as set out in Part C of Annexure G (Financial Specifications);

1.2.51 **'Guarantee'** means a guarantee substantially in a form acceptable to Eskom and initially for the amount stated therein, which (i) is issued by a financial institution which (a) holds an Approved Credit Rating and (b) is registered under applicable Law to carry on business in South Africa and (ii) constitutes an on demand, unconditional and irrevocable commitment to pay by the financial institution by which it is issued;

1.2.52 **'HV'** means high voltage;

1.2.53 **'Law'** means any law, order, rule, regulation or code of any Governmental Authority of the Republic of South Africa or the promulgation or introduction of any law, order, rule, regulation or code by any Governmental Authority of the Republic of South Africa;

1.2.54 **'Licences'** means the licence(s) issued by the NERSA to Eskom in terms of the Electricity Regulation Act;

1.2.55 **'Maximum Demand'** has the meaning as ascribed to it in the Schedule of Standard Prices;

1.2.56 **'Monopoly Works'** means those works forming part of the Eskom Connection Works which remain Eskom's responsibility under the Self-Build Agreement to ensure a standard of work that meets Eskom 's quality of supply, reliability and safety standards;

1.2.57 **'Monopoly Works Charge'** means the charge recouped or to be recouped by Eskom from the CUSTOMER for the Monopoly Works Cost;

1.2.58 **Monopoly Works Cost** means the cost of the Monopoly Works;

1.2.59 **'NERSA'** means the National Energy Regulator of South Africa or its successor-in-title established in terms of the National Energy Regulator Act, No 40 of 2004;

1.2.60 **'Notified Maximum Demand'** means the Maximum Demand notified in writing by the Customer and accepted by Eskom, as more fully described in Annexure "D" (*Technical Specifications*);

1.2.61 **'NRS 048'** means the quality of supply specification issued by the South African Bureau of Standards, as revised from time to time or as replaced by a national standard;

1.2.62 **'Parties'** means Eskom and the Customer, and the word **'Party'** shall be construed accordingly;

1.2.63 **'Point(s) of delivery** or **'POD'** has the meaning as ascribed to it in the Electricity Supply Agreement;

1.2.64 **'Point(s) of Supply (POS)'** means the electrical nodes on the Distribution System where the Customer's electrical equipment is physically connected to Eskom's electrical equipment. The location of the Point(s) of Connection is described in Annexure C (Customer/Technical Details and Location of the Electrical Installation);

1.2.65 **'PPI'** means the index published from time to time by Statistics South Africa, which is referred to as the "Production Price Index for final manufactured goods" in statistical release P0142.1 or such other index as may be determined by Statistics South Africa to replace or supersede that index;

1.2.66 **‘Premium Connection’** means a connection made or to be made between the Electrical Installation and Eskom’s network based on the customer’s requirements, that are in excess of the specifications of a Standard Connection to provide for a more reliable and secure connection and includes the acquisition and installation of the Premium Equipment;

1.2.67 **'Premium Connection Charge’** means that portion of the Connection Charge payable for costs associated with the Premium Connection included in the scope of the Eskom Connection Works to meet customer specific requirements in excess of what is considered as the least life-cycle cost investment;

1.2.68 **‘Premium Equipment’** means the equipment to be constructed, or to be installed if the Customer elects a Premium Connection and is in addition to and/or in place of the equipment installed in the case of a Standard Connection. Where applicable, the Premium Equipment shall comprise the equipment listed in Annexure E (Eskom Connection Works);

1.2.69 **‘Pre-project Investigation Charge’** means the charge recouped by Eskom from the Customer for the Pre-project Investigation Cost;

1.2.70 **‘Pre-project Investigation Cost’** means the cost charged to cover the investigation work prior to and including the issuing of the cost estimate letter or the budget quotation in case of applications that follow the major short process where the Cost Estimate Letter is not issued to the Customer. This is a standard charge based on the Cost Estimate Fee amount for the applicable supply size category;

1.2.71 **'Property'** means the Customer's property described in Annexure "C" (*Customer Details, Description of Electrical Installation and Property*) on which a supply of electricity is required by the Customer;

1.2.72 **'Reasonable and Prudent Operator'** means a person seeking in good faith to perform its contractual obligations and, in so doing and in the general conduct of its undertaking, exercising that degree of skill, diligence, prudence, responsibility and foresight which would reasonably and ordinarily be expected from a skilled and appropriately experienced person, developer, contractor, owner or operator internationally, who is complying with all applicable Laws, engaged in the same or a similar type of undertaking, in the same or similar circumstances and conditions, and any references herein to the ‘Standards of a Reasonable and Prudent Operator’ shall be construed accordingly;

1.2.73 **‘Request for Budget Quote’** means the request for the Budget Quote letter in the form attached hereto as Annexure A to be completed by the Customer and submitted to Eskom;

1.2.74 **'Schedule of Standard Prices'** means Eskom’s published tariffs, charges and the NMD Rules, applicable to Customers as approved by NERSA and as amended from time to time;

1.2.75 **'Self-Build'** means the planning, financing, insuring, land rights acquisition, design, engineering, procurement, supply, fabrication, construction, erection, installation, inspection, pre-commissioning, testing, completion and commissioning of the Contract Works by the Customer, and on completion of the Contract Works the handover of the plant, facilities, equipment, assets and related designs, material guarantees/ warranties, deeds and other documentation by the Customer to Eskom;

1.2.76 **'Self-Build Agreement'** means the agreement between Eskom and the Customer pertaining to the Contract Works to be undertaken by the Customer, and the Monopoly Works falling under the responsibility of Eskom;

1.2.77 ‘**South African Grid Code**’ means the set of documents entitled “South African Grid Code” published by NERSA as amended, modified, extended, replaced or re-enacted from time to time;

1.2.78 **‘Standard Connection’** means a connection made to or to be made between the Electrical Installation and Eskom’s network based on the lowest life-cycle costs design that meets the specifications in terms of NRS 048 and the Distribution Code for a technically acceptable solution;

1.2.79 **'Standard Connection Charge'** means that portion of the Connection Charge that is payable for costs associated with the Standard Connection;

1.2.80 **'Standard Equipment'** means the equipment to be constructed or to be installed if the Customer elects a Standard Connection. The Standard Equipment shall comprise the equipment listed in Annexure E (Eskom Connection Works);

1.2.81 **'Transformation Capacity Charge'** means the charge included in the Transmission Connection Charge for the use of transmission transformation assets that are dedicated to a customer or to a group of customers. The transmission transformation assets may be new or existing and would have been paid for fully or partially by customers either through Transmission Connection Charges or through Transmission Use of System charges;

1.2.82 **'Transmission Connection Charges'** means that portion of the Connection Charge associated with the Transmission System, which may comprise of the Transmission Standard Connection Charge and the Transmission Premium Connection Charge;

1.2.83 **'Transmission Monopoly Works'** means those Monopoly Works associated with the Transmission System;

1.2.84 **'Transmission Premium Connection Charge'** means that portion of the Connection Charge associated with a Premium Connection and the Transmission System;

1.2.85 **'Transmission Quotation Fee'** means the portion of the Transmission Connection Charge to be paid by the Customer to Eskom for the issue of the Budget Quote, the value of which is set out in Annexure G (Financial Specifications) and will be valid for a period of 12 months from the date of this Cost Estimate letter, where after the value will be revised by Eskom;

1.2.86 **'Transmission Standard Connection Charge'** means that portion of the Connection Charge associated with a Standard Connection and the Transmission System;

1.2.87 **'Transmission System'** means all Eskom's lines and substation equipment where the nominal voltage is above 132 kV. All other equipment operating at lower voltages are either part of the Distribution System or classified as transmission transformation equipment;

1.2.88 **'VAT'** means the value added tax levied in terms of the VAT Act; and

1.2.89 **'VAT Act'** means the Value Added Tax Act, No. 89 of 1991.

1.3 In this Cost Estimate Letter, unless a contrary intention clearly appears:-

1.3.1 the headings to the clauses and sub-clauses in this Cost Estimate Letter are for the purpose of convenience and reference only, and shall not be used in the interpretation, modification, amplification of any clause thereof;

1.3.2 words and expressions defined in this Cost Estimate Letter shall bear the same meanings in the Annexures to this Cost Estimate Letter unless specifically defined in those Annexures;

1.3.3 any words or expressions for which no meanings have been ascribed in this Cost Estimate Letter shall have the meanings ascribed to them in the Act or, in the absence of such meanings, the meanings ascribed to them in the Code(s);

1.3.4 words and expressions importing:

a. any one gender includes the other gender;
b. the singular includes the plural and vice versa;
c. natural persons include juristic persons and vice versa;

1.3.5 any reference to any law shall include any amendments, modifications, extensions, replacements or re-enactments thereof then in force;

1.3.6 any reference to 'this Cost Estimate Letter' shall mean this Cost Estimate Letter together with its Annexures as amended, modified or supplemented;

1.3.7 any reference to 'writing' or 'written' shall include all methods of reproducing words in a legible and non-transitory form;

1.3.8 any reference to ‘persons’ shall include individuals, firms and corporations, joint ventures, trusts, unincorporated associations and organisations, partnerships and any other entities, in each case whether or not having a separate legal personality; and

1.3.9 any reference to either ‘Party’ or ‘any person’ shall include its legal successors and permitted assignees;

1.3.10 in the computation of periods of time from a specified day to a later specified day, 'from' means from and including and 'until' or 'to' means to and including;

1.3.11 any reference in this Cost Estimate Letter to a ‘Clause’ or ‘sub-clause’ is a reference to a clause or sub-clause contained in this Cost Estimate Letter;

1.3.12 any reference to 'Clause', ‘Annexure’ and ‘Part’ are references to the relevant clause, annexure and part, respectively, of this Cost Estimate Letter, references to 'Annex' are to the relevant annex to an Annexure of this Cost Estimate Letter, references to 'Paragraph' are to the relevant paragraph in an Annexure or Annex to this Cost Estimate Letter;

1.3.13 where figures are referred to in numerals and in words, if there is any conflict between them the words shall prevail;

1.3.14 any reference to number of days shall be a reference to calendar days unless Business Days are specified; and

1.3.15 the rule of construction that this Cost Estimate Letter shall be interpreted against the Party responsible for the drafting or preparation hereof, shall not apply.

2. TECHNICAL

2.1 The Notified Maximum Demand to be made available by Eskom at the Customer's Point(s) of Delivery shall be as set out in Annexure "D" (*Technical Specifications*).

2.2 The Electrical Installation, the Property and the nature of the Customer’s plant is described in Annexure "C" (*Customer Details, Description of Electrical Installation and Property*).

2.3 The location of the Customer’s Point(s) of Delivery and Point(s) of Supply is described in Annexure “D” (*Technical Specifications).*

2.4 The Customer shall provide the relevant protection, synchronising and control equipment at the Electrical Installation which is compatible with the protection standard required by Eskom and in accordance with the terms and conditions of the Electricity Supply Agreement and the Code(s).

2.5 Prior to the Connection, the Customer shall comply with all applicable Law including but not limited to those governing the electricity supply industry including regulations, the Code(s), directives and guidelines, failing which Eskom may refuse to allow the Connection, or disconnect the Connection until such time as there is compliance with such Law.

2.6 Network performance and quality of supply

2.6.1 Eskom is required to provide a standard of quality of supply, which complies with NRS 048. The Customer shall comply with the quality of supply limits determined in accordance with NRS 048.

2.6.2 Eskom will use its reasonable endeavours to furnish the Customer with a reliable network for the supply of electricity to the Customer. However, it is not practicable for Eskom to guarantee that the continuity and voltage quality at the Point(s) of Supply will always be maintained under all contingencies. It will be incumbent on the Customer to take adequate measures to protect its business and the Electrical Installation against any damage and / or losses arising from frequency deviations, loss of Connection or connection/supply interruptions, voltage variations (including voltage dips), voltage harmonics, inter-harmonics, voltage flicker, voltage unbalance, voltage swells and transients, undervoltages and overvoltages at the Point of Delivery.

2.6.3 Eskom generally contracts with Customers for a Standard Connection in terms of which no specific voltage dip or interruption limits will be specified in the contract. Indicative levels of voltage dip and interruption performance may be obtained on request from Eskom. In order to ensure greater levels of assurance on interruption (and in some cases dip) performance, customers may elect to:

2.6.3.1 pay for the necessary infrastructure required to provide a Connection with higher levels of reliability; or

2.6.3.2 pay for additional monitoring equipment to effect monitoring of performance at the Point of Delivery.

2.7 **Technical assumptions**

2.7.1 This Cost Estimate Letter is based on the information provided by the Customer in the application for this Cost Estimate Letter attached hereto as Annexure "B" (Connection Application) and assumes that the Connection Works to be constructed is for the Connection of the Electrical Installation and not for any other customer. If other customers are to be connected the cost to connect and the technical assumptions may change.

2.7.2 This Cost Estimate Letter is based on the technical assumptions as set out in Part C of Annexure "E" (Eskom Connection Works).

3. CONNECTION WORKS

3.1 **Customer Connection Works**

3.1.1 The Customer shall be responsible for the portion of the Connection Works comprising the Customer Connection Works.

3.2 **Contract Works**

3.2.1 If a Self-Build option is elected by the Customer, the Customer shall be responsible for the portion of the Connection Works comprising the Contract Works as set out in Part B.2 of Annexure "E" (Eskom Connection Works) and associated timelines in accordance with the terms and conditions of the Self-Build Agreement.

3.2.2 The Customer must indicate in the Request for the Budget Quote whether it elects to Self-build and must also indicate the estimated timeline to complete the Contract Works.

3.2.3 The approval of a Self-Build option by Eskom and the take-over of any Contract Works by Eskom will be subject to the conditions contained in Eskom's Standard for HV self-build projects (a copy of which will be made available on request), the Procedure for Self-build Projects in Transmission and the Self-build Agreement to be concluded, which inter alia shall include the following:

3.2.3.1 the Contract Works must be built according to the Eskom standards and specifications and Eskom will not under any circumstances take over and energise any asset that is not built according to the Eskom standards; and

3.2.3.2 the Customer shall pay all costs incurred by Eskom in relation to all Monopoly Works (see Annexure "F").

3.3 **Eskom Works**

3.3.1 Eskom shall be responsible for the portion of the Eskom Connection Works comprising the Eskom Works as set out in Annexure "E" (Eskom Connection Works).

3.3.2 If a Self-Build option is not elected by the Customer, the Eskom Works shall be as set out in Part A.1 of Annexure "E" (Eskom Connection Works).

3.3.3 If a Self-Build option is elected by the Customer, the Eskom Works shall be as set out in Part B.1 of Annexure "E" (Eskom Connection Works).

3.4 **Estimated Connection timelines**

3.4.1 Subject to the content of this Cost Estimate Letter and the conditions of any Budget Quote accepted later, the estimated period for the completion of the Eskom Connection Works, calculated from the commencement of construction by Eskom, where the Customer does not elect an option of Self-Build, is set out in Part A.2 of Annexure "E" (Eskom Connection Works). The estimated period provided in this Cost Estimate Letter is not binding on Eskom in any way.

3.4.2 Where the Customer elects an option of Self-Build, the connection timeline shall be determined by the Parties taking into consideration resource availability for commissioning and related activities.

3.5 **SCOPE OF WORKS**

3.5.1 At the Customer's option, to be exercised on acceptance of the Budget Quote, the Eskom Works may comprise:

3.5.1.1 a Standard Connection, comprising the Eskom Equipment described in Part A of Annexure "E" (*Eskom Works*); or

3.5.1.2 where applicable, a Standard Connection and a Premium Connection, comprising the Eskom Equipment described in Part A and Part B of Annexure "E" (*Eskom Works*).

4. FINANCIAL

4.1 **Total Estimated Capital Costs**

4.1.1 The total Estimated Capital Costs:

4.1.1.1 if the Customer does not elect to Self-Build, are set out in Part A of Annexure F (Estimated Capital Costs); or

4.1.1.2 if the Customer elects to Self-Build, are set out in Part B of Annexure F (Estimated Capital Costs).

4.2 **Connection Charge Estimate**

4.2.1 The Connection Charge Estimate:

4.2.1.1 if the Customer does not elect to Self-Build, is set out in Part B of Annexure G (Financial Specification); or

4.2.1.2 if the Customer elects to Self-Build, is set out in Part C of Annexure G (Financial Specification).

4.2.2 The Customer shall pay the Connection Charge Estimate in accordance with the Budget Quote.

4.3 **Connection Charge Guarantee**

4.3.1 If the Customer elects in its acceptance of the Budget Quote to pay the Connection Charge Estimate in instalments, the Customer shall deliver a Connection Charge Guarantee in accordance with the Budget Quote.

4.4 **Early Termination Guarantee**

4.4.1 Eskom will, in connecting the Electrical Installation to the Distribution System incur certain expenditures and costs, which are not directly recovered through the Connection Charge. In the event of an early termination of the project or the ESA, such costs shall be recovered by Eskom from the Early Termination Guarantee.

4.4.2 The Customer shall deliver an Early Termination Guarantee in accordance with the Budget Quote. The Early Termination Guarantee Amount is set out in Annexure G (Financial Specifications).

4.5 **Contract Works Security**

4.5.1 Where the Customer elects an option of Self-Build, the Customer shall deliver the Contract Works Security in accordance with the Budget Quote.

4.6 **Standard tariff details**

4.6.1.1 Subject to the provisions of the Electricity Regulation Act, the current prices of the standard tariff as specified in Annexure G (*Financial Specifications*) to be charged monthly are set out in the Schedule of Standard Prices attached hereto as Annexure “H”. These prices will be valid until Eskom’s next price increase or tariff restructuring becomes operative.

4.6.1.2 The prices to be charged monthly are subject to the terms and conditions of the Electricity Supply Agreement.

4.7 **Electricity Accounts Guarantee**

4.7.1 The Customer shall provide an Electricity Accounts Guarantee, for the due payment of monthly electricity accounts in accordance with the terms of and conditions of the Electricity Supply Agreement. The Electricity Accounts Guarantee Amount is set out in Annexure "G" (*Financial Specifications)*. The security may be provided in cash or by means of a Guarantee.

5. BUDGET QUOTE

5.1 Eskom shall provide a Budget Quote to the Customer, provided that within 12 (twelve) months of the date of this Cost Estimate Letter the Customer complies with the Budget Quote application conditions set out in Clause 5.2 below.

5.2 **Budget Quote application conditions**

5.2.1 If the Customer wants Eskom to proceed to provide a Budget Quote the Customer must complete the Request for a Budget Quote, in the form attached to this Cost Estimate Letter as Annexure A and forward the request together with the Distribution Quotation Fee and/or the Transmission Quotation Fee where applicable and other required information and documentation.

5.3 **Cost Estimate Fee and quotation fees**

5.3.1 Eskom incurs costs in providing a Cost Estimate Letter. These costs are payable upfront as a Cost Estimate Fee before Eskom will proceed with the preparation of the Cost Estimate Letter.

5.3.2 Should a Budget Quote not be requested by the Customer, the Cost Estimate Fee will be forfeited.

5.3.3 Similarly, Eskom will incur costs, such as survey, environmental impact assessments, and detailed design, in providing a Budget Quote. These costs are payable upfront as a Distribution Quotation Fee and where applicable a Transmission Quotation Fee, before Eskom will proceed with the Budget Quote.

5.3.4 Should the Budget Quote not be accepted for any reason, the Cost Estimate Fee will be forfeited and any actual costs incurred by Eskom shall be set-off against any amounts paid in advance by the Customer and the balance refunded to the Customer.

5.3.5 Should the Customer require a revision of scope of the Connection after paying the Cost Estimate Fee and after receiving the Cost Estimate Letter, the Customer may be required to pay to Eskom another upfront cost estimate fee before another cost estimate letter will be provided.

6. LEGAL

6.1 Eskom may not connect the Electrical Installation to the Distribution System unless the Customer complies with the prevailing law in general. Any costs incurred by Eskom, at or after providing the Budget Quote, is payable by the Customer irrespective of whether these Approvals are obtained or not.

6.2 The Customer shall enter into a written Electricity Supply Agreement with Eskom in accordance with the Budget Quote.

6.3 Where the Customer elects to exercise the Self-Build option, the Customer shall enter into a written Self-Build Agreement with Eskom. If the Customer fails to construct the Contract Works in accordance with the required Eskom standards and specifications, Eskom will not be obligated to take ownership of these assets. In this instance, the Customer will be in breach of the Self-Build Agreement. Should the Customer fail to remedy its breach and meet the requirements, Eskom may, in its sole discretion, provide to the Customer a new quotation to complete the project and take over the assets.

6.4 The Customer shall be liable to pay any taxes and/or levies relating to the subject matter hereof, which may be imposed in terms of any existing and/or future legislation or as approved by NERSA.

6.5 The terms and conditions of this Cost Estimate Letter are subject to the provisions of the Code(s), the Act(s) and the rules and regulations issued thereunder, and of Eskom's licences and Schedule of Standard Prices, as amended or re-enacted from time to time and any other applicable laws.

6.6 The information contained in this Cost Estimate Letter should not be used for anything other than its intended purpose. Eskom accepts no liability, contractual or otherwise, as a result of any reliance on this information and the Customer accordingly indemnifies Eskom against any liability emanating from the use of this information.

6.7 Eskom's bank account details for direct deposits or bank transfers shall be specified in the invoice issued by Eskom in respect of the Distribution Quotation Fee and the Transmission Quotation Fee, if applicable.

6.8 The Customer shall use the account number on the invoice as the reference number for the deposit or transfer. Please attach proof of payment to the completed Request for Budget Quote.

For any information, enquiries or confirmation, please contact **Stoffel Makale** at telephone number **(011) 516 7036.**

I thank you for the opportunity of allowing Eskom to provide this service and trust that your favourable written reply will reach this office shortly.

Yours sincerely

……

Solly Matebula

SENIOR MANAGER CUSTOMER SERVICE)

28/04/2026

……

Date

ANNEXURE A

REQUEST FOR BUDGET QUOTE

Mr. Siya Nxumalo
Electrical Engineer
Vaal Aerozone (Pty) Ltd
P O Box 35465
MENLO PARK
0102

Date: ……..

Eskom Holdings SOC Ltd (Reg No: 2002/015527/30)
Mr Stoffel Makale
Key Accounts Relations Officer
Tel +27 16 362 9335
Fax +27 86 664 7182
P O Box 27
VEREENIGING
1930

Dear Mr Makale

REQUEST FOR BUDGET QUOTE FOR NEW DEDICATED SUBSTATION OF 20000KVA AT PORTION 15(A PORTION OF PORTION 1) VLAKPLAATS 555, VANDERBIJLPARK

I have read and understood the terms of the Cost Estimate Letter dated **27 March 2026**, reference number **VDL929105485**. I hereby request Eskom to prepare a Budget Quote for my consideration.

I do not intend to exercise the Self-Build option

.

Please provide an invoice for the following:

Description	**Cost**	**Select**
Distribution Quotation Fee	R 23 774 020.00 + VAT = R 27 340 123.00	
Transmission Quotation Fee	R 2 115 940.00 + VAT = R 2 433 331.00	
Total Quotation Fee	**R 25 889 960.00 + VAT = R 29 773 454.00**	

Please find herewith also the documentation/information required by Eskom as set out in the Cost Estimate Letter to proceed with the Budget Quote.

I acknowledge that Eskom will release the project for the Budget Quote phase when all of the following conditions are met:

- Request for Budget Quote letter received
- Distribution Quotation Fee and/or Transmission Quotation Fee paid

All future correspondence must be addressed as follows:

_____

_____code_____

Signed for and on behalf of …… on ..... 2026. by …… in my capacity as …… (who confirms that I am duly authorised).

……

ANNEXURE B

CONNECTION APPLICATION

Eskom Distribution	Application for Electricity	CNC AREA:
		Project number

APPLICATION FOR: (Tick where applicable)	NEW SUPPLY	UPGRADE OF SUPPLY	DOWNGRADE OF SUPPLY	LINE DEVIATION
	kVA 50 MVA	FROM ___ TO ___kVA	FROM ___ TO ___kVA	LINE LENGTH _____

Customer Title: Mr.

Initials: M

Surname/Company Name: VAAL AEROZONE (PTY) LTD

Full First Names: Marcel De Beer

VAT number: 4220292785

Nationality: South African

Co/CC Reg No: 2017/498408/07

Identity No: 9405205080088

Cell No: 082 336 4280

Business No: +27 (11) 568-1547

Telephone: +27 (11) 568-1547

Fax:

Language: ENGLISH

E-Mail Address: marcel@plumarigroup.co.za

Customer's Physical Address:
1st Floor, Building 2, Needwood Office
Park Cnr Cedar Boulevard &, Cedar Rd
Fourways, Johannesburg, 2191 **Code:** 2191

Postal Address for accounts:
P O BOX 35465 MENLO PARK
PRETORIA GAUTENG **Code:** 0102

Marital Status: N/A

Marriage Contract: N/A
Indicate if Ante-Nuptial / Community of Property / Other

Notification Preference: E-MAIL
Indicate E-mail / Fax / Pers. / Phone / Post

Next-of-Kin's Name: N/A
Customer's Family member

N/A
Contact No. for Family Member

TARIFF APPLICABLE:

Application date: 11/10/2024	**Supply needed:** 1 Phase: _____ or 3 Phase: X
Requested Completion date: 01/03/2026	**Owner/Tenant:**

Temporary Supply: YES / NO	**Estimated monthly consumption:**

PHYSICAL ADDRESS WHERE SUPPLY IS REQUIRED:

Site number	Portion 15 (A Portion of Portion 1)	**Site Name**	Vlakplaats 555
Short description of where the site is	Site to be located along the N1 north on aerotropolis owned land before Vanderbijlpark		
Latitude	-71309.8	**Longitude**	2947148.7

Type of supply required:					
House		Dairy		Workshop	
Shed		Pump		Labourer's house	
Other (please specify)	MV Supply				

Indicate usage category:			
Residential		Industrial	X
Industrial		Commercial	X
Re-distribution		Mining	

Nearest Eskom Pole Number:
Description/Reference no's of Eskom supply closest to PCD

Pump kW size: N/A

Contact person for project: Marcel De Beer
Authorised person if customer unavailable

Other Eskom Supplies:
Potential Eskom supplies from Olympus MTS and Riggi MTS.

Contact person's tel. no: 082 336 4280

Special instructions: The new aerotropolis development shall require two independent supplies from two Main Transmission substations at 132kV to be stepped down into the main intake selfbuild substation.
From the main internal substation there will be a further stepped down to 11kV for the internal reticulation ring to various 11kV/400V minisubs around the development.

Please take note of the following: You will receive a quotation and agreements to sign from ESKOM within 30 days from application. When acceptance received by Eskom you will receive a deposit notification

Customer signature: _____ Date: _____

Eskom official signature: _____ Date: _____

1) To proceed with application, attach the following documents

- Copy of ID book (individual)

2) If application is in business name

- Copy of business registration certificate
- Copy of TAX registration certificate
- Letter of signing authority plus copy of this person's ID document

NB!! OWNER/TENANT PLEASE PROVIDE PROOF OF OWNERSHIP OR LETTER FROM OWNER STATING TENANT MAY UP/DOWNGRADE OR APPLY FOR SUPPLY.

ANNEXURE C

CUSTOMER DETAILS, DESCRIPTION OF ELECTRICAL INSTALLATION AND PROPERTY

Table 1		
1.1	Customer	**Vaal Aerozone (Pty) Ltd**
1.2	Description of Property	**Passenger and Agricultural Goods Airport**
1.3	Description of Electrical Installation	**Substation**
1.4	Nature of Customer's plant	**Agricultural Good Airport**

ANNEXURE D

TECHNICAL SPECIFICATIONS

Part A – Technical Information

Table 1		
1.1	Notified Maximum Demand	**20000 kVA**
1.2	Declared Voltage	**11kV**
1.3	Nominal Voltage	**11kV**
1.4	Customer's Point of Delivery	**Vaal Aerozone Airport**
1.5	Customer's Point of Supply	**Vaal Aerozone Airport**
1.6	Estimated Period for the completion of the Eskom Works	**36 Months**
1.7	Estimated Period for the completion of the Contract Works (if applicable)	**N/A**
1.8	Estimated Period for the completion of the remaining Monopoly Works (if applicable)	**N/A**
1.9	Estimated Period for the completion of the Eskom Connection Works	**36 Months**

Part B – Assumptions

1. From time to time Eskom may have a shortage of generation capacity and may not be able to meet the energy and capacity required by all its customers.

2. Load-Curtailment:

2.1 When entering into any later contract with Eskom, such contract will include provisions to the effect that Eskom shall have the right, for purposes of the efficient operation and extension of Eskom's generation, transmission and distribution systems and also in emergencies, to temporarily interrupt the supply to you.

2.2 You will be required to collaborate in determining the portion of your load which will be reduced through Eskom's load curtailment and/or manual load-shedding and/or under-frequency load-shedding schemes, or by other means, if Eskom should experience a shortage of generation and/or transmission and/or distribution capacity.

ANNEXURE E

ESKOM CONNECTION WORKS

PART A: SELF-BUILD OPTION NOT ELECTED BY CUSTOMER (ESKOM BUILD)

A.1 Eskom Works

A.1.1 Eskom Equipment

A.1.1 Standard Equipment on the Transmission System

The recommended solution to facilitate end-customer connection is at 132 kV. The detailed scope of work is as follows:

Recommended scope of work

Upstream scope of work at Olympus Substation:
None

Shared scope of work at Olympus Substation:
Extend 132 kV yard
Extend 132 kV busbar

Dedicated scope of work at Olympus Substation:
Establish and equip 1 x 132 kV feeder bay

Upstream scope of work at Scafell Substation:
None

Shared scope of work at Scafell Substation:
None

Dedicated scope of work at Scafell Substation:
Upgrade protection scheme so that it is compatible with the feeder protection scheme that Distribution will install to integrate Vaal Aerozone load
Change the labels on Lochvaal Rural 132 kV feeder

A.1.2 Premium Equipment on the Transmission System- N/A

A.1.3 Standard Equipment on the Distribution System

Job 1: 132/11kV Vaal Airport Sub

Primary Plant Scope of Work

Primary Plant Scope of Work:
Acquire and register servitudes and obtain all relevant environmental approvals.
Design, supply and build a 132/11 kV substation. Consisting of:
o 3 Transformer bays
o 6 fully equipped Line bays
o Control room with 6 MV breakers
Appoint a clerk of works to monitor project implementations.

Build 3 x 132/11 kV transformer bays
Supply and Install 2 x 40 MVA 132/11 kV transformers, Breakers,VT's,CT's and isolators for all the transformer bays.
Install 3 x 11kV Meter panels
Test and commission and take over the assets.
Build a control room, install high risk security fence, lighting, and lightning masts

Control Plant Scope of Work
Protection
Install, test and commission 2 x 132kV Feeders using the 5FZD# Line Differential/Impedance Schemes. (2 x CT/JB's & 2 x VT/JB's)
Install, test and commission 132kV Bus Bar Protection using the 5BZ# Hi-Impedance Bus Zone

Protection Scheme
Install, test and commission 2 x 132/11kV 40MVA Transformers using the 5TM# Transformer Protection and the Tap Change Control Schemes. (3 x CT/JB's & 3 x VT/JB's)
Install, test and commission 3 x 132/11kV Meter Panel Feeders using the 5RF# Feeder Protection Schemes.

Metering
Install, test and commission the 132kV Stats Metering Panel. (2 x Feeders)
Install, test and commission the 132kV Tariff Metering Panel. (3 x 11kV Meter Panel Feeders)
Install 1 x Quality of Supply Module.

SCADA
Test and commission the RTU with a 2 Vertical IDF. DNP3 Protocol to be used.

DC
Install, test and commission the AC/DC Distribution Board.
Install, test and commission the 110V 30A Battery Charger with 85 x VTX1 185A/H Battery Bank.

Telecoms
Project Co-ordinator to order MSAP and associated equipment from the Telecoms Contracts Manager Sandile Mathebula.

Security
Install, test and commission the Substation Security Alarm and CCTV systems.

Tx Interdependent Job:
Apply to Eskom Transmission for 1 x 132kV Feeder bays for Vaal Airport 132/11 kV Substation
Acquire and register servitudes and obtain all relevant environmental approvals.

Job 2: Olympus-Vaal Airport 132 kV line (Standard)
Primary Plant Scope of Work:
Acquire and register servitudes for the line.
Design, supply and build the proposed 1 x ~10 km 132kV tern single circuit line.
Appoint a clerk of works to monitor project implementations.

Control Plant Scope of Work
Telecoms
Project Co-ordinator to arrange with Telecoms Contracts Manager Sandile Mathebula w.r.t. the OPGW
Fibre Optic to be installed on the new 10km Olympus – Vaal Airport SS 132kV Line.

Job 3: Loop in Loop out Lochvaal – Scafell 132kV Line (Premium)
Primary Plant Scope of Work:
Acquire and register servitudes for the line.

Loop in approximately 4km Tern line from Lochvaal Scafell line to Customer substation
Loop out approximately 4km Tern line from customer substation to Lochvaal Scafell Line

Telecoms
Project Co-ordinator to arrange with Telecoms Contracts Manager Sandile Mathebula with regard to the OPGW
Fibre Optic to be installed on the new 4km LILO 132kV Line from Vaal Airport to the Scafell - Loch Vaal Rural 132kV Line.

A.2 Estimated Period

A.2.1 The estimated period for the completion of the Eskom Works, calculated from the commencement date of the Eskom Works, shall be 18 months.

PART B: SELF-BUILD OPTION ELECTED BY CUSTOMER- N/A

B.1 Eskom Works

B.1.1 Eskom Equipment

B.1.1.1 Standard Equipment on the Transmission System

B.1.1.2 Premium Equipment on the Transmission System

B.1.1.3 Standard Equipment on the Distribution System

B.1.1.4 Premium Equipment on the Distribution System

B.1.2 Monopoly Works

B.1.2.1 Eskom will appoint a clerk of works to monitor the quality of the construction as well as the quality of material.
B.1.2.2 Eskom will appoint a project manager to do site inspections and also monitoring of workmanship and materials/equipment.
B.1.2.3 Eskom will monitor the Customer's environmental management in respect of the Contract Works
B.1.2.4 Eskom will verify the design and equipment of the Contract Works
B.1.2.5 Eskom will commission the metering, protection and the supervisory control and data acquisition system (SCADA), which will be installed by the Customer in terms of the Self-Build Agreement.
B.1.2.6 Eskom will monitor the installation of the Contract Works.
B.1.2.7 Eskom will be responsible for any commissioning in respect of the Contract Works required after the Connection of the Electrical Installation to the Distribution System.
B.1.2.8 Eskom will manage any outages required on the Distribution System and or Transmission System.
B.1.2.9 Eskom will check and accept the route selection and will monitor the process of registration of the Servitudes in the name of Eskom.
B.1.3.10 Eskom will effect the closing span to liven up the Connection Works as well as the optical fibre ground wire connection.

B.2 Contract Works

B.2.1 Contract Works Equipment

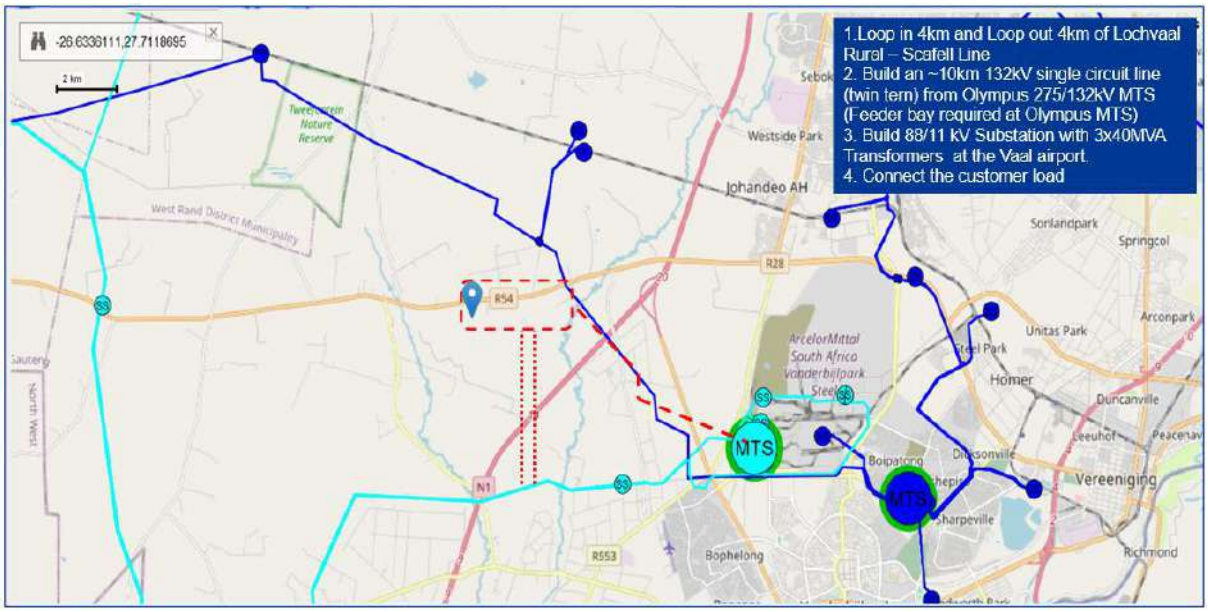
B.2.1.1 Standard Equipment on the Transmission System

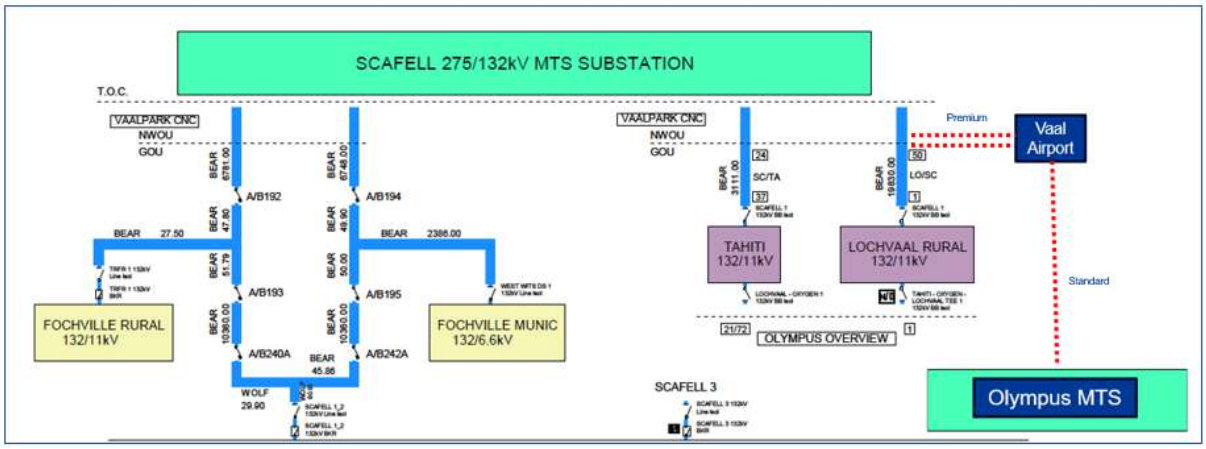
B.2.1.2 Premium Equipment on the Transmission System

B.2.1.3 Standard Equipment on the Distribution System

B.2.1.4 Premium Equipment on the Distribution System

PART C: TECHNICAL assumptions





ANNEXURE F

ESTIMATED COSTS AND MONOPOLY WORKS

PART A: SELF-BUILD OPTION NOT ELECTED BY CUSTOMER (ESKOM BUILD)

The estimated costs associated with the Eskom Works, including escalation and overheads are as follows:

Table 1 (a) Summary of allocated Estimated Capital Costs

Cost Item	Excl. VAT	Incl. VAT
Pre-Project Investigation Cost (This is a standard cost based on the Cost Estimate Fee amount)	R 66 991,30	R 77 040,00
Estimated Capital Cost for a Standard Connection	R 171904855.40	R 197 690 583.71
Estimated Capital Cost for a Premium Connection	R 22 502 876,00	R 25 878 307,40
Total Estimated Capital Costs	**R 194 474 722.70**	**R 223 645 931.11**

Table 1 (b) Estimated Capital Cost of Standard Equipment on the Distribution System

Cost item e.g.	Total Cost	Pro-rated %	Cost Excl. VAT	Cost Incl. VAT
Material	R 86 451 533,30	100%	R 86 451 533,30	R 99 419 263,30
Labour	R 23 441 562,10	100%	R 23 441 562,10	R 26 957 796,42
Total	**R 109 893 095,40**	100%	**R 109 893 095,40**	**R 126 377 059,71**

Table 1 (c) Estimated Capital Cost of Premium Equipment on the Distribution System

Cost item	Total Cost	Pro-rated %	Cost Excl. VAT	Cost Incl. VAT
Material	R 10 244 199,90	100%	R 10 244 199,90	R 11 780 829,89
Labour	R 12 258 676,10	100%	R 12 258 676,10	R 14 097 477,52
Other	R 14 844.50	100%	R 14 844.50	R 17 071.18
Total	**R 22 502 876,00**	**100%**	**R 22 502 876,00**	**R 25 878 307,40**

Table 1 (d) Estimated Capital cost of Standard Equipment on the Transmission System

Cost item	Total	Pro-rated %	Cost Excl. VAT	Cost Incl. VAT
Connection Charge	R 59 895 820.00	100%	R 59 895 820.00	R 68 880 193.00
Quotation fee	R 2 115 940.00	N/A	R 2 115 940.00	R 2 433 331.00
Total	**R 62 011 760.00**	**100%**	**R 62 011 760.00**	**R 71 313 524.00**

Table 1 (e) Estimated Capital Cost of Premium Equipment on the Transmission System

Cost item e.g.	Total	Pro-rated	Cost Excl.	Cost Incl.

		%	VAT	VAT
1 Transformer	R0,00	N/A	R0,00	R0,00
10 km 400 kV line	R0,00	N/A	R0,00	R0,00
Protection	R0,00	N/A	R0,00	R0,00
Total	R0,00	N/A	R0,00	R0,00

Table 2 Amount of estimated Capital Costs linked to each foreign currency

The Base Rates as at 27 March 2026 are as follows:

Currencies:		**Amount of Estimated Dedicated Capital Costs linked to each foreign currency**
US Dollars / ZAR	R0,00	R0,00
Euro / ZAR	R0,00	R0,00
Canadian Dollar / ZAR	R0,00	R0,00
Swiss Frank / ZAR	R0,00	R0,00
Swedish Krone / ZAR	R0,00	R0,00
Japanese Yen	R0,00	R0,00
Commodities:		Estimated total amount of commodity
Construction Steel	R0,00	R0,00
Aluminum	R0,00	R0,00
Copper	R0,00	R0,00
Transformer Oil	R0,00	R0,00
Core steel	R0,00	R0,00

PART B: <u>SELF-BUILD OPTION</u> ELECTED BY CUSTOMER N/A

The estimated costs associated with the Eskom Works, including escalation and overheads are as follows:

Table 1 (a) Summary of allocated Estimated Capital Costs

Cost Item	Excl. VAT	Incl. VAT
Pre-Project Investigation Cost (This is a standard cost based on the Cost Estimate Fee amount)	R0,00	R0,00
Estimated Capital Cost for a Standard Connection	R0,00	R0,00
Estimated Capital Cost for a Premium Connection	R0,00	R0,00
Total Estimated Capital Costs	R0,00	R0,00
Estimated Monopoly Works Cost	R0,00	R0,00
Total estimated costs	R0,00	R0,00

Table 1 (b) Estimated Capital Cost of Standard Equipment on the Distribution System

Cost item	Total Cost	Pro-rated %	Cost Excl. VAT	Cost Incl. VAT
1 Transformer	R0.00		R0,00	R0,00
10 km 132 kV line	R0.00		R0,00	R0,00
Protection	R0.00		R0,00	R0,00
Total	R0.00		R0,00	R0,00

Table 1 (c) Estimated Capital Cost of Premium Equipment on the Distribution System

Cost item	Total Cost	Pro-rated %	Cost Excl. VAT	Cost Incl. VAT
1 Transformer	R0.00		R0,00	R0,00
10 km 132 kV line	R0.00		R0,00	R0,00
Protection	R0.00		R0,00	R0,00
Total	R0.00		R0,00	R0,00

Table 1 (d) Estimated Capital cost of Standard Equipment on the Transmission System)

Cost item	Total	Pro-rated %	Cost Excl. VAT	Cost Incl. VAT
Metering	R0.00		R0,00	R0,00
1 Transformer	R0.00		R0,00	R0,00
10 km 400 kV line	R0.00		R0,00	R0,00
Protection	R0.00		R0,00	R0,00
Transformation Capacity Charge	R0.00		R0,00	R0,00
Total	R0.00		R0,00	R0,00

Table 1 (e) Estimated Capital Cost of Premium Equipment on the Transmission System

Cost item	Total	Pro-rated %	Cost Excl. VAT	Cost Incl. VAT
1 Transformer	R0.00		R0,00	R0,00
10 km 400 kV line	R0.00		R0,00	R0,00
Protection	R0.00		R0,00	R0,00
Total	R0.00		R0,00	R0,00

2 Estimated Monopoly Works Cost

Table 2 (a) Summary of Estimated Monopoly Works Cost

Cost Item	Excl VAT	Incl VAT
Pre-Project Investigation Cost Estimate	R0,00	R0,00
Estimated Monopoly Works Cost associated with Standard Equipment	R0,00	R0,00
Estimated Monopoly Works Cost associated with Premium Equipment	R0,00	R0,00
Total	R0,00	R0,00

Table 2 (b) Estimated Monopoly Works Cost associated with Standard Equipment

Cost item	Excl VAT	Incl VAT
Route/Site Selection Checking & Acceptance	R0,00	R0,00
Verification of Design	R0,00	R0,00
Project Management Fees • Project Manager/Coordinator • Clerk Of Works (Quality Assurance and Monitoring)	R0,00	R0,00
Commissioning	R0,00	R0,00
Total	R0,00	R0,00

Table 2 (c) Estimated Monopoly Works Cost associated with Premium Equipment

Cost item .	Excl VAT	Incl VAT
Route/Site Selection Checking & Acceptance	R0,00	R0,00
Verification of Design	R0,00	R0,00
Project Management Fees • Project Manager/Coordinator • Clerk Of Works (Quality Assurance and Monitoring)	R0,00	R0,00
Commissioning	R0,00	R0,00
Total	R0,00	R0,00

Table 3 Amount of estimated Capital Costs linked to each foreign currency

The Base Rates as at 27 March 2026 are as follows:

Currencies:		**Amount of Estimated Dedicated Capital Costs linked to each foreign currency**
US Dollars / ZAR	R 0,00	R 0,00
Euro / ZAR	R 0,00	R 0,00
Canadian Dollar / ZAR	R 0,00	R 0,00
Swiss Frank / ZAR	R 0,00	R 0,00
Swedish Krone / ZAR	R 0,00	R 0,00
Japanese Yen	R 0,00	R 0,00
Commodities:		Estimated total amount of commodity
Construction Steel	R 0,00	R 0,00
Aluminum	R 0,00	R 0,00
Copper	R 0,00	R 0,00
Transformer Oil	R 0,00	R 0,00
Core steel	R 0,00	R 0,00

ANNEXURE G

FINANCIAL SPECIFICATIONS

PART A: COST ESTIMATE FEE ALREADY PAID BY THE CUSTOMER

DATE COST ESTIMATE FEE AMOUNT PAID	Excl. VAT	Incl. VAT
21/02/2025	R 66 991.30	R 77 040.00

TARIFF

APPLICABLE TARIFF		
1.1	Tariff applicable	**Megaflex**

PART B: SELF-BUILD OPTION NOT ELECTED BY THE CUSTOMER (ESKOM BUILD)

Table 1 SUMMARY OF THE CONNECTION CHARGE ESTIMATES, FEES PAYABLE UPON ACCEPTANCE OF THE COST ESTIMATE LETTER AND GUARANTEES

Connection Charge Estimate	Excl. VAT	Incl. VAT
CEF/Pre-Project Investigation Charge	R 66 991.30	R 77 040.00
Estimated Distribution Standard Connection Charge	R 87 533 095.00	R 100 633 059.25
Estimated Distribution Premium Connection Charge	R 22 502 876,00	R 25 878 307,40
Estimated Transmission Standard Connection Charge	R 62 011 760.00	R 71 313 524.00
Estimated Transmission Premium Connection Charge	R 0,00	R 0,00
SUBTOTAL: CONNECTION CHARGE ESTIMATE	**R 172 114 722.30**	**R 197 931 930.65**
Less Cost Estimate Fee (already paid)	R 66 991.30	R 77 039.99
BALANCE: CONNECTION CHARGE ESTIMATE*	**R 172 047 731.00**	**R 197 854 890.65**
FEES PAYABLE UPON ACCEPTANCE OF THE COST ESTIMATE LETTER		
Distribution Quotation Fee	R 23 774 020.00	R 27 340 123.00
Transmission Quotation Fee	R 2 115 940.00	R 2 433 331.00
Total Quotation Fee	**R 25 889 960.00**	**R 29 773 454.00**
GUARANTEES		
Electricity Accounts Guarantee / Security Amount		R 43 606 000,00
Early Termination Guarantee Amount		R 25 714 000.00

PART C: SELF-BUILD OPTION ELECTED BY CUSTOMER N/A

Table 1 SUMMARY OF THE CONNECTION CHARGE ESTIMATES, FEES PAYABLE UPON ACCEPTANCE OF THE COST ESTIMATE LETTER AND GUARANTEES

Connection Charge Estimate	**Excl. VAT**	**Incl. VAT**
CEF/Pre-Project Investigation Charge	R 0,00	R 0,00
Estimated Distribution Standard Connection Charge	R 0,00	R 0,00
Estimated Distribution Premium Connection Charge	R 0,00	R 0,00
Estimated Transmission Standard Connection Charge	R 0,00	R 0,00
Estimated Transmission Premium Connection Charge	R 0,00	R 0,00
Estimated Monopoly Works Charge	R 0,00	R 0,00
SUBTOTAL: CONNECTION CHARGE ESTIMATE	**R 0,00**	**R 0,00**
Less Cost Estimate Fee (already paid)	R 0,00	R 0,00
BALANCE: CONNECTION CHARGE ESTIMATE*	**R 0,00**	**R 0,00**
FEES PAYABLE UPON ACCEPTANCE OF THE COST ESTIMATE LETTER		
Distribution Quotation Fee	R 0,00	R 0,00
Transmission Quotation Fee	R 0,00	R 0,00
Total Quotation Fee	R 0,00	R 0,00
GUARANTEES		
Electricity Accounts Guarantee / Security Amount		R 0,00
Early Termination Guarantee Amount		R 0,00

*

The factors to be used in the final calculation of the Connection Charges, the Early Termination Guarantee Amount and the Connection Charge Guarantee Amount are:

1. Overheads 10 %
2. Escalation 3,2 % (Production Price Index)
3. Escalation Duration 0

Escalation in the cost of obtaining servitudes (costs to be based on the most recent value of the land)

ANNEXURE H

SCHEDULE OF STANDARD PRICES

MEGAFLEX SCHEDULE OF STANDARD PRICES FOR NON-LOCAL AUTHORITY SUPPLIES - 1 APRIL 2025 TO 31 MARCH 2026*

1. STANDARD PRICES

The standard prices contained in this schedule to be charged by Eskom for electricity supplied or made available by Eskom to customers, shall, subject to the provisions of the Electricity Regulation Act (Act No 4 of 2006), or its successor-in-title, be as set out hereunder.

*These terms, conditions and prices contained in this schedule are approved by NERSA and are valid until Eskom's next price increase or tariff changes as approved by NERSA from time to time.

2. DEFINITIONS

For the purpose of this Schedule the following words and phrases shall have the same meanings as assigned to them herein:

Account means the invoice received by a customer for a single **POD/point of supply** or if consolidated, multiple **points of delivery**/supply for electricity supplied and/or use of the **System**.

Active energy charge or energy charge means the charge for each unit of energy consumed, typically charged for as c/kWh.

Administration charge means the daily fixed charge payable per **POD/point of supply/service agreement** to recover administration-related costs such as meter reading, billing, and meter capital. It is based on the **monthly utilised capacity** or **monthly maximum exported capacity** per **POD/point of supply/service agreement**.

Affordability subsidy charge means the transparent charge indicating socio-economic subsidies related to the supply of electricity to **residential tariffs** and is payable by **non-local authority tariffs** on total active energy sales.

Ancillary Service charge means the charge that recovers the cost of providing ancillary services by the System Operator.

Annual utilised capacity means the higher of the **notified maximum demand** (**NMD**) or the **maximum demand**, per **POD/point of supply** measured in kVA, and registered during a rolling 12-month period.

Annual maximum export capacity means the higher of the notified **maximum export capacity** (**MEC**) or the actual **maximum exported capacity**, per **point of supply** measured in kW, and registered during a rolling 12-month period.

Chargeable demand means the highest average demand measured in kVA in a billing month during the chargeable time periods specified for each tariff. For WEPS, Megaflex and Megaflex Gen, the chargeable period is during these tariffs peak and standard periods and for Nightsave Urban (Large and Small) and Nightsave Rural during Nightsave's peak periods.

Code means the Distribution Code, the South African Grid Code, the Grid Connection Code for Renewable Power Plants, or any other code, published by NERSA, as applicable, and as amended, modified, extended, replaced or re-enacted from time to time.

Distribution means the regulated business unit through which Eskom constructs, owns, operates, and maintains the **Distribution System** in accordance with its licence and the **Code**.

Distribution connected means connected to the **Distribution system.**

Distribution losses charge means the production-based (energy) charge to generators. The losses charge is based on the approved loss factors, the load factor, the amount of energy produced seasonally and TOU and the WEPS energy rate (excluding losses).

Distribution network capacity charge (previously known as the **Distribution network access charge**) means the R/kVA or **R/POD** fixed network charge raised to recover **Distribution** network costs and depending on the tariff is charged on the **annual utilised capacity** or **maximum export capacity** where **maximum demand** is measured or the **NMD** where **maximum demand** is not measured.

Distribution network demand charge means the R/kVA or c/kWh variable network charge raised to recover Distribution network costs and depending on the tariff may be charged on the **chargeable demand** or the active energy.

Distribution System means Eskom's network infrastructure consisting of assets operated at a nominal voltage of 132 kV or less, not classified as transmission transformation equipment.

Distribution use-of-system (DUoS) **charges** means the network tariffs charged for making capacity available, connecting to and for the use of the **Distribution System**. The **DUoS** charges are the source of the **Distribution** network charge components in the retail tariff structures.

DUoS charge (generators) means the **DUoS** charges payable by generators. These **DUoS** charges for generators comprise the **network capacity charge** based on **maximum export capacity**, the **losses charge**, the **ancillary service charge**, the **service charge** and the **administration charge**.

DUoS charge (loads) means the **DUoS** charges payable by loads. These **DUoS** charges comprise the **network capacity charge**, the **network demand charge**, the **urban low voltage subsidy charge**, the **ancillary service charge**, the **service charge**, the **administration charge** and the **electrification and rural network subsidy charge**.

Electrification and rural network subsidy charge means the **DUoS charge** transparently indicating the contribution towards socio-economic network-related subsidies for Residential and **Rural$_p$** tariffs and is payable by loads that use the **Distribution** or **Transmission System** for the delivery of energy.

Energy demand charge means the seasonally differentiated charge per **POD** that recovers peak energy costs and is based on the **chargeable demand**.

Embedded Transmission use-of-system (ETUoS) charge means the TUoS charges payable by customers connected to the **Distribution** network.

Excess network capacity charge (previously known as the **excess network access charge)** means the charge payable with reference to the **NMD rules** and is based on the maximum demand exceeding the NMD multiplied by the **event number** (recorded every time the NMD is exceeded) multiplied by the applicable **network capacity charges** for the tariff.

Generation Capacity Charge means the fixed charge raised to recover the cost of providing backup power, this charge is recovered as a R/kVA or R/POD/day.

Grid-tied generation means a generator that is connected to the grid, and in technical terms is in parallel operation with the grid.

High-demand season means the **TOU** Period from 1 June to 31 August of each year.

High voltage (HV) networks usually consist of equipment supplied at a voltage greater than 22 kV and consist of the distribution substations and networks. A substation is considered an **HV** substation when the primary side of the substation is supplied at a voltage > 22 kV.

Key customer means a customer that consumes more than 100 GWh per annum on a contiguous site under a single management structure or is prepared to pay to be a Key Customer.

Legacy Charge means the c/kWh variable charge raised to recover the cost of contracts associated with mandatory government energy procurement programmes.

Local authority tariffs mean tariffs applicable to municipal bulk points of supply.

Loss factors mean the factor indicating the cost or benefit of technical energy losses on the **Transmission** and the **Distribution System**. The **Distribution loss factors** differ per voltage category and per **Rural$_p$** and **Urban$_p$** categories. The **Transmission loss factors** differ for generators and loads and are based on the **Transmission zones**.

Losses charge means the charge payable based on the applicable **loss factors** and the WEPS rate excluding losses.

Low-demand season means the TOU Period from 1 September to 31 May of each year.

Maximum demand/exported capacity means the highest average demand measured in kVA or kW at the **POD/point of supply** during a 30-minute integrating period in a billing month.

Maximum export capacity (MEC) means the maximum capacity at the **point(s) of supply** notified by the customer and accepted by Eskom for the **t**ransmission of electrical energy between a generator and the **Transmission or Distribution System**. *Note: The notification of the maximum export capacity shall be governed by the **NMD and MEC rules.***

Medium voltage (MV) networks consist of the networks above 1 kV up to 22 kV. Eskom has specifically designated some rural networks with a voltage of 33 kV as rural reticulation networks. A substation is considered a MV substation when the primary side of the substation is supplied at a voltage ≤ 22 kV.

Monthly maximum exported capacity means the higher of the notified **maximum export capacity (MEC)** or the actual **maximum exported capacity**, measured in kW registered during the billing month.

Monthly utilised capacity means the higher of the **notified maximum demand** (**NMD**) or the **maximum demand**, measured in kVA or kW registered during the billing month.

Network capacity charge (previously known as the **network access charge**) means the R/kVA or R/**POD** fixed network charge raised to recover network costs and depending on the tariff is charged on the **annual utilised capacity** or **maximum export capacity** where **maximum demand** is measured or the **NMD** where **maximum demand** is not measured.

Network demand charge means the R/kVA or c/kWh variable network charge raised to recover network costs and depending on the tariff may be charged on the **chargeable demand** or the active energy.

Non-local authority tariffs mean the tariffs applicable to Eskom's direct customers (i.e., customers within Eskom's licensed area of supply) and exclude the **non-local authority tariffs.**

Notified maximum demand (NMD) means the contracted **maximum demand**, notified in writing by the customer and accepted by Eskom **per POD/point of supply**. *Note: The notification of demand shall be governed by the **NMD (and MEC) rules.***

NMD (and MEC) rules means the rules approved by NERSA and as amended from time to time for the notification of demand or maximum export capacity or changes to or exceedances of the **NMD or MEC**.

Off-peak period means the **TOU periods** of relatively low **system** demand.

Offset (also called Net-billing) means a method of compensating customers when their generation is synchronised with the grid and some electricity is exported. The compensation for exported electricity is calculated using the Gen-offset tariff. The customer is still charged the full tariff for the amount of energy consumed and capacity provided.

Peak period means the **TOU periods** of relatively high system demand.

Point of delivery (POD)/point of supply means either a single point of supply, or a specific group of points of supply on Eskom's **System,** from where electricity is supplied to the customer by Eskom, or from where the customer supplies electricity to Eskom's **System** located within a single substation, at which electricity is supplied/delivered to the customer at the same declared voltage and tariff. Note: This can be a metering or summation point.

Public holidays mean the treatment of charges on **public holidays** as specified by Eskom.

Reactive energy charge means a c/kVArh charge based on the power factor and tariff of the **POD**.

Residential tariffs mean the Homelight and Homepower suite of tariffs.

Rural$_p$ means areas classified as rural by Eskom for the purposes of tariff design and classification.

Service agreement means each tariff /transaction/contract linked to an account.

Service and administration charge means the monthly charge payable per **service agreement** for service and administration related costs. (Also see **service charge** and **administration charge**).

Service charge means the daily fixed charge payable per POD to recover service-related costs and is based on the **monthly utilised capacity** or **maximum export capacity** of each **POD** linked to an **account**.

Standard period means the **TOU periods** of relatively mid system demand.

Standard charge/fee means the fees/charges described in paragraph 9.

System means the **Transmission** and **Distribution** network infrastructure consisting of all lines and substation equipment.

Time-of-use (TOU) tariff means a tariff with energy charges that change during different **TOU periods** and seasons.

TOU periods mean time blocks based on the volume of electricity demand during high, mid and low demand periods and may differ per tariff. The **TOU periods** typically are **peak, standard,** and **off-peak** periods and differ during in **high** and **low demand seasons**.

Transmission means the regulated business unit through which Eskom constructs, owns, operates and maintains the **Transmission System** in accordance with its licence and the **Code.**

Transmission connected means connected to the **Transmission system.**

Transmission system means Eskom's electricity **system** consisting of all lines and substation equipment where the nominal voltage is above 132 kV or where the nominal voltage is lower than or equal to 132 kV and there are no **Distribution System** assets.

Transmission use-of-system (TUoS) charges means the network tariffs charged for making capacity available, connecting to and for the use of the **Transmission System**. The **TUoS** charges are the source of the **ETUoS** and the **Transmission network charge** components in the retail tariff structures.

Transmission network access charge means the same as **Transmission network charge.**

Transmission network charge means the network related **TUoS** charge.

Transmission zone(s) means the geographic differentiation, applicable to **Transmission** network charges and **loss factors**, to indicate the costs associated with the delivery and transmission of energy.

Urban$_p$ areas means areas classified by Eskom as urban for the purposes of tariff design and classification.

Urban low voltage subsidy charge means the charge transparently indicating the network-related cross subsidy payable by ≥ 66 kV **Urban$_p$** connected supplies for the benefit of < 66 kV connected **Urban$_p$** supplies.

Utilised capacity means the same as **annual utilised capacity**.

Wheeling means the delivery of electricity from a point of generator connection to a load consumption point through a network owned by a Licensee.

3. TIME OF USE PERIODS

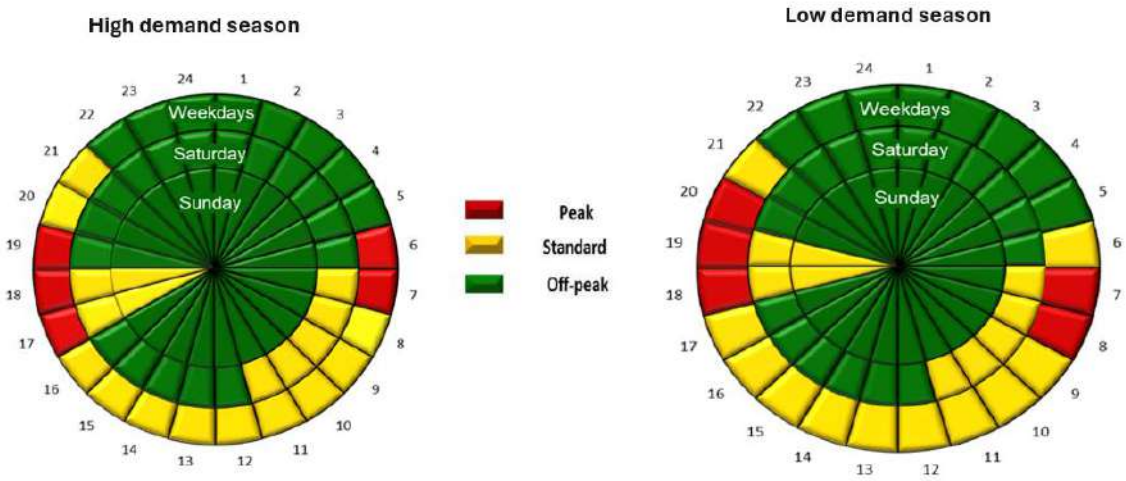


Figure 1: WEPS, Megaflex, Megaflex Gen, Municflex, Miniflex, Transflex, Homeflex, Ruraflex and Ruraflex Gen: low and high demand seasons TOU periods

4. TRANSMISSION ZONES

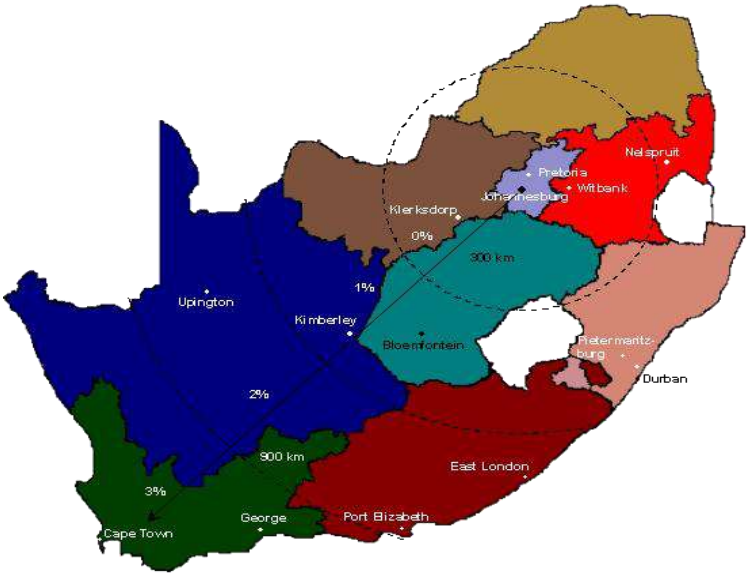


Figure 2: Transmission zones for loads

5. NMD and MEC rules and charges payable in the event of an NMD exceedance

The NMD (and MEC) rules, as amended from time to time with the approval of NERSA, set out the rules relating to notification, changes and exceedance of the **NMD (and MEC)**. For the rules, please go to www.eskom.co.za/tariffs.

5.1. Charges applicable for exceedance of the NMD

An exceedance of the **NMD** based on the difference between the **maximum demand** and the NMD, will impact the following charges (as applicable); the **Distribution network capacity charge[2], the network capacity charge*,** the **Transmission network charge** and the **urban low voltage subsidy charge** for as applicable, the DUoS charges, the TUoS charges and the Ruraflex, Ruraflex Gen, Nightsave Rural, Megaflex, Megaflex Gen, Municflex, Miniflex, Nightsave Urban Small and Nightsave Urban Large tariffs. The **generation capacity charge** will not be impacted by excess charges payable for exceedance of the NMD. This means that the generation capacity charge will be based on the utilised capacity without applying the "excess charges" currently used for excess network capacity charges related to NMD exceedance.

The amount payable through the **excess network capacity charge[2]** , in the event of an exceedance is calculated on the number of times the **NMD** is exceeded by the **maximum demand** multiplied by the portion of the maximum demand exceeding the **NMD** multiplied by the sum of the **Distribution network capacity charge[2]** and the **Transmission network charge** (or for Miniflex and Ruraflex the **network capacity charge[2]**) and if applicable, the **urban low voltage subsidy charge** for the respective tariffs.

5.2. Charges applicable for exceedance of the MEC[1] rules

These rules are in the process of being revised by Nersa. Please refer to the Eskom website (www.eskom.co.za/tariffs) for the latest version of the rules.

[1] Eskom submitted to NERSA an amendment to the NMD rules to include the MEC rules. Once this decided on by NERSA, any rules associated with the MEC will apply.
[2] Note that any reference in the NMD rules to “the network access charge” must be replaced with “the network capacity charge” and to “the excess network access charge” must be replaced with “the excess network capacity charge”.

6. PUBLIC HOLIDAYS

The table below indicates the treatment of public holidays for the Nightsave Urban, WEPS, Municflex, Megaflex, Megaflex Gen and Miniflex tariffs for the period 1 April 2025 to until 30 June 2026. The relevant seasonally differentiated energy charges, energy demand charges and network demand charges will be applicable on these

days. Any unexpectedly announced public holiday not listed below will be treated as the day of the week on which it falls.

- The following public holidays will always be treated as a Sunday for Municflex, Miniflex, Megaflex, Megaflex Gen and WEPS tariffs, New Year's Day, Good Friday, Family Day, Christmas Day and Day of Goodwill. All other days will be treated as a Saturday unless it falls on a Sunday in which case it will be treated as a Sunday.
- For Nightsave Urban, all public holidays will be treated as a Sunday.
- All public holidays for the Nightsave Rural, Homeflex, Ruraflex and Ruraflex Gen tariffs will be treated as the day of the week on which it falls.

Date	**Day**	**Actual day of the week**	**TOU day treated as**	
			Nightsave Urban	**Megaflex, Miniflex, Municflex, WEPS, Megaflex Gen**
18 April 2025	Good Friday	Friday	Sunday	Sunday
21 April 2025	Family Day	Monday	Sunday	Sunday
27 April 2025	Freedom Day	Sunday	Sunday	Sunday
28 April 2025	Public Holiday	Monday	Sunday	Saturday
1 May 2025	Workers Day	Thursday	Sunday	Saturday
16 June 2025	Youth Day	Monday	Sunday	Saturday
9 August 2025	National Women's Day	Saturday	Sunday	Saturday
24 September 2025	Heritage Day	Wednesday	Sunday	Saturday
16 December 2025	Day of Reconciliation	Tuesday	Sunday	Saturday
25 December 2025	Christmas Day	Thursday	Sunday	Sunday
26 December 2025	Day of Goodwill	Friday	Sunday	Sunday
1 January 2026	New Year's Day	Thursday	Sunday	Sunday
21 March 2026	Human Rights Day	Saturday	Sunday	Saturday
3 April 2026	Good Friday	Friday	Sunday	Sunday
6 April 2026	Family Day	Monday	Sunday	Sunday
27 April 2026	Freedom Day	Monday	Sunday	Sunday
1 May 2026	Worker's Day	Friday	Sunday	Saturday
16 June 2026	Youth Day	Tuesday	Sunday	Saturday

7. Value-added tax (VAT)

The standard prices as specified in this Schedule include value-added tax (VAT) at the current prescribed tax rate of 15%. In cases of electricity supplies where the said tax is not applicable or partly or wholly exempt, the customer concerned will be informed in writing of the effective prices payable.

The charges and rates excluding VAT are also shown as these are used in the monthly electricity account to calculate the individual tariff charges before VAT is added on. This is done for the convenience of the customer so as to facilitate the claiming of input tax where applicable and to allow for part exemptions and zero rating.

8. CHARGES PAYABLE MONTHLY

All electricity accounts payable by a customer in terms of this Schedule shall be rendered monthly by Eskom and shall be payable monthly in accordance with the provisions of the electricity supply agreement. If, in terms of the electricity supply agreement, meter readings are made at three-monthly intervals, Eskom shall render provisional accounts for the months in which no meter reading is made, based upon the monthly consumption in the previous three-monthly period or upon an estimated amount, and a final account, incorporating an adjustment of the provisional accounts, based upon the actual consumption for the period.

If the commencing date or the termination date of any supply is such that the supply was available for a portion of a month then the monthly charges payable in terms of this Schedule shall be calculated pro rata to the portion of a month of 30 (thirty) days during which the supply was available.

In addition to the charges payable in terms of this Schedule, a connection charge and/or standard charges/fees may be raised for costs not recovered through the tariff charges for the provision of new or additional capacity, or for additional services rendered to the customer.

9. STANDARD FEES/CHARGES FOR SERVICES RENDERED

In addition to the standard tariff charges set out in this schedule, Eskom may raise additional standard fees/charges for direct services rendered to a customer s e.g. the provision of service mains, the installation of equipment in the customer's substation, for the taking of any special meter readings, for reconnection of the supply after disconnection (i) either at the request of the customer or (ii) caused by the customer in failure to carry out its obligations, and for special/additional work done for the customer by Eskom. Refer to www.eskom.co.za/tariffs for the list of standard/charges/fees applicable.

10. MEGAFLEX CHARACTERISTICS

TOU electricity tariff for Urban$_p$ customers with an NMD greater than 1 MVA, with the following charges:

- seasonally and **time-of-use** differentiated c/kWh **active energy charges** including losses, based on the voltage of supply and the **Transmission zone**;
- three **time-of-use** periods namely **peak, standard,** and **off-peak**;
- the treatment of **public holidays** for the raising of the **active energy charge** and the **network demand charge**;
- A R/kVA/month **generation capacity charge** based on the voltage of the supply and the annual utilised capacity measured at the POD applicable during all time periods;
- A c/kWh **legacy charge** based on the voltage of the supply applicable during all time periods.
- a R/kVA/month **Transmission network charge** based on the voltage of the supply, the **Transmission zone** and the **annual utilised capacity** measured at the **POD** applicable during all time periods;
- a R/kVA/month **Distribution network capacity charge** based on the voltage of the supply and the **annual utilised capacity** measured at the **POD** applicable during all time periods;
- a R/kVA/month **Distribution network demand charge** based on the voltage of the supply and the **chargeable demand** measured at the **POD** applicable during **peak a**nd **standard** periods;
- a R/kVA **urban low voltage subsidy charge** based on the voltage of the supply and charged on the **annual utilised capacity** measured at the **POD** applicable during all time periods
- a c/kWh **ancillary service charge** based on the voltage of the supply applicable during all time periods;
- a R/**POD**/day **service charge** based on the **monthly utilised capacity of each POD linked to an account**;
- a R/**POD**/day **administration charge** based on the **monthly utilised capacity** of each **POD** linked to an **account**;

- a c/kVArh **reactive energy charge** supplied in excess of 30% (0,96 power factor or less) of the kWh recorded during the **peak** and **standard** periods. The excess reactive energy is determined per 30-minute integrating period and accumulated for the month and will only be applicable during the **high-demand season**;
- a c/kWh **electrification and rural network subsidy charge**, applied to the total active energy measured at the **POD** in the month;
- a c/kWh **affordability subsidy charge** applied to the total active energy measured at the **POD** in the month – applicable to **non-local authority** tariffs only; and
- an **excess network capacity charge** shall be payable in the event of an **NMD** exceedance in accordance with the **NMD rules** for the relevant tariff**.**

11.RATES

Megaflex – Non-local Authority

Transmission zone	Voltage	Active energy charge [c/kWh]												Legacy charge [c/kWh]		Generation capacity charge [R/kVA/m]		Transmission network charges [R/kVA/m]	
		High demand season [Jun - Aug]						Low demand season [Sep - May]											
		Peak		Standard		Off Peak		Peak		Standard		Off Peak							
			VAT incl		VAT incl		VAT incl		VAT incl		VAT incl		VAT incl		VAT incl		VAT incl		VAT incl
≤ 300km	< 500V	684.59	787.28	171.15	196.82	114.09	131.20	284.12	326.74	159.74	183.70	114.09	131.20	22.78	26.20	R 3.49	R 4.01	R 10.63	R 12.22
	≥ 500V & < 66kV	666.92	766.96	166.73	191.74	111.15	127.82	276.78	318.30	155.62	178.96	111.15	127.82	22.20	25.53	R 8.09	R 9.30	R 10.25	R 11.79
	≥ 66kV & ≤ 132kV	618.91	711.75	154.72	177.93	103.15	118.62	256.86	295.39	144.42	166.08	103.15	118.62	20.60	23.69	R 6.12	R 7.04	R 9.35	R 10.75
	> 132kV*	577.13	663.70	144.28	165.92	96.19	110.62	239.52	275.45	134.67	154.87	96.19	110.62	19.21	22.09	R 7.02	R 8.07	R 16.34	R 18.79
> 300km and ≤ 600km	< 500V	691.43	795.14	172.86	198.79	115.23	132.51	286.96	330.00	161.34	185.54	115.23	132.51	22.78	26.20	R 3.49	R 4.01	R 10.74	R 12.35
	≥ 500V & < 66kV	673.60	774.64	168.40	193.66	112.27	129.11	279.55	321.48	157.17	180.75	112.27	129.11	22.20	25.53	R 8.09	R 9.30	R 10.35	R 11.90
	≥ 66kV & ≤ 132kV	625.10	718.87	156.28	179.72	104.18	119.81	259.43	298.34	145.86	167.74	104.18	119.81	20.60	23.69	R 6.12	R 7.04	R 9.45	R 10.87
	> 132kV*	582.90	670.34	145.73	167.59	97.15	111.72	241.91	278.20	136.01	156.41	97.15	111.72	19.21	22.09	R 7.02	R 8.07	R 16.51	R 18.99
> 600km and ≤ 900km	< 500V	698.28	803.02	174.57	200.76	116.37	133.83	289.80	333.27	162.93	187.37	116.37	133.83	22.78	26.20	R 3.49	R 4.01	R 10.85	R 12.48
	≥ 500V & < 66kV	680.27	782.31	170.07	195.58	113.37	130.38	282.32	324.67	158.73	182.54	113.37	130.38	22.20	25.53	R 8.09	R 9.30	R 10.45	R 12.02
	≥ 66kV & ≤ 132kV	631.29	725.98	157.82	181.49	105.21	120.99	262.00	301.30	147.31	169.41	105.21	120.99	20.60	23.69	R 6.12	R 7.04	R 9.54	R 10.97
	> 132kV*	588.67	676.97	147.17	169.25	98.11	112.83	244.31	280.96	137.36	157.96	98.11	112.83	19.21	22.09	R 7.02	R 8.07	R 16.66	R 19.16
> 900km	< 500V	705.13	810.90	176.28	202.72	117.52	135.15	292.64	336.54	164.53	189.21	117.52	135.15	22.78	26.20	R 3.49	R 4.01	R 10.96	R 12.60
	≥ 500V & < 66kV	686.94	789.98	171.74	197.50	114.49	131.66	285.09	327.85	160.28	184.32	114.49	131.66	22.20	25.53	R 8.09	R 9.30	R 10.55	R 12.13
	≥ 66kV & ≤ 132kV	637.48	733.10	159.37	183.28	106.25	122.19	264.56	304.24	148.75	171.06	106.25	122.19	20.60	23.69	R 6.12	R 7.04	R 9.63	R 11.07
	> 132kV*	594.44	683.61	148.61	170.90	99.06	113.92	246.70	283.71	138.70	159.51	99.06	113.92	19.21	22.09	R 7.02	R 8.07	R 16.83	R 19.35

* 132 kV or Transmission connected

Distribution network charges						
Voltage	Network capacity charge [R/kVA/m]		Network demand charge [R/kVA/m]		Urban low voltage subsidy charge [R/kVA/m]	
		VAT incl		VAT incl		VAT incl
< 500V	R 39.22	R 45.10	R 48.41	R 55.67	R 0.00	R 0.00
≥ 500V & < 66kV	R 35.98	R 41.38	R 24.17	R 27.80	R 0.00	R 0.00
≥ 66kV & ≤ 132kV	R 13.02	R 14.97	R 9.53	R 10.96	R 10.20	R 11.73
> 132kV*	R 0.00	R 0.00	R 0.00	R 0.00	R 10.20	R 11.73

* 132 kV or Transmission connected

Voltage	Ancillary service charge [c/kWh]	
		VAT incl
< 500V	0.41	0.47
≥ 500V & < 66kV	0.39	0.45
≥ 66kV & ≤ 132kV	0.36	0.41
> 132kV*	0.34	0.39

* 132 kV or Transmission connected

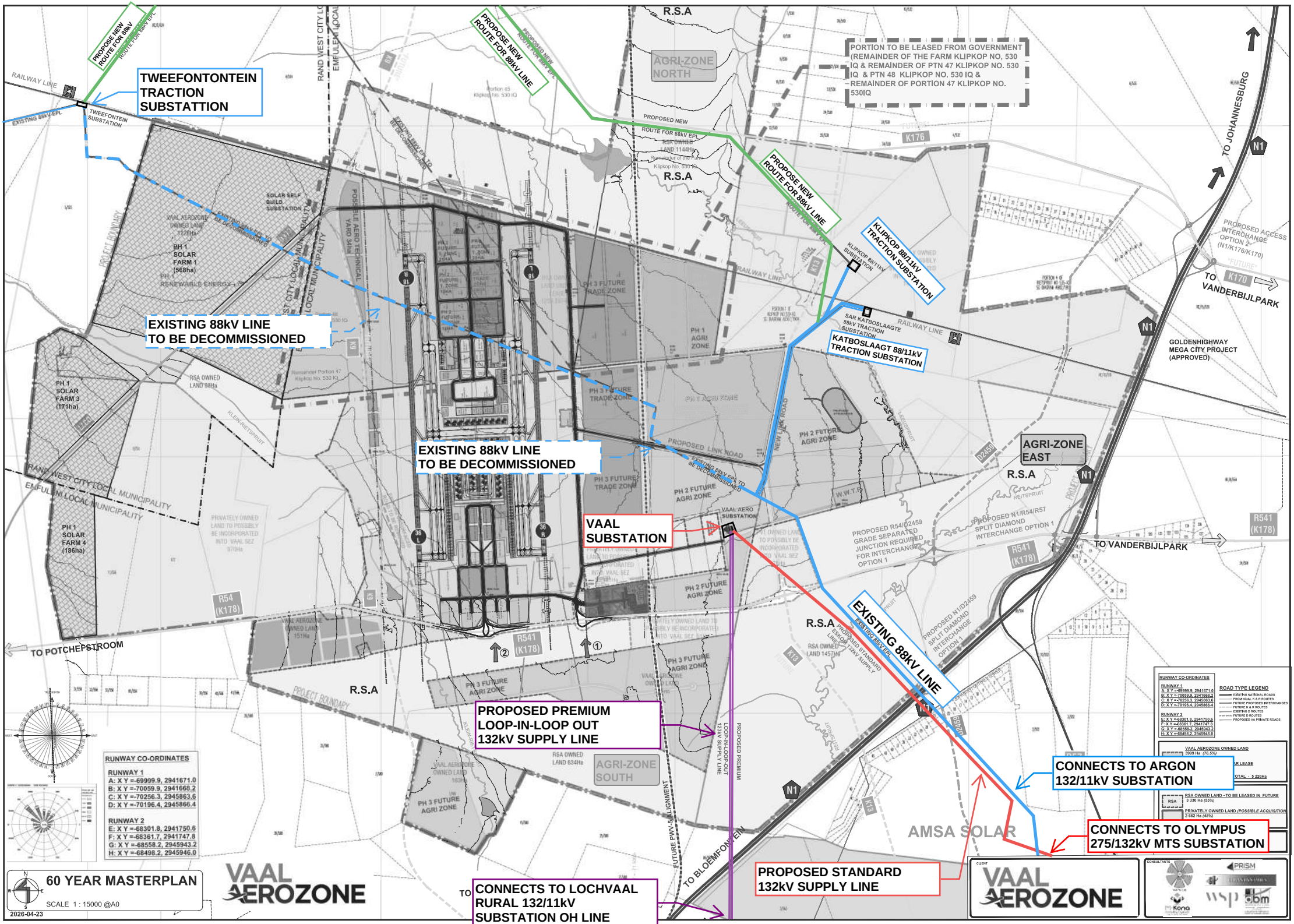
Customer categories	Service charge [R/POD/day]		Administration charge [R/POD/day]	
		VAT incl		VAT incl
> 1 MVA	R 198.52	R 226.30	R 19.37	R 22.28
Key customers	R 1 118.46	R 1 286.23	R 19.37	R 22.28

Reactive energy charge [c/kVArh]			
High season		Low season	
	VAT incl		VAT incl
31.71	36.47	0.00	0.00

Electrification and rural network subsidy charge [c/kWh]		Affordability subsidy charge [c/kWh] Only payable by non-local authority tariffs	
	VAT incl		VAT incl
4.94	5.68	4.69	5.39

Appendix D – Electrical Drawings

Type here


TWEEFONTONTEIN TRACTION SUBSTATTION
PROPOSE NEW ROUTE FOR 88kV LINE
PROPOSE NEW ROUTE FOR 88kV LINE
PROPOSE NEW ROUTE FOR 88kV LINE
PORTION TO BE LEASED FROM GOVERNMENT (REMAINDER OF THE FARM KLIPKOP NO, 530 IQ & REMAINDER OF PTN 47 KLIPKOP NO. 530 IQ & PTN 48 KLIPKOP NO. 530 IQ & REMAINDER OF PORTION 47 KLIPKOP NO. 530IQ
KLIPKOP 88/11kV TRACTION SUBSTATION
KATBOSLAAGT 88/11kV TRACTION SUBSTATION
EXISTING 88kV LINE TO BE DECOMMISSIONED
EXISTING 88kV LINE TO BE DECOMMISSIONED
VAAL SUBSTATION
EXISTING 88kV LINE
PROPOSED PREMIUM LOOP-IN-LOOP OUT 132kV SUPPLY LINE
CONNECTS TO ARGON 132/11kV SUBSTATION
CONNECTS TO OLYMPUS 275/132kV MTS SUBSTATION
PROPOSED STANDARD 132kV SUPPLY LINE
CONNECTS TO LOCHVAAL RURAL 132/11kV SUBSTATION OH LINE
AGRI-ZONE NORTH
AGRI-ZONE EAST
AGRI-ZONE SOUTH
AMSA SOLAR
GOLDENHIGHWAY MEGA CITY PROJECT (APPROVED)
TO JOHANNESBURG
TO VANDERBIJLPARK
TO POTCHEFSTROOM
TO BLOEMFONTEIN
RAND WEST CITY LOCAL MUNICIPALITY
EMFULENI LOCAL MUNICIPALITY
RUNWAY CO-ORDINATES
RUNWAY 1
A: X Y =-69999.9, 2941671.0
B: X Y =-70059.9, 2941668.2
C: X Y =-70256.3, 2945863.6
D: X Y =-70196.4, 2945866.4
RUNWAY 2
E: X Y =-68301.8, 2941750.6
F: X Y =-68361.7, 2941747.8
G: X Y =-68558.2, 2945943.2
H: X Y =-68498.2, 2945946.0
60 YEAR MASTERPLAN
SCALE 1 : 15000 @A0
2026-04-23
VAAL AEROZONE

wsp

wsp.com

ANNEXURE Q

Vaal Aerozone

Integrated Waste Management Plan (IWMP)

Vaal Aerotropolis Project

Vaal Aerozone
September 2026

Confidential

Vaal Aerozone

Integrated Waste Management Plan (IWMP)

Vaal Aerotropolis Project

Confidential

Project no. 43103108

Vaal Aerozone

Date: September 2026

WSP

Building 1, Maxwell Office Park
Waterfall City
Midrand
1685

Phone: +27 11 361 1300

WSP.com

Quality control

Issue/revision	First issue	Revision 1	Revision 2	Revision 3
Remarks		Inclusion of estimated waste volume generation		
Date	3 June 2026	02 September 2026		
Prepared by	Evashan Moodliar	Evashan Moodliar		
Signature		Moodliar, Evashan (ZAEM05700) Digitally signed by Moodliar, Evashan (ZAEM05700) DN: cn=Moodliar, Evashan (ZAEM05700), ou=WSPObjects, email=Evashan.Moodliar@wsp.com Reason: I am the author of this document Date: 2026.09.02 13:39:10 +02'00'		
Checked by	Kosikee Emma-Iwuoha	Kosikee Emma-Iwuoha		
Signature		Digitally signed by Kosikee.Emma-Iwuoha@wsp.com Date: 2026.09.03 13:40:19 +02'00'		
Authorised by	John Rammutla	John Rammutla		
Signature		John Koketso Rammutla Digitally signed by John Koketso Rammutla DN: cn=John Koketso Rammutla, c=ZA, o=WSP Africa , ou=Transport & Infrastructure , email=koketso.rammutla@wsp.com		
Project number	43103108	43103108		
Report number	01	01		
File reference				

Contents

Executive summary

1 Background Information 1

1.1 Introduction 1

1.2 Vaal Aerotropolis Location 2

1.3 Objective of the Report 3

2 Policy, Legislative and Best-Practice Framework 5

2.1 International Aviation Best Practice 5

2.1.1 ICAO Eco Airport Toolkit: Waste Management at Airports 5

2.1.2 Airports Council International (ACI) Environmental and Circular Economy Guidance 5

2.1.3 ISO 14001 Aligned Environmental Management Systems (EMS) 6

2.2 South African Legislative and Policy Context 6

2.3 Integration of Frameworks 7

3 Waste Management Principles 8

3.1 The Waste Hierarchy 8

3.2 Circular Economy Integration 9

3.3 Duty of Care and Compliance 11

3.4 Polluter Pays Principle 11

3.5 Integrated and Coordinated Approach 11

3.6 Stakeholder Engagement and Awareness 12

3.7 Monitoring, Reporting, and Continuous Improvement 12

3.8 Resource Efficiency and Cost Optimisation 12

3.9 Safety and Risk Management 12

3.10 Summary 13

4 Waste Streams Considered 14

4.1 Municipal Solid Waste (MSW) 14
4.2 Sewerage, Wastewater and WWTW Residuals 14
4.3 Waste from Aircraft Operations and Deplaned Waste 15
4.4 International Catering Waste (ICW) 15
4.5 Organic and Biodegradable Waste 15
4.6 Construction and Demolition (C&D) Waste 16
4.7 Hazardous and Industrial Waste 16
4.8 Aviation-Specific and Special Waste Streams 16

5 Waste Management Measures 18

5.1 Waste Avoidance and Minimisation 18
5.2 Waste Segregation at Source 18
5.3 Waste Collection and On-Site Storage 18
5.4 Recycling and Resource Recovery 19
5.5 Management of Hazardous and Regulated Waste 19
5.6 Management of International Catering Waste (ICW) 19
5.7 Interface with Bulk Engineering Services 20

6 Municipal Solid Waste Management 21

6.1 Construction and Development Phase 21

7 Sewerage, Wastewater and WWTW Residuals Management 23

7.1 Construction Phase 23
7.2 Phase 1: Initial Operations 23
7.3 Phase 2: Expanded Operations 24
7.4 Phase 3: Ultimate Development 24
7.5 Roles, Responsibilities and Monitoring 24

8 Waste from Aircraft Operations and Deplaned Waste Management 26

8.1 Construction Phase 26
8.2 Phase 1: Initial Operations 26

8.3 Phase 2: Expanded Operations 26
8.4 Phase 3: Ultimate Development 26
8.5 Roles, Responsibilities and Monitoring 26

9 International Catering Waste Management 28

9.1 Construction Phase 28
9.2 Phase 1: Initial Operations 28
9.3 Phase 2: Expanded Operations 28
9.4 Phase 3: Ultimate Development 28
9.5 Roles, Responsibilities and Monitoring 28

10 Organic and Biodegradable Waste Management 29

10.1 Construction and Development Phase 29

11 Construction and Demolition Waste Management 31

11.1 Construction Phase 31
11.2 Phase 1, 2 and 3 31
11.3 Roles, Responsibilities and Monitoring 31

12 Hazardous and Industrial Waste Management 32

12.1 Construction Phase 32
12.2 Phase 1: Initial Operations 32
12.3 Phase 2 and 3 32
12.4 Roles, Responsibilities and Monitoring 32

13 Aviation Specific and Special Waste Management 33

13.1 Construction Phase 33
13.2 Phase 1: Initial Operations 33
13.3 Phase 2 and 3 33
13.4 Roles, Responsibilities and Monitoring 33

14 Conclusion 35

Tables

No table of figures entries found.

Figures

Figure 1-1 - Vaal Aerotropolis Location 2

Appendices

Appendix A

Emfuleni LM Confirmation Letter

Executive summary

This Integrated Waste Management Plan (IWMP) establishes a comprehensive and phased framework for the management of waste generated during the construction, operation, and long-term development of the Vaal Aerotropolis.

Emfuleni Local Municipality has formally confirmed that it will provide municipal solid waste removal services to the proposed Vaal Aerotropolis development. This confirmation informs the waste management approach adopted in this IWMP. General municipal solid waste generated across the airport, logistics, trade and airport city precincts will be managed through a municipal service-based model, with Emfuleni Local Municipality providing bulk refuse skips, collection, transportation, and disposal to authorised regional landfill facilities, subject to compliance with municipal standards and by-laws.

In light of this confirmed municipal service provision for solid waste, the IWMP deliberately adopts a conservative and approval-focused approach to solid waste management. Onsite recycling, composting, or waste treatment facilities are not relied upon as core infrastructure for environmental authorisation purposes. Recycling and diversion initiatives are framed as incremental and operationally driven measures that may be implemented over time, primarily through off-site licensed facilities, once the airport and aerotropolis operations have stabilised.

The other waste streams identified within this report will follow a structured waste management process to effectively dispose the waste in a sustainable manner and aligned to environmental requirements.

The IWMP focuses on establishing clear waste stream definitions, compliant storage and handling systems, interfaces with municipal services, and governance arrangements across all phases of development. This approach ensures that waste management does not introduce unnecessary environmental approval risk, while remaining consistent with the waste hierarchy, international airport best practice, and South African legislative requirements.

Overall, the IWMP provides a practical approach that supports phased development of the Vaal Aerotropolis while maintaining flexibility for future operational refinement.

1 Background Information

1.1 Introduction

The Vaal Aerotropolis is a planned new multi-phase development in Emfuleni Municipality that will consist of an international airport with passenger terminals, a secure cargo terminal, a strategically located Trade Zone, surrounding Agri zones and an Airport City business park which will include commercial and retail amenities. The Aerotropolis will offer facilities featuring environmentally sustainable practices and various incentives to attract international airlines and freight carriers. It is the intention to incorporate the Vaal Aerotropolis in the Vaal Special Economic Zone (SEZ).

The Aerotropolis will comprise of various components:

- An International Airport with a 4,2km runway to accommodate any size of aircraft, with a second parallel runway of 4.2 km in to be constructed in a future phase, with a central apron link.
- Three passenger and cargo terminals including all supporting facilities.
- The terminals and runways will be implemented in three phases.
- Agri-zones and holding areas for produce being air freighted across the world.
- External provincial road network upgrades with direct access to the N1 at a new access interchange.
- Trade port with logistics and distribution facilities and general and cold warehousing and other commercial and industrial opportunities.
- Agri-zones and holding areas for produce being air freighted across the world.
- Airport City with commercial land uses.

The mix of land uses proposed within the Vaal Aerotropolis has direct implications for the nature and composition of waste streams generated across the development. In addition to conventional passenger terminal waste, the inclusion of agri-zones, cold-chain logistics facilities, trade and distribution warehouses, and industrial precincts is expected to result in elevated volumes of organic waste, packaging materials, pallets, and rejected or downgraded produce associated with export and logistics activities. These waste streams differ in both character and generation patterns from typical airport municipal waste and require dedicated management approaches within the Integrated Waste Management Plan.

At the heart of the development, the Aerotropolis is envisioned to alleviate capacity constraints at existing regional airports, such as OR Tambo and Lanseria. Additionally, the Vaal Aerotropolis is designed to function as a logistics hub with direct access to the N1 freeway, ensuring seamless connectivity for freight and passenger traffic. Surrounding land

uses will include advanced manufacturing zones, agricultural processing hubs, and commercial facilities, enhancing the airport's functionality and economic impact. The three phases of development are summarized below. The phases span 60 years, ensuring gradual and scalable development.

1.2 Vaal Aerotropolis Location

National Road N1 and directly adjacent and north of Provincial Road P24/1-60 (R541/ future K178). The planned Vaal SEZ is a separate development, to be located east of the N1 freeway, south-east of the Vaal Aerotropolis. Refer to Figure 1-1 for the location of the Aerotropolis, the VAAL SEZ and the local high order road network.

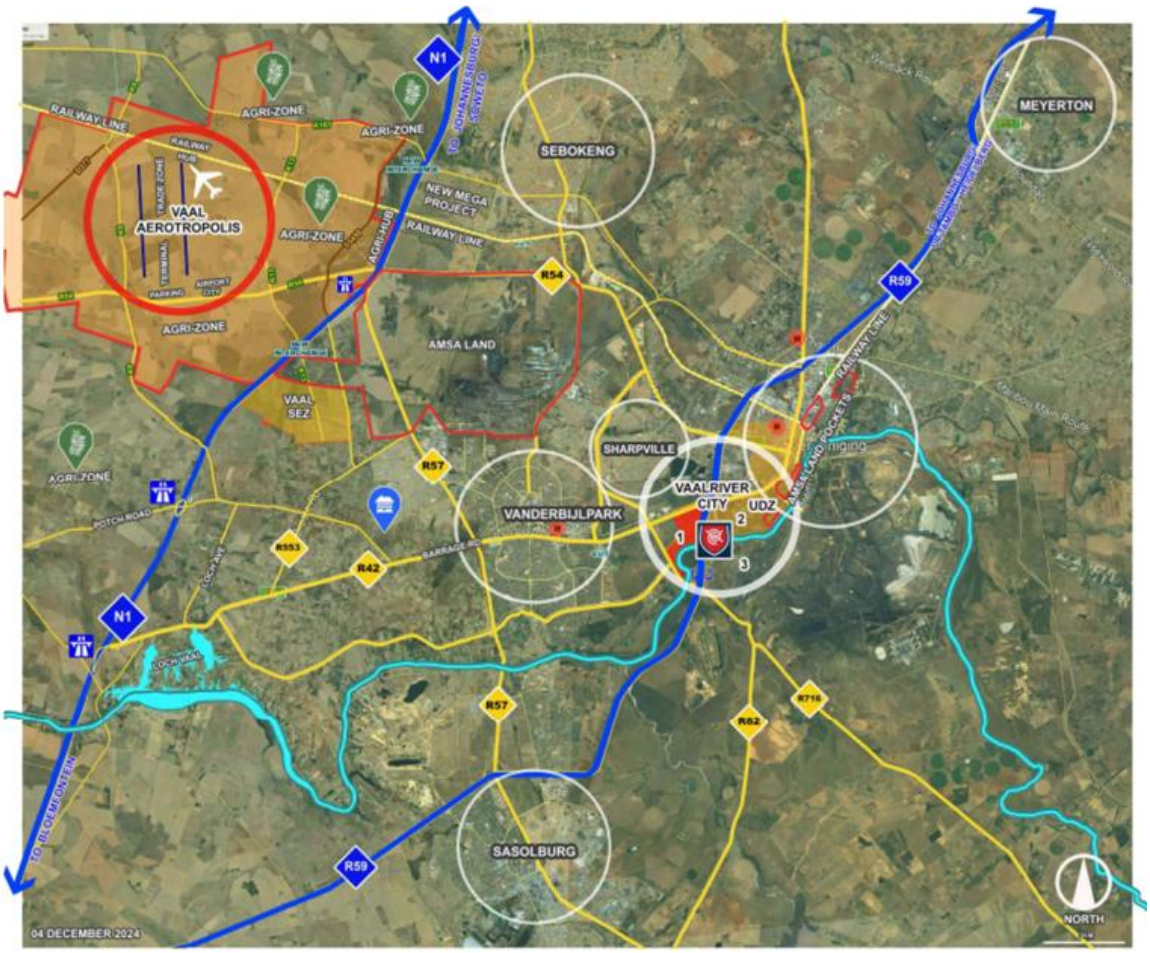


Figure 1-1 - Vaal Aerotropolis Location

1.3 Objective of the Report

The objective of this Integrated Waste Management Plan is to establish a comprehensive and coherent framework for the management of all waste streams anticipated to arise from the construction, operation, and long-term development of the Vaal Aerotropolis. The report seeks to identify and clearly define distinct waste streams, apply the waste hierarchy to minimise environmental impacts, ensure alignment with international airport best practice and applicable South African legislation, and provide a phased and scalable waste management approach that responds to the evolving nature of the development, particularly during the construction phase, phase 1,2 and 3.

In doing so, the IWMP is intended to support the environmental authorisation process, inform future Environmental Management Programmes and operational procedures, and provide a consistent basis for implementation, monitoring, and continuous improvement throughout the lifecycle of the project.

1.4 Development Phasing of the Project

The development of the Vaal Aerotropolis is structured as a phased, long-term programme aligned with the bulk engineering services strategy. The three development phases referenced throughout this Integrated Waste Management Plan (IWMP) are defined in accordance with the Engineering Services Report and reflect the progressive rollout of infrastructure, operational capacity, and land-use activation across the aerotropolis.

The phased approach is necessary due to the scale of the development, the limited capacity of existing municipal infrastructure, and the requirement for the Vaal Aerotropolis to initially operate with largely self-contained bulk services.

1.4.1. Phase 1: Initial Development and On-Site Infrastructure

Phase 1 represents the early implementation of the airport and supporting precincts, including initial terminal operations, airport city components, and portions of the trade and logistics zones.

Bulk services during this phase are designed to operate independently of municipal systems and include:

- On-site water supply (e.g. borehole abstraction and treatment)
- On-site wastewater treatment works (WWTP) with reuse of treated effluent for non-potable applications
- Sludge treatment through digestion and composting for beneficial reuse where feasible

Waste management systems during this phase are therefore required to be self-sufficient, tightly controlled, and aligned with on-site treatment and reuse infrastructure, with minimal reliance on municipal services.

1.4.2. Phase 2: Expansion and Partial Integration with Regional Infrastructure

Phase 2 involves the expansion of the aerotropolis footprint, including additional airport infrastructure, logistics and trade zones, agricultural precincts, and associated commercial and institutional land uses.

Bulk services are expanded and partially integrated with regional infrastructure, including:

- Extension of bulk sewer networks across the expanded precinct
- Introduction of a secondary bulk sewer pipeline connecting to the Rietspruit Wastewater Treatment Works, subject to capacity and upgrade programmes
- Continued operation of the on-site WWTP, with an operational balance between on-site treatment and off-site conveyance

Waste management systems in this phase must accommodate increased volumes, a broader spatial footprint, and greater operational complexity, while maintaining compliance and ensuring compatibility with both on-site and externally connected infrastructure.

1.4.3. Phase 3: Full Development and Long-Term Operational Integration

Phase 3 represents the ultimate development of the Vaal Aerotropolis, with full activation of all precincts, including airport operations, logistics and trade zones, airport city, agricultural areas, and supporting infrastructure.

Bulk services during this phase are characterised by:

- Full integration of internal networks across the aerotropolis
- Increased conveyance of wastewater to regional infrastructure where capacity allows
- Upgrades to pipelines, pump stations, and treatment systems to meet ultimate demand
- Optimisation of wastewater reuse, sludge management, and resource recovery systems

Waste management systems at this stage will operate at full scale and must be fully standardised, performance-driven, and embedded within the aerotropolis Environmental Management System, with mature monitoring, reporting, and continuous improvement mechanisms.

2 Policy, Legislative and Best-Practice Framework

The Integrated Waste Management Plan (IWMP) for the Vaal Aerotropolis is grounded in internationally recognised aviation best practices and aligned with South Africa's legislative and policy frameworks. This dual foundation ensures that waste management at the airport is both globally benchmarked and locally compliant, enabling sustainable operations and long-term resilience.

2.1 International Aviation Best Practice

The waste management approach for the Vaal Aerotropolis is informed by global frameworks that recognise airports as complex, multi-tenant ecosystems requiring coordinated governance, strong stakeholder engagement, and robust monitoring systems. Key international best practices include:

2.1.1 ICAO Eco Airport Toolkit: Waste Management at Airports

The International Civil Aviation Organization (ICAO) Eco Airport Toolkit provides a comprehensive framework for managing airport-specific waste streams. It emphasises:

- Waste hierarchy application
- Operational management principles
- Stream-specific guidance

This toolkit ensures that airports adopt structured, efficient, and environmentally responsible waste management practices.

2.1.2 Airports Council International (ACI) Environmental and Circular Economy Guidance

ACI's guidance promotes the integration of circular economy principles across airport ecosystems. It advocates for:

- Waste minimisation and source separation
- Closed-loop systems
- Stakeholder collaboration

By embedding circular economy thinking, airports can reduce environmental footprints while creating economic opportunities.

2.1.3 ISO 14001 Aligned Environmental Management Systems (EMS)

ISO 14001 provides a globally recognised standard for environmental management. Airports adopting EMS aligned with ISO 14001 benefit from:

- Systematic management of environmental aspects
- Continuous improvement cycles
- Integration with corporate governance

This framework supports airports in achieving compliance, enhancing efficiency, and demonstrating environmental leadership.

2.2 South African Legislative and Policy Context

The IWMP is aligned with South Africa's robust legislative and policy instruments, ensuring compliance with national priorities and local requirements. Key frameworks include:

- **National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008)**
  - Establishes the waste hierarchy, duty of care obligations, licensing of waste management activities, and enforcement mechanisms. It provides the legal foundation for all waste-related activities at the airport.
- **National Waste Management Strategy (NWMS)**
  - Operationalises the Waste Act by promoting waste avoidance, reuse, recycling, and recovery. It sets national targets and provides strategic direction for integrated waste management.
- **Waste Classification and Management Regulations (2013)**
  - Governs the classification, handling, and disposal of general and hazardous waste. Compliance ensures safe management of diverse waste streams generated at airports, including hazardous materials from maintenance and operations.
- **Extended Producer Responsibility (EPR) Regulations (2020)**
  - Applies to packaging, paper, plastics, lighting, and electronic waste streams. Airports, as significant consumers of these products, must ensure compliance through supplier engagement and internal waste management systems.
- **Provincial and Municipal By-laws**
  - The IWMP will adhere to applicable provincial and municipal waste by-laws, as well as requirements of licensed waste service providers in the Vaal region. This ensures alignment with local governance structures and service delivery mechanisms.

While South Africa's legislative framework for waste management is well established, implementation capacity and available infrastructure can vary at municipal and regional level. The IWMP therefore adopts a conservative and risk-averse approach, prioritising the use of licensed private waste service providers and authorised facilities, while remaining adaptable to future improvements in municipal waste services within the Emfuleni and broader Sedibeng District area.

2.3 Integration of Frameworks

By combining international best practice with South African legislative requirements, the IWMP for the Vaal Aerotropolis establishes a holistic governance model. This model ensures:

- Compliance with statutory obligations.
- Adoption of globally benchmarked operational standards.
- Engagement of stakeholders across the airport ecosystem.
- Continuous monitoring and improvement of waste management performance.

This integrated approach positions the Vaal Aerotropolis as a leader in sustainable airport operations, contributing to both environmental stewardship and economic development.

3 Waste Management Principles

Effective waste management at the Vaal Aerotropolis must be guided by internationally recognised principles that ensure environmental sustainability, regulatory compliance, operational efficiency, and stakeholder accountability. These principles provide the foundation for designing, implementing, and continuously improving the Integrated Waste Management Plan (IWMP).

3.1 The Waste Hierarchy

The waste hierarchy provides the primary decision-making framework for waste management at the Vaal Aerotropolis; however, its application must be informed by operational realities, regulatory requirements, and the specific waste profiles associated with aviation, logistics, and industrial land uses. The hierarchy is therefore applied as a practical prioritisation tool, rather than as a rigid prescriptive sequence, to ensure that waste management measures remain effective and implementable over the life of the development.

3.1.1. Waste Prevention and Avoidance

Waste prevention and avoidance will be prioritised where influence can realistically be exercised, particularly through infrastructure design, procurement practices, and tenant and concessionaire requirements. In airport environments, experience indicates that prevention is most effectively achieved upstream, through decisions relating to material selection, packaging specifications, and service delivery models, rather than through passenger behaviour alone. The IWMP therefore places emphasis on avoidance measures within terminal design, retail and catering fit-outs, and logistics operations, recognising that these interventions have the greatest long-term impact on waste generation volumes.

3.1.2. Reuse

Reuse will be encouraged where operationally feasible, particularly for transport packaging, pallets, crates, and durable materials associated with logistics, trade, and agri-processing activities. Opportunities for reuse within passenger terminals are more limited due to hygiene, security, and turnaround constraints; however, reuse initiatives will be supported in back-of-house environments, maintenance operations, and construction activities where safety and compliance requirements allow.

3.1.3. Recycling

Recycling represents the most significant and reliable diversion pathway for the Vaal Aerotropolis, particularly for high-volume, consistent waste streams such as cardboard, paper, plastics, metals, and glass generated by terminals, offices, warehouses, and logistics facilities. Recycling systems will be designed around source separation, consolidation, and engagement with licensed service providers operating within the Gauteng and broader industrial region. The IWMP recognises that recycling performance is highly dependent on

contamination control, tenant participation, and the stability of downstream markets, and therefore prioritises standardised infrastructure and clear operational responsibilities.

3.1.4. Recovery

Recovery, including the recovery of value or energy from residual waste streams, may be considered where authorised facilities and viable service providers are available. Given the current regional context, recovery options will be assessed cautiously and implemented only where they offer demonstrable environmental and operational benefits without introducing additional risk or complexity to airport operations.

3.1.5. Disposal

Disposal to landfill is recognised as the least preferred option within the hierarchy and will be limited to residual waste streams that cannot be reasonably avoided, reused, recycled, or recovered. The IWMP acknowledges that landfill availability and capacity represent a long-term risk within the region and therefore seeks to progressively reduce reliance on disposal through improved segregation, procurement controls, and diversion initiatives as the aerotropolis matures.

In applying the waste hierarchy, the IWMP deliberately avoids aspirational targets that are not supported by existing infrastructure or operational capacity. Instead, it adopts a phased and adaptive approach, allowing waste management practices to evolve in line with passenger throughput, tenant mix, and the development of regional recycling and recovery markets. This ensures that the hierarchy is applied in a manner that is environmentally responsible, operationally credible, and defensible within the regulatory context of the Vaal Aerotropolis.

3.2 Circular Economy Integration

The application of circular economy principles at the Vaal Aerotropolis will be guided by operational practicality, regulatory compliance, and the availability of viable downstream markets, rather than by aspirational targets that cannot be reliably implemented over the life of the development. As a large, multi-tenant aviation and logistics precinct located within an established industrial region, the Vaal Aerotropolis presents both opportunities and constraints for circular economy interventions.

Circular economy measures will therefore be prioritised for high-volume, repeatable waste streams that are generated consistently across airport operations and aerotropolis land uses, including packaging materials from logistics and warehousing activities, food and organic waste from catering and hospitality facilities, and construction materials arising from phased development. These waste streams offer the greatest potential for diversion, recovery, and value retention when supported by stable collection systems and reliable service providers.

Within passenger terminals and commercial buildings, circular economy principles will be applied primarily through waste avoidance and improved material selection, including

engagement with concessionaires and tenants to reduce non-recyclable packaging, encourage reusable service items where operationally feasible, and align procurement practices with Extended Producer Responsibility (EPR) obligations. Experience from comparable airport developments indicates that procurement and tenant requirements are among the most effective levers for reducing waste generation at source in complex, high-throughput environments.

The logistics, trade, and agri-processing components of the Vaal Aerotropolis are expected to generate substantial volumes of cardboard, plastics, pallets, and organic residues, particularly associated with cold-chain handling and export preparation. Circular economy interventions in these precincts will focus on material segregation at source, consolidation of recyclable materials, and engagement with regional recycling and recovery markets within Gauteng and the broader industrial corridor. Where feasible, closed-loop arrangements for pallets, crates, and reusable transport packaging will be encouraged through contractual requirements and tenant operating procedures.

Organic waste diversion represents a further circular economy opportunity, particularly in relation to food waste from catering facilities, airport lounges, hospitality uses, and agri-zone activities. However, given regulatory requirements, biosecurity considerations, and variability in regional treatment capacity, organic waste recovery options will be implemented incrementally and only where authorised facilities and reliable logistics are available. The IWMP therefore adopts a cautious and scalable approach, prioritising off-site treatment at licensed facilities over on-site processing during early development phases.

Construction and demolition activities associated with the long-term, phased development of the aerotropolis provide additional scope for circular practices through the reuse and recycling of construction materials, particularly concrete, metals, and excavated materials. These measures will be implemented through project-specific construction waste management plans, contractor accountability, and performance monitoring, recognising that construction activities will recur periodically over the anticipated 60-year development horizon.

Overall, the circular economy approach adopted in this IWMP is deliberately pragmatic and adaptive. It recognises that circular outcomes at the Vaal Aerotropolis will evolve over time as waste volumes increase, tenant profiles mature, and regional recycling and recovery capacity develops. By focusing on realistic, high-impact interventions and embedding circular economy principles within governance, procurement, and operational systems, the IWMP provides a credible pathway for progressively improving waste diversion and resource efficiency without compromising operational reliability or regulatory compliance.

3.3 Duty of Care and Compliance

All entities generating waste within the Vaal Aerotropolis, including the airport operator, tenants, airlines, concessionaires, contractors, and service providers, are subject to a legal duty of care under the National Environmental Management: Waste Act. This duty extends across the full waste lifecycle, from generation and storage through to transportation and final disposal.

In practice, this principle will be implemented through clearly defined roles and responsibilities, mandatory waste segregation requirements, the use of licensed waste service providers, and the maintenance of appropriate records and documentation. Given the multi-tenant nature of the aerotropolis, compliance will be enforced primarily through contractual mechanisms, operating procedures, and oversight by the airport and aerotropolis management entities.

3.4 Polluter Pays Principle

The polluter pays principle underpins cost allocation and accountability for waste management across the Vaal Aerotropolis. Waste generators will be responsible for the costs associated with managing the waste they produce, including segregation, storage, collection, treatment, and disposal.

This principle is particularly important in a complex airport environment where waste generation varies significantly between passengers, airlines, logistics operators, retail tenants, and industrial users. Cost recovery mechanisms will therefore be structured to incentivise waste minimisation and proper segregation, while avoiding cross-subsidisation between tenants and land uses.

3.5 Integrated and Coordinated Approach

At the Vaal Aerotropolis, integration extends beyond stakeholder coordination and includes direct alignment between waste management systems and bulk engineering services, particularly on-site wastewater treatment, stormwater reuse infrastructure, and agricultural irrigation systems. Waste management decisions have therefore been informed by engineering constraints related to water availability, sewer capacity, aviation safety, and environmental risk.

The IWMP therefore promotes an integrated waste governance model, led by the aerotropolis management entity and airport operator, with aligned standards, infrastructure, and service arrangements across terminals, logistics zones, agri-zones, and commercial precincts. This approach supports operational efficiency, consistent compliance, and improved environmental performance across the development.

3.6 Stakeholder Engagement and Awareness

Waste management performance in airport environments is strongly influenced by user behaviour, operational practices, and staff awareness. Stakeholder engagement is therefore treated as a supporting enabler rather than a standalone solution.

Engagement efforts will focus on targeted training for staff, contractors, and tenants, supported by clear operational procedures and intuitive waste infrastructure. Passenger-facing awareness measures will be designed to be simple and consistent, recognising time-constrained airport environments and the limitations of behavioural interventions alone.

3.7 Monitoring, Reporting, and Continuous Improvement

Monitoring and reporting are essential to ensuring that waste management measures remain effective and defensible over the life of the aerotropolis. Waste quantities, segregation performance, recycling rates, and disposal volumes will be tracked to the extent practicable, with a focus on high-volume and high-risk waste streams.

Performance data will be used to identify opportunities for improvement, refine operational procedures, and inform future phases of development. Continuous improvement will be driven through incremental, evidence-based adjustments rather than wholesale system changes that could disrupt airport operations.

3.8 Resource Efficiency and Cost Optimisation

Resource efficiency is closely linked to both environmental performance and long-term operational sustainability. Waste management systems at the Vaal Aerotropolis will therefore be designed to minimise unnecessary handling, duplication of services, and avoidable disposal costs.

Opportunities to leverage economies of scale across tenants and precincts will be pursued where practical, particularly for recycling and collection services. Cost optimisation measures will be implemented without compromising compliance, safety, or service reliability.

3.9 Safety and Risk Management

Waste management activities within an airport environment present specific safety and operational risks, including hygiene concerns, wildlife attraction, hazardous material exposure, and airside operational constraints.

All waste handling, storage, and transportation activities will be designed to minimise these risks through appropriate infrastructure, access controls, staff training, and emergency response procedures. High-risk waste streams, including hazardous waste and international catering waste, will be subject to enhanced controls consistent with aviation and environmental requirements.

3.10 Summary

The waste management principles set out above establish a coherent and operationally grounded philosophy for managing waste at the Vaal Aerotropolis. Together, they emphasise practicality, regulatory compliance, and phased implementation, while providing sufficient flexibility to adapt to future growth, changing tenant profiles, and evolving regional waste management capacity.

By aligning waste hierarchy application, circular economy integration, governance, and risk management within a single, consistent framework, the IWMP provides a robust foundation for sustainable waste management across the full lifecycle of the aerotropolis.

4 Waste Streams Considered

The Vaal Aerotropolis will function as a multi-tenant aviation, logistics, trade and agri-processing precinct, and will therefore generate waste streams that differ in character, risk profile and handling requirements across landside, airside and precinct-level operations. Waste streams are defined in this IWMP to:

(i) Prevent operational overlap between tenants and service providers,

(ii) Ensure that regulated wastes are managed under appropriate controls,

(iii) Enable an auditable application of the waste hierarchy that remains implementable through the project's phased development.

To support practical implementation, each waste stream description below emphasises where the waste arises, the operational interfaces that matter, and the key controls that determine compliance and performance, rather than providing generic lists.

4.1 Municipal Solid Waste (MSW)

Municipal Solid Waste (MSW) includes general, non-hazardous waste generated from passenger terminals, offices, retail and food outlets, public areas, landside support facilities, logistics warehouses and airport city land uses.

MSW generated within the Vaal Aerotropolis will be managed through a municipal service-based system. Emfuleni Local Municipality will provide bulk refuse skips located within designated refuse holding areas constructed by the developer in accordance with municipal standards. These skips will be serviced, removed and replaced at intervals determined by the Municipality, with waste transported to the nearest authorised regional landfill facility. The letter of confirmation for the provision of the solid waste removal service provision by the Emfuleni Local Municipality is attached in Appendix B.

Waste generators remain responsible for appropriate containment, basic source segregation where required operationally, and compliance with municipal by-laws. The IWMP does not rely on the provision of private general refuse services or onsite MSW treatment facilities as part of the core waste management system.

4.2 Sewerage, Wastewater and WWTW Residuals

Sewerage and wastewater management at the Vaal Aerotropolis forms a distinct and critical waste stream due to the absence of sufficient municipal sewer capacity west of the N1 and the requirement for predominantly self-contained wastewater systems. Unlike conventional developments that rely on municipal treatment works, the aerotropolis will generate, convey, treat, reuse, and manage wastewater and wastewater-related residues largely within its own infrastructure footprint, as confirmed in the Bulk Wastewater Services Report.

This waste stream includes domestic sewage generated by terminals, offices, commercial facilities, trade and airport city precincts, agrizones, and support infrastructure. It also includes aircraft lavatory waste interfaces, which are managed exclusively through authorised wastewater systems and are explicitly excluded from solid waste streams. In addition to liquid effluent, the sewerage system generates regulated waste outputs in the form of wastewater treatment plant (WWTW) screenings, grit, sludge, biosolids, and residues from oil-water separators associated with sewer and drainage infrastructure.

Sewerage-related waste streams are treated as controlled waste streams under the National Environmental Management: Waste Act where applicable, particularly in relation to sludge, screenings, grit, and separator residues. Treated effluent reuse and sludge reuse initiatives are governed by separate water use and environmental authorisations and are managed independently from solid waste systems to maintain regulatory clarity and operational control.

4.3 Waste from Aircraft Operations and Deplaned Waste

Aircraft operations generate waste that is operationally sensitive due to airside safety, hygiene and turnaround requirements. Deplaned waste includes cabin and galley waste removed from aircraft after landing and is handled through airside interfaces involving airlines, ground handlers and cleaning crews. Effective management depends on controlled segregation at source, sealed handling to prevent spillage/odours, and rapid consolidation in designated airside holding areas that limit wildlife attraction risk.

This stream is managed separately from MSW due to the operational environment in which it is generated and the clear distinction required between domestic and international waste pathways.

4.4 International Catering Waste (ICW)

ICW is a specialised subcategory of deplaned waste associated with international flights and controlled international servicing areas. It is treated as high-risk due to biosecurity and regulatory considerations, and must not be mixed with domestic deplaned waste or general MSW streams. The critical controls for ICW are unambiguous identification at source; secure, access-controlled interim storage; and transfer through specialist licensed contractors to authorised treatment or disposal routes.

Given the inland location of the Vaal Aerotropolis and the potential distance to specialised facilities, ICW logistics and interim storage controls are particularly important to ensure operational reliability and compliance (especially during early operations as international routes ramp up).

4.5 Organic and Biodegradable Waste

At the Vaal Aerotropolis, organic waste management is closely linked to the on-site wastewater treatment and agricultural reuse strategy. Organic waste streams from food

concessions, catering facilities, airport lounges, hotels, agri-processing activities, and rejected produce will be considered in conjunction with treated wastewater sludge and green waste, with the objective of supporting composting and soil-conditioning applications within the agri-zones, subject to regulatory approvals and quality controls.

4.6 Construction and Demolition (C&D) Waste

C&D waste will be generated repeatedly across the phased development of runways, terminals, cargo/logistics facilities, airport city precincts and bulk infrastructure. This is not a once-off stream: the long-term build-out horizon means C&D waste management must be treated as a recurring control system that is progressively refined between phases.

The primary drivers of performance are contractor accountability, material-specific segregation, and documented reuse/recycling pathways for high-mass materials such as rubble, concrete and metals, with disposal limited to residuals that cannot practically be diverted.

4.7 Hazardous and Industrial Waste

Hazardous and industrial waste at the Vaal Aerotropolis will include residues from oil-water separators, wastewater treatment chemicals, contaminated sediments from stormwater infrastructure, and maintenance waste associated with bulk services. These waste streams are influenced by the scale of on-site water, sewer and stormwater systems and require coordinated management to prevent secondary pollution of the Leeuspruit, Rietspruit and downstream Vaal River catchment.

4.8 Aviation-Specific and Special Waste Streams

Certain wastes are unique to airport environments or require special handling due to safety and compliance risk, including aircraft lavatory waste interfaces (managed via wastewater systems), spill response residues and contaminated absorbents, medical waste, tyres, and electronic equipment. These wastes are not treated as “miscellaneous”; they are defined explicitly to ensure that controls, storage requirements and authorised disposal pathways are clear and enforceable, particularly in airside environments where operational risk is elevated.

Aviation-specific waste management will be implemented in a manner that avoids attracting wildlife, in alignment with the stormwater and attenuation strategy which limits open water bodies within airside areas to reduce bird-strike risk.

4.9 Waste Volume Generation

At this stage of the Vaal Aerotropolis development, detailed design information, confirmed tenant mixes, and final operational layouts are not yet sufficiently developed to support reliable quantitative estimates of waste generation volumes across the various waste streams.

Waste volumes will be influenced by multiple factors, including passenger throughput, airline operations, tenant composition, logistics and warehousing activities, and the scale of agrizone and airport city developments, all of which will be progressively refined during subsequent project phases.

As such, detailed waste generation rates and associated infrastructure sizing requirements will be determined during the detailed design phase of the project. The waste management systems proposed in this IWMP have therefore been developed as scalable and adaptable frameworks capable of accommodating varying waste volumes as the development matures.

5 Waste Management Measures

The waste management measures for the Vaal Aerotropolis are structured as an enabling system that can be implemented progressively as the airport and precincts come online. In practice, waste management performance at airports is determined less by policy intent and more by:

1. Standardised infrastructure,
2. Enforceable responsibilities across tenants,
3. Reliable service provider performance, and
4. Auditable data and oversight.

The measures below are therefore written to be operationally credible for environmental authorisation and scalable across the phased development of terminals, cargo/logistics facilities, agri-zones and airport city land uses.

5.1 Waste Avoidance and Minimisation

Waste avoidance will be driven primarily through design and procurement levers under the control of the airport operator, aerotropolis management entity and tenants. Measures will focus on reducing non-recyclable packaging and unnecessary single-use items in concession and catering operations, and on embedding practical minimisation requirements in tenant fit-out standards and contractor specifications. Avoidance measures will be prioritised where they do not introduce operational risk or compromise hygiene/security requirements typical of airport environments.

5.2 Waste Segregation at Source

Segregation at source is treated as the primary determinant of diversion performance. The aerotropolis will implement standardised waste-stream definitions and consistent colour-coding/signage across public areas and back-of-house environments, recognising that contamination control is a practical constraint in high-throughput passenger areas. Back-of-house segregation will be prioritised early, with public-facing segregation expanded as operational maturity and contamination performance allow.

5.3 Waste Collection and On-Site Storage

Collection regimes and on-site storage will be designed to maintain hygiene, prevent litter and wildlife attraction, and avoid interference with airport operations. Consolidation areas will be provided for terminals and precincts, with secure and clearly demarcated storage for hazardous waste, ICW and other regulated streams. Storage design will prioritise controlled access, containment where needed (e.g., bunding for relevant liquids/contaminated materials), and practical logistics for service vehicles and contracted collection schedules.

Designated refuse holding areas for the placement of municipal bulk refuse skips will be provided across the Vaal Aerotropolis in accordance with Emfuleni Local Municipality requirements, including provisions for access, vehicle manoeuvrability, ventilation, and safety.

At this stage, the precise location, number and configuration of these refuse holding areas cannot be finalised, as they are dependent on detailed precinct layouts, building designs, traffic circulation patterns, and operational interfaces.

The identification and finalisation of refuse holding area locations will therefore be undertaken during the detailed design phase of the project, in coordination with architectural, civil engineering, and operational planning inputs, and in consultation with Emfuleni Local Municipality to ensure full compliance with applicable standards and by-laws.

5.4 Recycling and Resource Recovery

Recycling and resource recovery initiatives are recognised as desirable outcomes in the longer term; however, they are not treated as approval-critical components of the waste management system. The IWMP deliberately avoids reliance on onsite recycling or treatment infrastructure to support environmental authorisation.

Where implemented, recycling will focus on clean, high-volume dry recyclables such as cardboard, paper, plastics, metals and glass, generated primarily in back-of-house environments. All recycling initiatives will be implemented through licensed off-site service providers and facilities.

Recycling systems may be introduced incrementally as operational maturity increases, tenant profiles stabilise and reliable downstream markets are confirmed. Any such initiatives will be managed in a manner that does not introduce additional environmental approval triggers or aviation safety risks.

5.5 Management of Hazardous and Regulated Waste

Hazardous and regulated wastes will be managed using conservative controls: classification in line with South African requirements; secure storage with access control and appropriate containment; and traceable transfer to authorised facilities via licensed contractors. Recordkeeping and monitoring are treated as core controls (not administrative add-ons), ensuring that duty-of-care obligations can be demonstrated across multiple waste generators operating within the aerotropolis.

5.6 Management of International Catering Waste (ICW)

ICW will be managed as a distinct high-risk stream with strict segregation and secure interim storage. Controls will be implemented through clear procedures for airlines and ground handlers, targeted training for staff handling ICW, and contracted collection to authorised treatment/disposal routes. The system will be designed to remain reliable during early

operations, when international volumes may be lower but compliance risk remains high. Construction and Demolition Waste Management

5.7 Interface with Bulk Water, Wastewater and Stormwater Services Reports

Waste management at the Vaal Aerotropolis is closely interlinked with bulk engineering services, particularly water supply, sewerage, wastewater treatment, and stormwater management. The IWMP has therefore been developed to align with the Bulk Water, Wastewater and Stormwater Services Report, recognising the reliance on on-site infrastructure, the reuse of treated wastewater and sludge, the management of stormwater residues, and the protection of sensitive watercourses. Ongoing coordination between waste management, water, sewer, and stormwater operations will be required during detailed design and operational phases to ensure environmental compliance, operational efficiency, and aviation safety.

6 Municipal Solid Waste Management

6.1 Construction and Development Phase

Municipal solid waste across all phases will be managed through Emfuleni Local Municipality's waste removal service (confirmation letter is attached in Appendix A). The developer and airport operator will be responsible for providing compliant refuse holding areas, vehicle access, manoeuvring space, and gate specifications in accordance with municipal requirements.

During construction, MSW from site offices and welfare facilities will be removed via municipal service arrangements or, where required, licensed interim contractors operating under municipal conditions.

During all operational phases, MSW systems prioritise hygiene, operational practicality, and regulatory compliance over diversion targets. Recycling, where implemented, supplements rather than replaces the municipal disposal pathway.

6.2 Roles, Responsibilities and Monitoring

Overall responsibility for municipal solid waste (MSW) management rests with the aerotropolis management entity and the airport operator, who are responsible for ensuring that compliant waste storage infrastructure is provided across all terminals, precincts and support areas. This includes the provision of designated refuse holding areas, adequate vehicle access, manoeuvring space, and gate specifications in accordance with Emfuleni Local Municipality requirements and applicable municipal by-laws.

Emfuleni Local Municipality is responsible for the provision, servicing, removal, and replacement of bulk refuse skips, as well as the transportation and disposal of collected municipal solid waste to authorised regional landfill facilities. The frequency of collection and servicing intervals is determined by the Municipality based on operational requirements and waste generation volumes.

Tenants, concessionaires, airlines, logistics operators and contractors operating within the Vaal Aerotropolis are responsible for appropriate containment of waste at source, compliance with approved waste stream definitions, and adherence to municipal by-laws and site-specific waste handling procedures. Where basic source separation is implemented for operational reasons, waste generators are responsible for maintaining segregation and preventing contamination.

Monitoring of MSW management focuses on service reliability, housekeeping standards, and regulatory compliance rather than diversion performance. The aerotropolis management entity and airport operator will oversee the condition and functionality of refuse holding areas, adequacy of collection frequencies, and general cleanliness across operational areas.

Records of municipal service arrangements, complaints, service interruptions, and corrective actions will be maintained to demonstrate compliance with municipal requirements. As operational maturity increases, high-level tracking of waste volumes may be undertaken for planning and service optimisation purposes; however, MSW monitoring is not structured around recycling targets or performance indicators that could introduce approval risk.

7 Sewerage, Wastewater and WWTW Residuals Management

7.1 Construction Phase

During the construction phase, permanent sewer infrastructure is not yet fully operational. Sewerage generated during this period is derived primarily from construction personnel and temporary site facilities. Temporary ablution systems are installed and serviced using licensed sewer removal contractors, operating in accordance with applicable health and environmental regulations.

No wastewater treatment residues are generated during this phase, as the on-site WWTW is not yet commissioned. Construction-phase sewer management therefore focuses on preventing uncontrolled discharges, ensuring hygienic site conditions, and protecting surface watercourses from contamination. All sewer-related wastes are removed offsite to authorised treatment facilities.

The construction phase also establishes the foundations for future sewer management, including the protection of planned sewer corridors, pump station sites, and WWTW footprints from contamination or misuse during earthworks and bulk construction activities.

7.2 Phase 1: Initial Operations

Phase 1 marks the commissioning of initial sewer infrastructure and the on-site WWTW serving the airport and early precinct development. Sewerage generated during this phase includes flows from terminal buildings, offices, retail concessions, staff facilities, and limited trade zone activities. Aircraft lavatory waste interfaces commence during this phase and are managed exclusively through authorised wastewater systems, with no interaction with solid waste streams.

Wastewater treatment during Phase 1 focuses on operational stability and compliance. The WWTW generates associated waste streams in the form of screenings, grit, and sludge. These materials are managed conservatively, with secure containment and removal to authorised facilities where required. While treated effluent is reused for approved non-potable applications in line with the Bulk Wastewater Services Report, sludge reuse is only undertaken where supported by authorisations and quality controls.

At this stage, wastewater-related waste management prioritises risk control rather than optimisation. Preventing overflows, managing odours, and protecting downstream watercourses take precedence over recovery targets. Sewer and wastewater systems are operated independently from municipal infrastructure, reflecting the capacity constraints within Emfuleni Local Municipality.

7.3 Phase 2: Expanded Operations

As development intensifies during Phase 2, sewer flows increase significantly due to higher passenger throughput, expanded airport operations, and the activation of trade and agri-zone precincts. The WWTW operates at greater capacity, and wastewater-related waste streams become more predictable in both volume and composition.

Screenings, grit, and sludge generation stabilises, allowing for more structured handling and planning. Sludge management during Phase 2 increasingly aligns with agricultural reuse objectives, subject to regulatory approvals, sludge quality testing, and operational controls. Sludge and biosolids are treated as controlled waste streams under NEMWA until such time as they meet the criteria for reuse.

The interface between sewerage, stormwater, and waste management becomes more pronounced during this phase. Residues from oil-water separators, particularly those protecting surface water and reused stormwater systems, are managed as industrial waste streams and removed by licensed contractors. Sewer system reliability remains critical to avoiding knock-on impacts on airport operations and environmental compliance.

7.4 Phase 3: Ultimate Development

At full development, the sewerage and wastewater system functions as a mature utility service underpinning the entire aerotropolis. Sewer flows reflect long-term passenger volumes, industrial activity, and agricultural operations. Wastewater treatment and reuse systems operate at scale, supported by permanent infrastructure, trained operational teams, and integrated monitoring systems.

Waste streams arising from wastewater treatment, including sludge, biosolids, and separator residues, are managed through established protocols. Where sludge reuse is implemented, it is governed by strict quality, application, and monitoring requirements aligned with agricultural plans and regulatory approvals. Residual materials that do not meet reuse criteria are removed to authorised disposal facilities.

Throughout Phase 3, sewerage-related waste management remains closely aligned with aviation safety requirements. Controls are maintained to prevent odour, attraction of wildlife, or contamination of stormwater systems, recognising the operational sensitivities of an international airport environment.

7.5 Roles, Responsibilities and Monitoring

Responsibility for sewerage and wastewater waste management lies primarily with the airport operator and aerotropolis management entity, who are accountable for the operation of the sewer network, pump stations, and on-site WWTW. This includes ensuring that wastewater-related waste streams are correctly classified, handled, stored, reused, or disposed of in accordance with regulatory requirements.

Operational responsibility for the WWTW and associated infrastructure rests with appointed specialist operators under the oversight of the airport operator. These operators are responsible for managing screenings, grit, sludge, and treated effluent in line with approved operating procedures and authorisations. Contractors involved in sludge handling, transport, or disposal are required to be appropriately licensed.

Monitoring of sewer and wastewater-related waste streams is integrated into the broader Environmental Management System. Routine monitoring includes influent and effluent quality, sludge characteristics, removal volumes, reuse applications, and incident reporting. Records are maintained to demonstrate compliance with authorisations and to support adaptive management as flows and land uses evolve over the life of the project.

8 Waste from Aircraft Operations and Deplaned Waste Management

8.1 Construction Phase

No aircraft operations occur during construction and therefore no deplaned waste is generated. Planning during this phase focuses on designing airside waste holding areas, vehicle access routes, and operational procedures that are compatible with apron layouts and turnaround requirements.

8.2 Phase 1: Initial Operations

Deplaned waste generation commences with initial flight operations. Volumes are modest but operationally sensitive. Waste handling prioritises hygiene, aircraft turnaround efficiency, and airside safety. Domestic deplaned waste is collected in sealed containers and transferred directly to secure holding areas. Sorting or recovery airside is not undertaken due to contamination risk and operational constraints.

8.3 Phase 2: Expanded Operations

As aircraft movements increase, deplaned waste volumes scale accordingly. Systems established in Phase 1 are refined to improve consistency across airlines and ground handlers. Recycling of deplaned waste is considered only downstream and only where contamination can be reliably managed by service providers. Operational efficiency continues to take precedence over diversion targets.

8.4 Phase 3: Ultimate Development

At maturity, deplaned waste handling is fully standardised and embedded into apron and terminal operations. Waste systems are optimised for high throughput without introducing additional handling steps that could compromise aircraft turnaround time or airside safety.

8.5 Roles, Responsibilities and Monitoring

Airlines and their appointed ground handling agents retain primary responsibility for the removal, containment, and initial segregation of deplaned waste in accordance with airport operational procedures. The airport operator is responsible for providing suitable airside infrastructure, enforcing standardised handling requirements, and coordinating downstream waste transfer logistics.

Monitoring of this waste stream prioritises compliance with airside safety, hygiene, and turnaround requirements. Oversight focuses on container integrity, adherence to segregation

rules between domestic and international waste, and the prevention of spillage or wildlife attraction. Waste volumes are monitored at an aggregate level to inform planning and service provision, but performance metrics are not structured around recycling targets, recognising the operational sensitivity of this waste stream.

9 International Catering Waste Management

9.1 Construction Phase

No international catering waste is generated during construction.

9.2 Phase 1: Initial Operations

ICW is introduced with the commencement of international flights and is treated as a high-risk, regulated waste stream from the outset. Given the inland location of the airport and the distance to authorised facilities, Phase 1 ICW systems rely on sealed, access-controlled storage and conservative collection schedules. No treatment, processing, or volume reduction occurs onsite. Storage times are tightly controlled to prevent odour, hygiene issues, and biosecurity risks.

9.3 Phase 2: Expanded Operations

Increased international flight activity results in higher ICW volumes. Storage and transfer systems are scaled accordingly, but controls remain unchanged. Collection logistics are strengthened through longer-term contracts and contingency arrangements for delays caused by weather or operational disruptions.

9.4 Phase 3: Ultimate Development

Even at full development, ICW continues to be managed under strict segregation and offsite disposal requirements. The scale of operations does not justify relaxing controls due to the ongoing biosecurity, regulatory, and reputational risks associated with this waste stream.

9.5 Roles, Responsibilities and Monitoring

The airport operator holds ultimate responsibility for the governance of international catering waste, including the designation of controlled areas, approval of storage facilities, and appointment of suitably licensed specialist contractors. Airlines, caterers, and ground handlers are responsible for correct identification, segregation, and secure transfer of ICW at source.

Given the elevated regulatory and biosecurity risks, monitoring of ICW is stringent and documentation-driven. Records of quantities generated, storage durations, collection dates, and disposal certificates are maintained to demonstrate full compliance with regulatory requirements. Audits focus on containment integrity, access controls, and contractor performance rather than volume reduction or diversion.

10 Organic and Biodegradable Waste Management

10.1 Construction and Development Phase

Solid organic waste generated from food concessions, catering facilities, airport lounges, hospitality uses and agrizone activities will be managed as part of the general municipal solid waste stream and removed off-site via municipal collection or licensed contractors as applicable.

No onsite composting or organic waste treatment is proposed under this IWMP. This approach avoids aviation wildlife risk, odour management challenges, and additional environmental screening or authorisation requirements.

Treated wastewater sludge and biosolids arising from onsite wastewater treatment are managed under separate water and environmental authorisations and are not combined with solid organic waste streams.

10.2 Roles, Responsibilities and Monitoring

Responsibility for organic and biodegradable waste management is shared between individual waste generators, the aerotropolis management entity, and the airport operator. Food concessionaires, caterers, hospitality operators, agrizone activities and landscaping contractors are responsible for the correct containment of organic waste at source, including the use of sealed containers and adherence to hygiene and storage requirements.

The airport operator and aerotropolis management entity are responsible for approving organic waste storage arrangements, ensuring that handling practices do not introduce odour, hygiene or aviation wildlife risks, and coordinating removal through municipal collection services or licensed contractors where applicable. No onsite composting or organic waste processing facilities are permitted under this IWMP.

Management of treated wastewater sludge and biosolids arising from onsite wastewater treatment is excluded from this subsection and is governed under separate water use and environmental authorisations, with clear separation from solid organic waste streams.

Monitoring of organic waste management is operationally focused and risk-based. Oversight prioritises timely removal, container integrity, cleanliness of storage areas, and the prevention of odour, vermin or wildlife attraction, particularly within and adjacent to airside and terminal environments.

Routine inspections by airport operational staff will be used to identify non-compliance and housekeeping issues. Formal quantitative tracking of organic waste volumes is not required

under this IWMP, as diversion or onsite treatment is not proposed. Records related to service arrangements and any incidents or corrective actions will be retained to demonstrate compliance with operational and regulatory requirements.

11 Construction and Demolition Waste Management

11.1 Construction Phase

Construction and demolition waste is the dominant waste stream. Management focuses on material reuse in line with bulk earthworks and geotechnical strategies. Contractors are required to segregate materials and implement project-specific waste plans.

11.2 Phase 1, 2 and 3

C&D waste continues to arise intermittently during refurbishment, expansion, and infrastructure upgrades. Systems established during construction are retained as standing requirements, recognising that development is ongoing throughout the aerotropolis lifecycle.

11.3 Roles, Responsibilities and Monitoring

During construction and subsequent expansion phases, primary responsibility for construction and demolition waste lies with appointed contractors. Each contractor is required to implement a project-specific construction waste management plan aligned with the overarching IWMP and engineering specifications. The aerotropolis management entity provides oversight to ensure consistency across multiple contractors and phases.

Monitoring focuses on material reuse, lawful disposal, and protection of stormwater and sensitive environmental features. Records of waste movements, reuse volumes, and disposal destinations are maintained to demonstrate compliance. These requirements persist beyond initial construction, recognising that refurbishment and expansion generate recurring C&D waste throughout the project lifecycle.

12 Hazardous and Industrial Waste Management

12.1 Construction Phase

This Hazardous and Industrial Waste Management Plan provides a framework for managing hazardous and industrial waste generated by construction, maintenance, fueling, and operational activities.

12.2 Phase 1: Initial Operations

Hazardous waste expands to include residues from oil-water separators, initial WWTW operations, and maintenance activities. Conservative management and strict recordkeeping are prioritised.

12.3 Phase 2 and 3

Volumes increase as bulk services scale. Hazardous waste management is fully integrated into environmental monitoring and compliance systems, with long-term service arrangements in place.

12.4 Roles, Responsibilities and Monitoring

The airport operator and aerotropolis management entity are responsible for establishing hazardous waste controls, including approved storage facilities, contractor selection, and compliance oversight. Waste generators, including maintenance teams, bulk services operators, and tenants, are responsible for correct classification, labelling, and internal handling prior to collection.

Monitoring of hazardous waste is documentation-intensive and risk-focused. Waste manifests, classification records, and disposal certificates are maintained to demonstrate duty-of-care compliance. As bulk services such as the wastewater treatment plant and oil-water separators scale up, monitoring integrates with broader environmental reporting systems to ensure that hazardous residues are managed consistently and traceably.

13 Aviation Specific and Special Waste Management

13.1 Construction Phase

Limited generation, mainly from construction equipment and temporary medical facilities.

13.2 Phase 1: Initial Operations

Aviation-specific waste streams emerge, including spill response residues, electronic waste, and medical waste. Aircraft lavatory waste is managed exclusively through wastewater systems.

13.3 Phase 2 and 3

These waste streams stabilise and are managed through mature, specialised procedures aligned with aviation safety and regulatory requirements.

13.4 Roles, Responsibilities and Monitoring

Aviation-specific and special wastes are managed under the direct oversight of the airport operator due to their close linkage with safety-critical systems. Specialist service providers are appointed for the handling and disposal of these wastes, while internal operational teams are responsible for correct segregation and interim storage.

Monitoring prioritises compliance with aviation safety requirements, occupational health standards, and environmental authorisations. Aircraft lavatory waste is monitored through wastewater system controls, while other special wastes such as spill response residues, medical waste, and electronic waste are tracked through contractor documentation and periodic audits. Performance assessment focuses on risk prevention and regulatory compliance rather than diversion outcomes.

14 Volume of Waste Generation

For planning purposes, an order-of-magnitude estimate has been derived from comparable airport and aviation waste benchmarks. Phase 1 is planned for 7.2 million passengers per annum (mppa). Recent IATA waste audits indicate approximately 0.94 kg of aircraft cabin waste per passenger, yielding a passenger-related estimate of approximately 18 500 kg/day (excluding landside activities such as retail, food courts, offices, cargo and logistics).

To account for the cargo terminal, trade zones, airport-city commercial developments and logistics/warehousing, a solid waste generation rate of approximately 25 tonnes/day (25 000 kg/day) has been adopted.

This estimate is subject to refinement during detailed design once the tenant mix, cargo throughput, commercial floor areas and operational arrangements are confirmed.

15 Conclusion

This Integrated Waste Management Plan (IWMP) provides a structured and operationally grounded framework for managing waste across all phases of the Vaal Aerotropolis development. The Plan is aligned with the relevant bulk engineering services reports and reflects the phased rollout of infrastructure, recognising that waste management is closely linked to water, wastewater, and stormwater systems.

The IWMP adopts a phased approach, with Phase 1 based on self-sufficient, on-site infrastructure, Phase 2 introducing expansion and partial integration with regional systems, and Phase 3 representing full development and long-term operational maturity. This ensures that waste management systems remain scalable and implementable as the aerotropolis evolves.

Seven distinct waste streams are addressed, each with defined management requirements aligned to their operational and regulatory context. While municipal solid waste is a primary focus, the IWMP also explicitly addresses other critical waste streams, including deplaned aircraft waste, international catering waste, organic waste, hazardous and industrial waste, and wastewater-related residuals such as treatment sludge.

These waste streams are managed as part of an integrated system, linked to on-site wastewater treatment, effluent reuse, sludge management, stormwater control, and agricultural activities within the aerotropolis. This approach ensures that waste is not managed in isolation, but as a component of a broader environmental and resource management framework.

The IWMP is aligned with applicable legislation and international best practice, while responding to the specific constraints of the Vaal context, including limited municipal service capacity and the need for self-sufficient infrastructure.

In conclusion, the Integrated Waste Management Plan establishes a robust and practical foundation for sustainable waste management at the Vaal Aerotropolis. Its implementation will support environmental compliance, operational efficiency, and long-term sustainability objectives, while enabling the aerotropolis to adapt responsibly to future growth and changing waste management practices over the life of the development.

Appendix A

Emfuleni LM Confirmation Letter

Building 1, Maxwell Office Park
Waterfall City
Midrand
1685

wsp.com

WSP UK Limited makes no warranties or guarantees, actual or implied, in relation to this report, or the ultimate commercial, technical, economic, or financial effect on the project to which it relates, and bears no responsibility or liability related to its use other than as set out in the contract under which it was supplied.

T

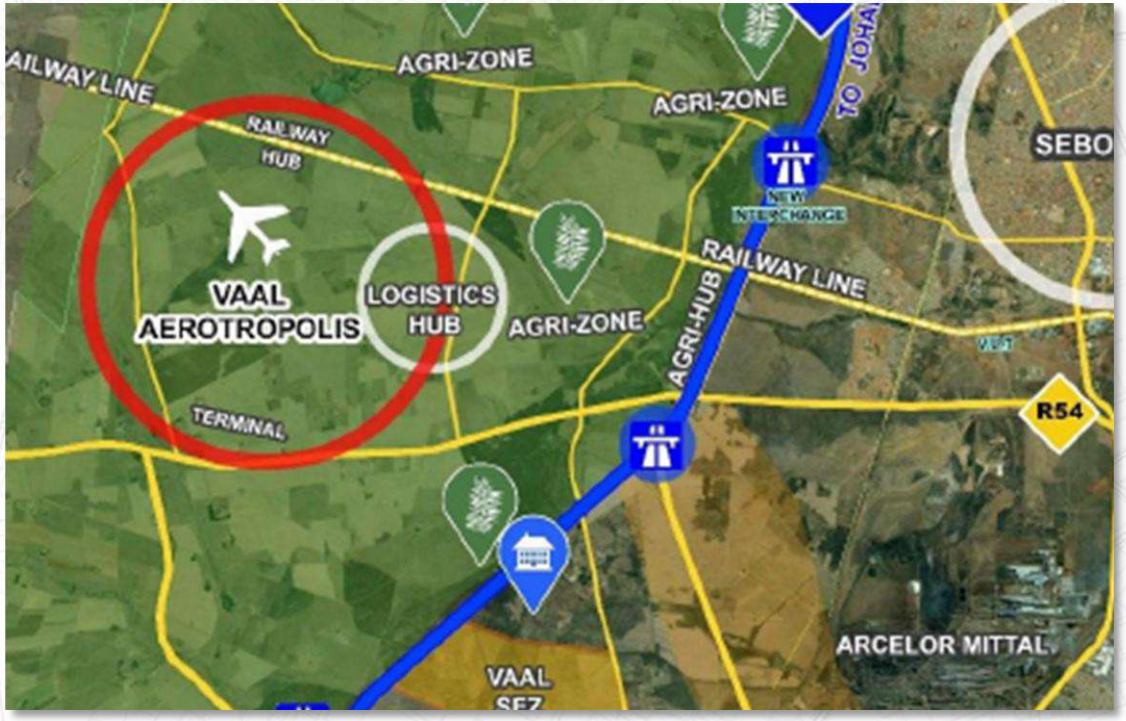
Confidential

ANNEXURE R

Report Prepared For:

Vaal Aerotropolis Design (Pty) Ltd

January **2025**



Vaal Aerotropolis

Market Demand Assessment Report

DEMACON
market studies

LEADERS IN ECONOMIC & REAL ESTATE MARKET INSIGHT

Market Studies
Retail Studies | Centre Repositioning | Consumer Surveys

Special Projects
Mixed Use Developments | Inclusionary Housing Projects | Economic Impact Assessments

Africa
Real Estate Feasibility Studies | Economic Assessments | Socio-Economic Surveys | Impact Assessments

Incorporating
GIS Technology
for Advanced
Geo-Spatial Analysis

Contact Us:
Dr. Hein du Toit
+27 460 7009
+27 12 346 5883
+27 82 8988 667
hein@demacon.co.za
www.demacon.co.za

About Us

We provide accurate & independent market insight solutions

DEMACON is a specialist research firm with a focus on topics in the fields of Demographics, Mapping (i.e., GIS – geographic information systems) and Economics, including real estate economics. Hence the acronym, DE-MA-CON.

The company is privately owned and offers clients the benefit of extensive in-house databases, including responses from more than 100 000 consumer surveys conducted all over South Africa and in time series format. DEMACON delivers a highly specialised product range of custom designed research reports, tailored to each client's unique research needs. The company's analytical processes are supported by specialised expertise, extensive experience, multi-variable databases, and advanced information technology systems. In addition to our focused research reports, the company offers high calibre industry insights and project specific solutions.

Services & Solutions

Advanced market potential modelling techniques were developed for all sectors, based on international best practice and leading methods globally. The services offered by the company include:

- Market research
- Economic analyses (Macro, meso and micro level)
- Socio-economic analyses (Macro, meso and micro level)
- Feasibility studies
- Business plans
- Real estate market analyses (Macro, meso and micro level)
- Urban and rural markets (Including township and traditional area)

DEMACON has developed specialised expertise and technically sound methodologies, aligned with international best practice, to address the complex research needs of our clients in a highly effective and efficient manner.

In this respect, we have developed a unique, customisable, and flexible research system - deploying a combination of primary and secondary data assimilation techniques, tailored to suit, respectively, the client's and project's specific requirements.

TABLE OF CONTENTS

EXECUTIVE SUMMARY – VAAL AEROTROPOLIS DEVELOPMENT SYNOPSIS i

1 Introduction and Project Brief 1

1.1 Introduction and Purpose of the Report 1

1.2 Project Brief 1

1.3 Project Overview 1

1.4 Research Methodology 4

1.5 Report Outline 5

1.6 Data Sources And Quality 6

2 Strategic Considerations and Location Analysis 8

2.1 Introduction 8

2.2 External Strategic Considerations 8

2.2.1 National Plans and Strategies 8

2.2.2 Provincial Plans and Strategies 12

2.2.3 District Plans and Strategies 15

2.2.4 Local Plans and Strategies 21

2.3 Building Statistics 27

2.4 State Of The Municipality 28

2.5 Project Location Assessment 30

2.6 Synthesis 31

3 Economic Analysis 35

3.1 Introduction 35

3.2 Reference Framework 35

3.3 Macro-Economic Trends and Performance 36

3.3.1 Economic Outlook for South Africa (August 2024) 36

3.3.2 Macro-Economic Forecasts and Related Indicators 37

3.3.3 South Africa Property Market Outlook 38

3.3.4 Residential Property Market Outlook 39

3.3.5 Retail Market Indicators 40

3.3.6 Office Market Indicators 41

3.3.7 Industrial Market Indicators 41

3.4 Industrial Development Corporation – Sector Trends, 2024 42

3.4.1 Agricultural Imports And Exports 43

3.4.2 Manufacturing Imports And Exports 43

3.5 Local Economy Trends and Performance 50

3.5.1 Geographically Defining the Local and Regional Economy 50

3.5.2 Economy Size and Structure 53

3.5.3 Economy Growth and Household Consumption Expenditure 54

3.5.4 Labour Force Participation 55

3.5.5 Labour Force Breakdown 56

3.5.6 Local Economy Synthesis and Key Considerations 57

3.6 Emfuleni local economy Competitive Advantage Analysis 58

3.6.1 Competitive Advantage Analysis – Economic Growth Based 60

3.6.2 Competitive Advantage Analysis – Employment Growth Based 68

3.7 Metsimaholo local economy Competitive Advantage Analysis 76

3.7.1 Competitive Advantage Analysis – Economic Growth Based 76

3.8 Cluster Analysis 84

3.8.1 Cluster Analysis Approach 85

3.8.2 Transportation And Logistics Cluster Analysis 87

3.8.3 Agro-Processing Cluster Analysis 97

3.9 Synthesis 106

4 Socio-Economic Analysis 108
4.1 Introduction 108
4.2 Socio-Economic Market Area Delineation 108
4.3 Primary Market Area Demographic Analysis 110
4.3.1 Demographic Size and Composition 110
4.3.2 Labour Force Profile 113
4.3.3 Household Profile 115
4.3.4 Demographic Profile And Generational Consumers 118
4.3.5 Socio-Economic Profile Synthesis and Key Considerations 120
4.4 60 Minute Drive Time Demographic Analysis 122
4.5 Gauteng City Region Demographic Analysis 125
5 AIRPORT ECONOMICS & DEVELOPMENT TRENDS 129
5.1 Introduction 129
5.2 Introduction To Airport Economics 129
5.2.1 Introduction 129
5.2.2 Airport Land Use And Economic Clusters 129
5.2.3 Benefits And Economic Impacts Associated With Airports 132
5.3 Airports And Logistics 133
5.4 List Of Busiest Airports In Africa Handling Cargo 133
5.5 South Africa Intra-African Trade And Tariff Profile 2022 135
5.5.1 Intra-African Trade 136
5.5.2 Intra-African Exports 136
5.5.3 Intra-African Imports 136
5.5.4 Trade With African Countries Outside Sacu And Sadc 137
5.5.5 Intra-African Trade In Services 139
5.5.6 South Africa's Transport Routes: Air And Maritime Trade 140
5.5.7 South Africa's Transport Routes: Rail 141
5.5.8 The Agribusiness Value Chain In Africa 142
5.5.9 Intra-Africa Trade By Regional Economic Communities, 2021 144
5.6 Airports And Industrial Development 146
5.6.1 Airport Land Use Profile 146
5.6.2 Changing Demand 146
5.6.3 Warehousing And Distribution Space 146
5.6.4 Appeal Of The Development Site For Industrial/Warehousing Development 147
5.7 Industrial Location Factors 147
5.8 Components Of A Successful Cluster 148
5.9 Innovative Industrial Development Trends 148
5.10 South African Exports of Live Animals 152
5.11 Airport Growth Potential 155
5.12 Vaal Aerotropolis High Level Demand Assessment 156
Method 1 – Socio-Economic Quantums And The Economic Production Function 156
Method 2 – Agricultural Produce Cargo Export Potential 157
Airport Passenger Trends 158
Passenger Growth Forecast 159
6 RESIDENTIAL LAND USE DEMAND ASSESSMENT 161
6.1 INTRODUCTION 161
6.2 Residential Sales Trends in the Surrounding Suburbs (time series format) 161
6.2.1 Vanderbijlpark Residential Market Activity 162
6.2.2 Vereeniging Residential Market Activity 163
6.2.3 Sasolburg Residential Market Activity 164
6.2.4 Sebokeng Residential Market Activity 165
6.3 RESIDENTIAL REAL ESTATE MARKET DEMAND SIDE INDICATORS 168

6.3.1 DEFINING RESIDENTIAL MARKET DEMAND 168
6.3.2 MARKET DEMAND MODELLING 170
6.3.3 MARKET DEMAND MODELLING OUTCOME 171
6.3.4 GAP ANALYSIS AND HIGH-LEVEL RECOMMENDATIONS 173
7 SOCIAL HOUSING LAND USE DEMAND ASSESSMENT 175
7.1 Introduction 175
7.2 Social Housing In South Africa 175
7.2.1 Comprehensive Plan For The Development Of Sustainable Human Settlements 175
7.2.2 Housing Programmes And Instruments 176
7.2.3 Social Housing – Status Of The Sector Report 177
7.2.4 Lessons And Trends 184
7.3 Social Housing Supply 187
7.4 Social Housing Demand Modelling 187
7.4.1 Defining Market Demand 187
7.4.2 Social Housing Demand Modelling 189
7.5 Gap Analysis and High Level Recommendations 190
8 RETAIL LAND USE DEMAND ASSESSMENT 192
8.1 Introduction 192
8.2 GENERAL RETAIL MARKET CONSIDERATIONS AND TRENDS 192
8.2.1 RETAIL LOCATION REQUIREMENTS 192
8.2.2 RETAIL MARKET TRENDS 193
8.3 Retail Demand Side Indicators 195
8.3.1 Defining Retail Demand 195
8.3.2 Market Demand Modelling 195
8.4 Gap Analysis and High-Level Recommendations 197
9 INDUSTRIAL AND WAREHOUSING LAND USE DEMAND ASSESSMENT 199
9.1 INTRODUCTION 199
9.2 GENERAL INDUSTRIAL MARKET TRENDS 199
9.2.1 INDUSTRIAL PARKS 199
9.2.2 TYPES OF INDUSTRIAL SPACE 201
9.2.3 NEW AGE WAREHOUSING AND DISTRIBUTION SPACE 204
9.2.4 INDUSTRIAL LOCATION CONSIDERATIONS 205
9.3 NATIONAL INDUSTRIAL MARKET TRENDS AND INDICATORS 205
9.4 INDUSTRIAL MARKET DEMAND SIDE INDICATORS 207
9.4.1 DEFINING INDUSTRIAL AND WAREHOUSING DEMAND 207
9.4.2 MARKET DEMAND MODELLING 207
9.5 Gap Analysis and High-Level Recommendations 209
10 TRADE AND AUTOMOTIVE LAND USE DEMAND ASSESSMENT 211
10.1 Introduction 211
10.2 Defining the Sector and Subsector 211
10.3 Automotive Trends and Outlook 2024 212
10.4 Trade Market Demand Side Indicators 214
10.5 Market Demand Modelling Results 215
10.6 Gap Analysis and High-Level Recommendations 216
11 OFFICE AND RELATED LAND USE DEMAND ASSESSMENT 218
11.1 INTRODUCTION 218
11.2 GENERAL OFFICE MARKET CONCEPTS 218
11.2.1 OFFICE SPACE GRADING 218
11.2.2 LOCATION CONSIDERATIONS 219
11.3 OFFICE MARKET TRENDS 219
11.3.1 QUICK FACTS 219
11.3.2 COVID-19 AND ITS IMPACT ON THE OFFICE MARKET 220
11.3.3 FLEXIBLE OFFICE SPACE 222

11.3.4 OFFICE SPACE CONVERSION 223
11.3.5 THE FUTURE OF OFFICE SPACE 224
11.4 OFFICE MARKET DEMAND SIDE INDICATORS 226
11.4.1 DEFINING OFFICE SPACE DEMAND 226
11.4.2 Market Demand Modelling 226
11.4.3 CUMULATIVE DEMAND ESTIMATE 226
11.5 Gap Analysis and High-Level Recommendations 227
12 Tourism And Short-Stay Accommodation Land Use Demand Assessment 229
12.1 INTRODUCTION 229
12.2 DEFINING TOURISM AND SHORT-STAY ACCOMMODATION PRODUCT 229
12.3 TOURISM MARKET SEGMENTATION 230
12.4 DEFINING SHORT-STAY ACCOMMODATION 232
12.5 TOURISM STATISTICS 232
12.5.1 SOUTH AFRICA INTERNATIONAL TOURISM PERFORMANCE 233
12.5.2 SOUTH AFRICA DOMESTIC TOURISM PERFORMANCE 234
12.6 Tourist and Short-Stay Market Demand Side Indicators 235
12.6.1 Market Demand Modelling 235
12.7 Gap Analysis and High-Level Recommendations 236
13 CONCLUSIONS AND CONSIDERATIONS 238
13.1 INTRODUCTION 238
13.2 DEMOGRAPHIC OVERVIEW 238
13.3 SUMMARY OF DEMAND ANALYSIS 240
13.4 Synthesis & Land Budget 243
ANNEXURE A: NATIONAL AIRPORT CASE STUDIES 246

EXECUTIVE SUMMARY – VAAL AEROTROPOLIS DEVELOPMENT SYNOPSIS

LOCATION PROFILE	Site Ratings	*Sub*	*Moderate*	*High*	*Exceptional*
ECONOMIC INDICATORS	Economic Character	*Informal*	*Developing*	*Formal*	
	Sector Orientation	*Primary*	*Secondary*	*Tertiary*	
	Economic Growth	*Negative*	*Low*	*Moderate*	*High*
LABOUR PROFILE	Skills Profile	*Low-Skilled*	*Semi-Skilled*	*Highly Skilled*	
	Labour Absorption	*Low*	*Moderate*	*High*	
	Labour Character	*Informal*	*Evolving*	*Formal*	
SOCIO-ECONOMIC PROFILE	Education Level	*None*	*Primary*	*Secondary*	*Matric & Tertiary*
	SEM Profile	*Low*	*Moderate*	*High*	
	Income Profile	*Low*	*Moderate*	*High*	
	Population Growth	*Negative*	*Low*	*Moderate*	*High*
	Income Growth	*Negative*	*Low*	*Moderate*	*High*

EXECUTIVE SUMMARY – STRATEGIC CONSIDERATIONS AND LOCATION ANALYSIS

The development site is situated within the Emfuleni Local Municipality. Due to the size and nature of the proposed development, national, district and local policies were evaluated.

The NDP, in terms of the rural economy identifies that rural economic growth should ideally target three aspects:

- Agricultural development based on successful land reform, employment creation and strong environmental safeguards. To achieve this, irrigated agriculture and dry-land production should be expanded, with emphasis on smallholder farmers where possible. To this end, established agricultural industries must be enabling partners.
- Quality basic services, particularly education, health care and public transport. Well-functioning and supported communities enable people to seek economic opportunities. This allows them to develop their communities further through remittances and the transfer of skills, which will contribute to the local economy.
- In areas with greater economic potential, industries such as agro-processing, tourism, fisheries (in coastal areas) and small enterprise development should be developed with market support. Special focus to enhance skills and capabilities of rural women entrepreneurs with access to land and finance.

The NDP furthermore highlights the need to “provide innovative market linkages”. Make provisions to link small-scale farmers in the communal and land-reform areas to markets in South Africa and further afield on the subcontinent. This will require improved road and rail infrastructure to usher farm products to and through the value chain and to markets, and improved communications infrastructure to inform agricultural role-players about buying and selling prices and supply-and-demand trends.

Linking farmers to markets will also require infrastructure for processing and value addition and new forms of intermediaries, such as cooperatives, to help small producers achieve economies of scale in processing. Farmers also need cold-chain infrastructure if they are to access markets for high-value produce and rural consumers.

The NDP plans to aggressively expand trade and investment in the region, on the continent and globally. This will require developing hard infrastructure (like road and rail networks) and soft infrastructure (trade facilitation systems, supply-chain management, and customs controls and administration). South Africa should identify specific trade, manufacturing and industrial niches, where the country enjoys competitive advantages to make full use of the strong growth in East Asian economies and their interests on the African continent.

The development site forms part of the Central Innovation Belt, as identified by the NSDF. The area surrounding the core of the Gauteng Urban Region is spatially positioned to be an economically strong, diverse production area that forms an integral part of the core economic driver of the country and the sub-continent. The Central Innovation Belt (CIB) is (1) a key contributor to national economic growth and employment, and (2) a crucial surface water production area, i.e. the Vaal Catchment. The NSDF states that the CIB should support large-scale regional economic and employment change in the region through innovation, diversification, adaptation and the repurposing of existing industrial land and associated infrastructure. Expedite urban and rural land reform, consolidate existing small and- medium-scale agriculture support programmes, protect and optimise high-value agricultural land, and strengthen the focus on job-intensive agro-processing in the area.

The GSDF has identified Vereeniging, Vanderbijlpark and Sebokeng in the Emfuleni LM as key urban development nodes of provincial significance, enhancing the viability of a potential aerotropolis. These nodes are to be linked via movement networks such as rail and road. Emfuleni major road and rail infrastructure are well developed; these traverse the area and are as follows:

- The N1 linking Pretoria with the Free State continuing to Cape Town
- The K178 linking Vereeniging with the N1 and the North West Province
- to the west
- The K53 linking Vereeniging in the south with Johannesburg in the north
- The K59 linking Vereeniging with De Deur, Walkerville and Johannesburg to the north
- The rail line that links Vereeniging and Johannesburg to the north.

The Gauteng Spatial Development Framework has identified the importance of the R59 corridor to link Johannesburg, Ekurhuleni, Meyerton and Vereeniging. The close proximity of Johannesburg to Midvaal, linked by the R59, R82, M61 and N1, has contributed to the development of residential areas in the north of Midvaal as dormitory areas for people working in Johannesburg. Recently industrial/commercial areas have also developed in the northern part of the Midvaal Municipality adjacent to the R59 route, which takes advantage of the accessibility, low land costs and proximity to the Johannesburg, Tshwane and Ekurhuleni Metropolitan areas. Areas of strategic development are mainly focusing on future development along the R59 corridor, Henley-on- Klip, Vaal Marina/Mamello, De Deur, Walkerville and Savannah City. In addition, the densification of existing urban areas and emerging areas such as Riversdale is a key priority for the Municipality

The development site is situated within the Gauteng City Region. The GSDF 2030 is to contextualize and prioritise the existing and proposed SEZs in the broader Gauteng context including OR Tambo SEZ, TA SEZ and proposed Vaal SEZ. The Gauteng SDF further mentions the Vaal Agrotropolis to be spatially referenced and bolstered for joint spatial prioritisation.

The site indicated for the Sebokeng Agri-Park (AP) as identified in the Sedibeng District SDF is located near Sebokeng. The proposed AP in Sebokeng was chosen for the following locational characteristics by DRDLR:

- Good road and rail connectivity,
- Many PLAS projects to the west of the location,
- CASP projects and Ilima Letsema projects in the area,
- Land Reform acquisition projects to the west of Sebokeng,
- Moderate land capability,
- Fresh produce market,
- At least 11 SPAR food stores in the area,
- Good water supply in terms of rivers in the area,
- Potential vacant state land to the south and north west of the location,
- Proximity to the CRDP site to the east of Sebokeng,
- Location lies within the poorest wards (PIMD),
- Proposed location is surrounded by CASP 15 – 16 projects,
- Close proximity to N1 national road between Gauteng and the Western Cape,
- 2 RID projects to the south east of the proposed location, and
- Close proximity to the Emfuleni Regional Gateway.

The Emfuleni Local Municipality SDF also focuses on the potential aerotropolis development and provides potential benefits of the Aerotropolis

- It will attract new investment and have a positive impact on the socio-economic development of the Vaal region.
- It will diversify and grow the Vaal economy.
- It will create job opportunities that will address unemployment in the Vaal region.
- It will afford local people the opportunity to participate in the economy through business partnering, business establishment, training, and skills development.
- It will create a greater demand for Arcelor Mittal's manufacturing output.
- The location of the Logistics Hub at Arcelor Mittal will help minimize transport cost of materials.
- It will create various opportunities for BBBEEE and SMME's within the Vaal region; and
- Kick-start downstream manufacturing in Emfuleni.
- Reduce transport costs of goods from areas surrounding the airport and enhance tourism opportunities within the Vaal region.

The table below provides a summary of the location assessment ratings / scoring for different land use based on the location of the Vaal Aerotropolis.

Location Assessments

Land Use	Rating
Industrial	74.2%
Retail / Trade / Automotive	73.3%
Residential	71.5%
Hotel	66.6%
Office	65.5%

The development site scored a rating of 74.2% for industrial, 73.3% for retail / trade / automotive, 71.5% for residential, 66.6% for hotel and 65.5% for office development. A site rating of above 70% indicates that all of the critical success factors for development are in place.

SWOT ANALYSIS

Strengths

- The designated aerotropolis area is in close proximity to Vanderbijlpark and Sebokeng.
- The area has vast open space available for development.
- The area is located within the Gauteng City Region.
- The GSDF has identified Vereeniging, Vanderbijlpark and Sebokeng as key urban development nodes of provincial significance.
- The development site forms part of the Central Innovation Belt.
- Regional access to the proposed area is favourable
- High local accessibility.
- Industrial nodes in close proximity.
- Access to a railway line.

Weaknesses

- Negative economic growth experienced over the long term and short term.
- Dwindling manufacturing base.
- The data shows that the sub-regional economy is experiencing a slowdown in the rate at which the local economy can produce jobs
- No bulk infrastructure and services currently at the development site.
- Limited agglomeration advantages.
- Currently not enough highly specialised employees in close proximity.
- Security might pose a risk.
- Not an established tourist destination.
- Close proximity of O R Tambo and Lanseria, limited travelling advantages of a potential new airport.

Opportunities

- Opportunity to establish a decentralised economic node in an area where economic growth and job creation is limited and lacks diversity.
- The area has the potential to create employment opportunities.
- The development has the opportunity to establish a functional and preferred destination for agro-processing.
- Establishing agro processing plants to produce high-value products could increase profitability.
- There is opportunity to create an offset for agricultural products from the North West and Free State provinces – decreasing travelling time and costs.
- Opportunity exists to strengthen the business core of Emfuleni.
- Development of the N1 corridor enhances the site's future potential.
- Opportunity to become the first live animal cargo hub in South Africa.

Threats

- Capital investment could be sizeable and could limit the potential of development and long-term sustainability.
- Gauteng has a severe shortage of access to bulk services, which limits development and expansion potential. Bulk service delivery would need to be stabilised and expanded to enable sustainability and long-term operational growth of the project
- Potential noise pollution as a result of the airport.
- Potential air pollution as a result of the industrial activities to be conducted at the site.
- Significant funding requirements.
- Limited bulk engineering services supply available for additional demand.
- Major road upgrades will be required.
- Lengthy administration process may delay potential development.
- Limited market growth capacity for industrial uses given current macro and local economic growth trends

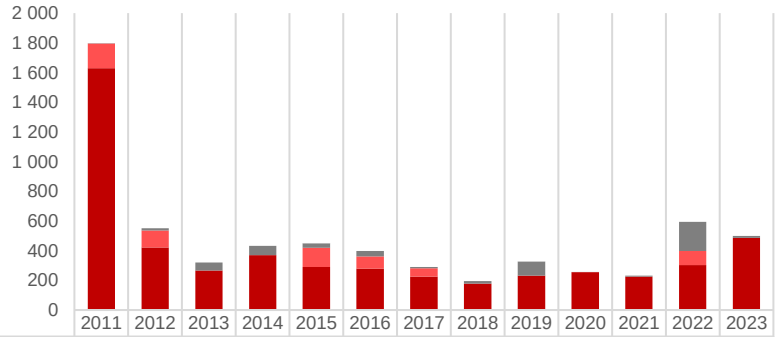
BUILDING STATISTICS[1]

EMFULENI LOCAL MUNICIPALITY: TOTAL BUILDINGS COMPLETED BETWEEN 2011 AND 2023 (PRIVATE SECTOR)

The historical trends of the Emfuleni Local Municipality show that the following has been completed between 2011 and 2023.

		Total	Average per annum
Residential Buildings	Dwelling-Houses	5 159 units	397 units
	Flats	1644 units	50 units
	Townhouses	534 units	41 units
	Other Residential (incl. Tourism Accommodation)	6 units	0.5 unit
	TOTAL residential	**6 343 units**	**488 units**
Non-Residential Buildings	Shopping Space	33 758m²	2 597m²
	Office and Banking Space	24 015m²	1 847m²
	Industrial and Warehouse Space	47 742m²	3 672m²

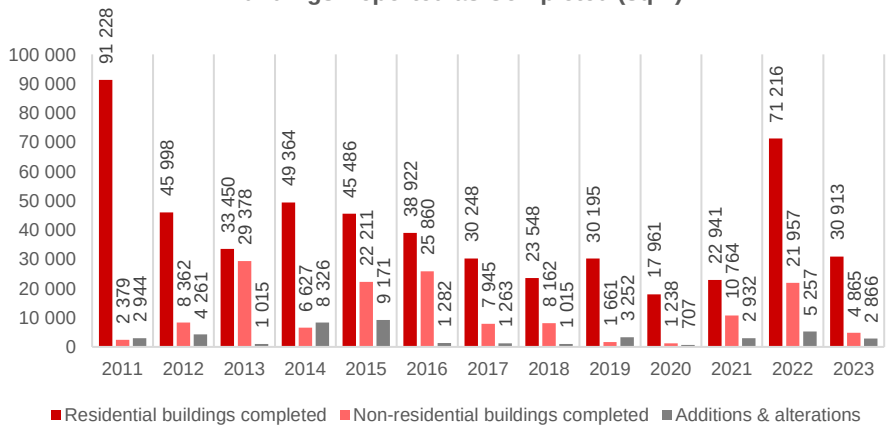
Dwelling Houses, Flats & Townhouses Completed (no of units)



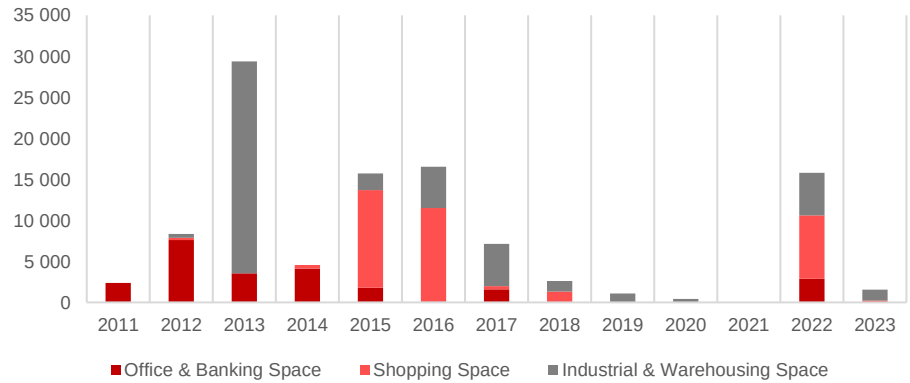
	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Other	0	0	0	0	1	0	0	0	2	1	2	0	0
Townhouses	1	14	54	63	31	36	9	17	94	0	6	196	13
Flats	165	115	0	0	129	84	55	0	0	0	0	96	0
Dwelling Houses	1 629	421	266	370	290	278	226	178	232	255	225	302	487

Dwelling Houses Flats Townhouses Other

Buildings Reported as Completed (sqm)



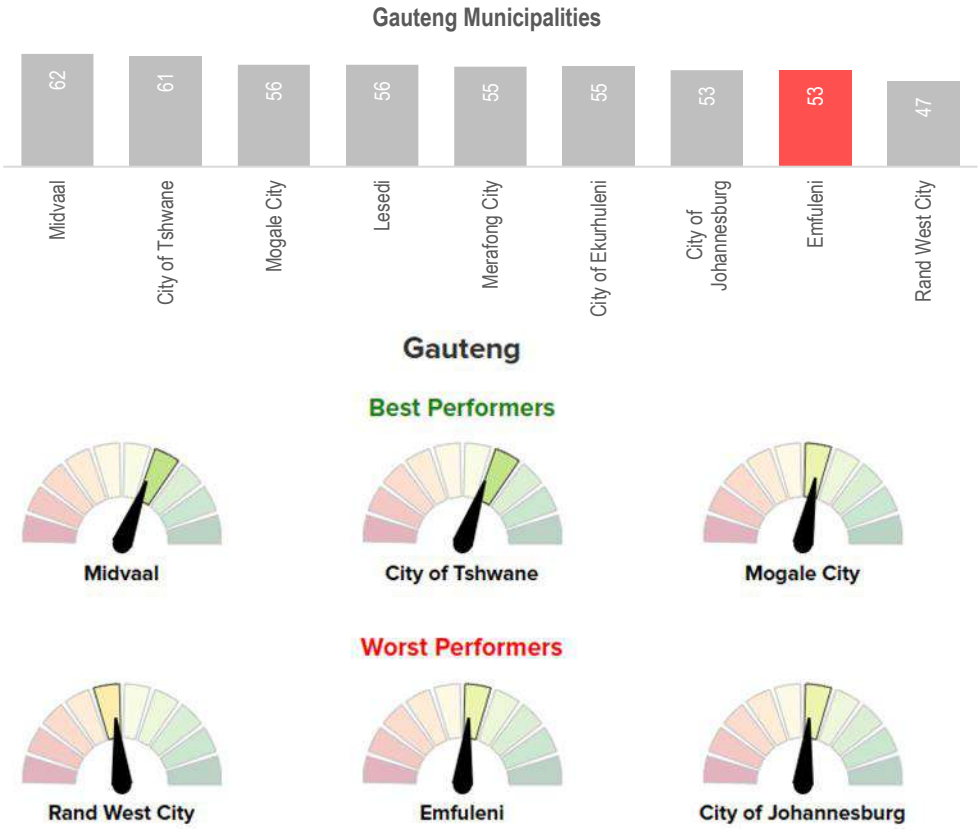
Non-residential Space as Completed (sqm)



[1] *Building Plans Stats SA, 2024*

STATE OF THE MUNICIPALITY

The Out of Order Index is an index that allocates each of the more than 200 local municipalities and eight Metros a score on a scale from 0-100, where 0 is a failure and 100 is perfectly performing. The data used are sourced from authoritative sources, such as National Treasury's budget data which is used for calculating budget allocations to municipalities, the Auditor-General's reports, and Statistics South Africa. Unlike other approaches, the Index does not only include pure financial metrics, but also measures of unemployment, poverty, and basic service delivery to households. Some factors are within the direct control of the municipality and others are not, but all affect their trajectory as sustainable entities.



FACTORS that contribute towards the Emfuleni Local Municipality's Out of Order Index Score:

Indicators

Some key factors contributing to the Index

Money not spent properly
R0

Operating budget
No Data

Maintenance spending
No Data

Number of households
259,468

% of households that are poor
58%

% of households receiving water
99%

% of households receiving electricity
86%

% of households receiving sewerage services
95%

% of household receiving rubbish removal
88%

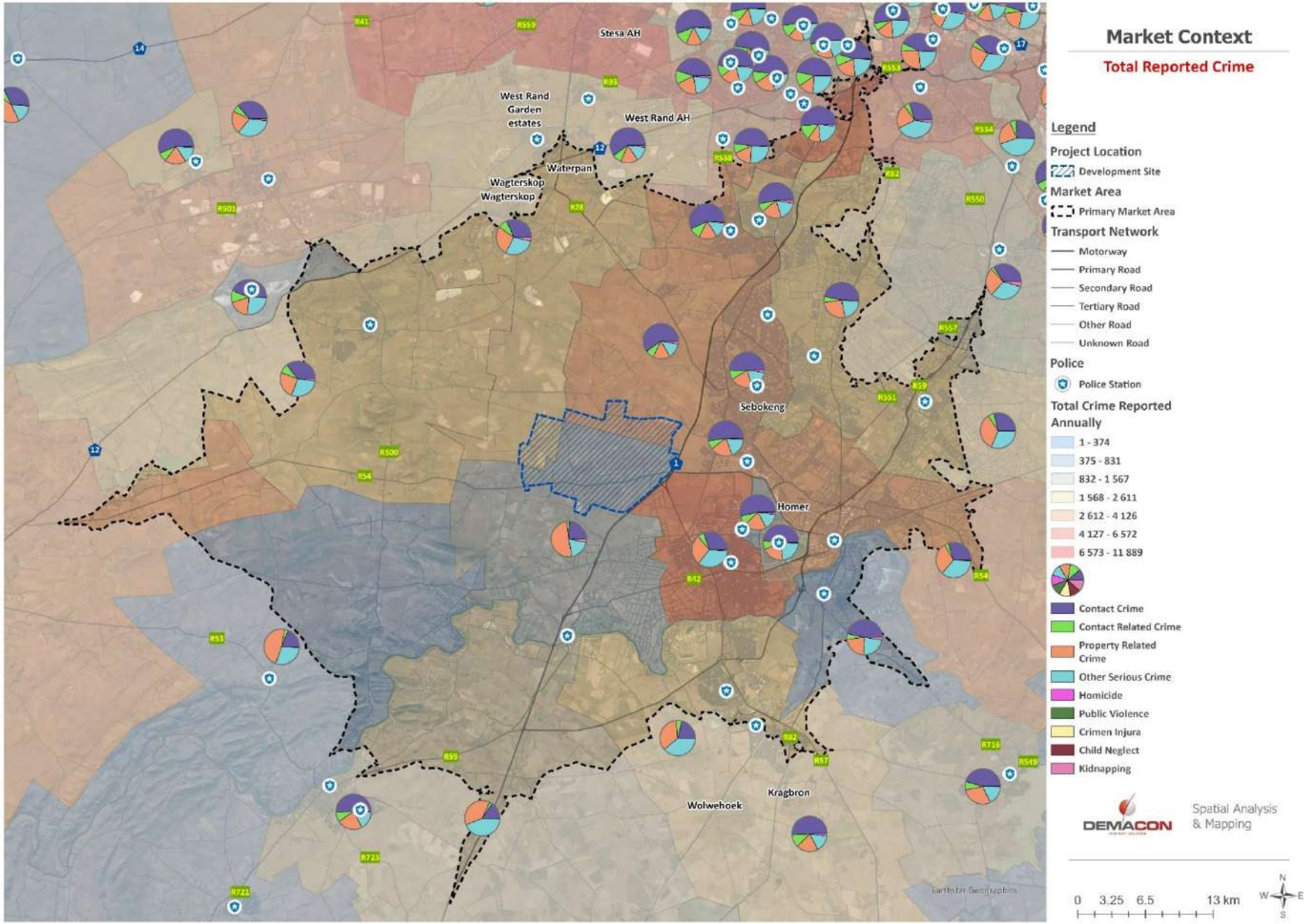
% of operating budget spent on staff wages
16%

Latest Auditor General Report:

Overall, audit outcomes regressed over the term of the previous administration due to a lack of institutionalised preventative controls. Municipal managers and senior management did not fulfil their responsibility to develop and effectively implement the basic controls that form the foundation of a sound control environment. Although we commend the province for the improvement in the 2020-21 audit outcomes, the improvements are not sustainable because weak control environments and a lack of decisive action to address transgressions persist.

Source: DEMACON ex SAPOA, Auditor General SA & News 24, May 2023

Primary Market Area Crime Statistics



EMFULENI LOCAL ECONOMIC OVERVIEW

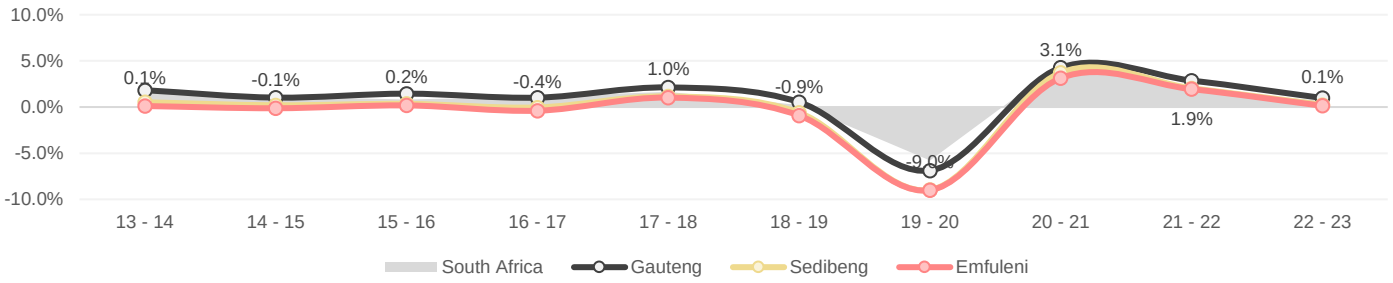
ECONOMIC GROWTH

-0.4%
(2013 to 2023)

Average annual growth of the local economy over the previous **10 years**

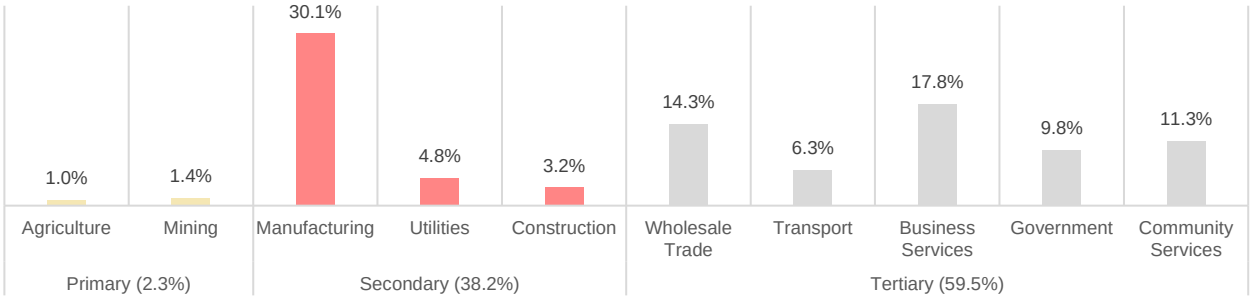
-1.0%
(2018 to 2023)

Average annual growth of the local economy over the previous **5 years**



ECONOMIC STRUCTURE, 2023

Proportional Contribution per Economic Sector to the Total GVA of the Regional Economy



LABOUR FORCE PARTICIPATION, 2022

61.5% of the potential labour force participate in the regional economy

19.1% Informal employment

80.9% Formal employment

42 261 informal jobs exist in the local economy.

The informal economy shed 12 082 jobs since 2013 at an average rate of 1 208 jobs per annum.

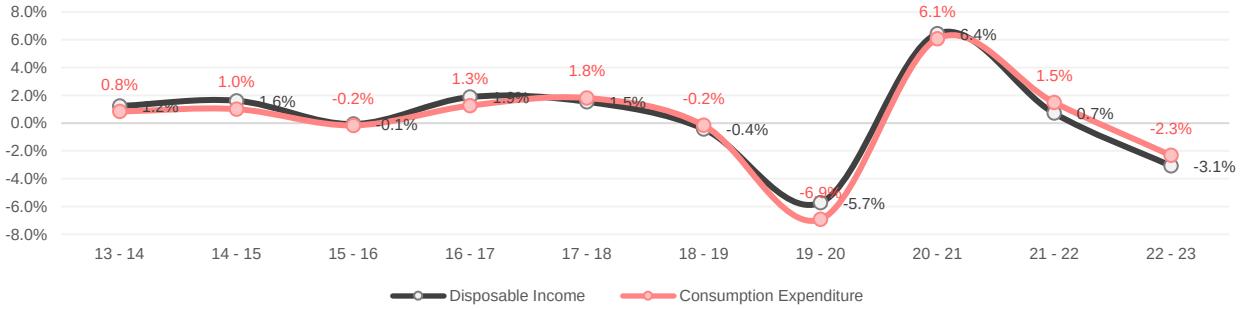
178 567 formal jobs in the local economy.

61 911 People became economically active since 2013.

Employment decreased with **1 330** people since 2013.

63 241 People became unemployed since 2013.

DISPOSABLE INCOME & CONSUMPTION EXPENDITURE GROWTH, 2013 – 2023



INDUSTRY TARGET CLASSIFICATION

This classification is based on a combination of the location quotient, National Sector Growth and Local Sector Growth values and it is expressed qualitatively not quantitatively. It is somewhat different in the way that it classifies the sectors, the categories are phrases that suggest the kind of prospects for growth that could be expected and, in some cases, whether the sector should be a retention target.

Emfuleni Local Economy Targeting Classification

Economic Sectors and Sub-sectors	Classification
Agriculture	Emerging Strength
Agriculture	Emerging Strength
Forestry	Emerging Strength
Fishing	Prospects limited by weak base and external trends
Mining	Prospects limited by weak base and external trends
Manufacturing	Prospects limited by external trends and declining competitiveness
Food, beverages and tobacco	Prospects limited by external trends
Textiles, clothing and leather products	Prospects limited by external trends
Wood and paper, publishing and printing	Prospects limited by external trends
Petroleum products, chemicals, rubber and plastic	Prospects limited by external trends and declining competitiveness
Other non-metal mineral products	Prospects limited by external trends and declining competitiveness
Metals, metal products, machinery and equipment	Prospects limited by external trends and declining competitiveness
Electrical machinery and apparatus	Prospects limited by external trends and declining competitiveness
Radio, TV, instruments, watches and clocks	Prospects limited by external trends and declining competitiveness
Transport equipment	Prospects limited by external trends
Furniture, other manufacturing	Prospects limited by external trends
Utilities	Prospects limited by external trends and declining competitiveness
Electricity and gas	Prospects limited by external trends and declining competitiveness
Water	Prospects limited by external trends and declining competitiveness
Construction	Prospects limited by external trends
Trade	Prospects limited by external trends and declining competitiveness
Wholesale and retail trade	Prospects limited by external trends and declining competitiveness
Catering and accommodation services	Current Strength
Transport and Storage	Current Strength
Transport and storage	Current Strength
Communication	Prospects limited by weak base and declining competitiveness
Business and Financial Services	High priority retention target
Finance and insurance	Prospects limited by weak base and declining competitiveness
Business Services	High priority retention target
Professional business services	High priority retention target
Business activities n.e.c.	High priority retention target
Government	High priority retention target
National and Provincial government	Prospects limited by external trends and declining competitiveness
Local government	High priority retention target
Community and Personal Services	Prospects limited by weak base and declining competitiveness
Education (Private)	Prospects limited by weak base and declining competitiveness
Health and social work (Private)	Prospects limited overall
Other community, social and personal services	Current Strength

Source: DEMACON Calculations, 2024

The industry target classification is displayed graphically by the subsequent Figure. The size of the circles represents the location quotient, that is, the relative size of the sector.

Sectors located in the top and bottom left quadrants are considered to have limited prospects because these industries are declining in the aggregate economy. If they are small, they have additional challenges and if they are within the negative range in terms of LSRG, they also suffer from declining competitiveness.

In business terminology, the upper left quadrant reflects industry groups that are increasing their market share in a declining market, industries in the lower left quadrant represents industries that are losing market share in a declining market.

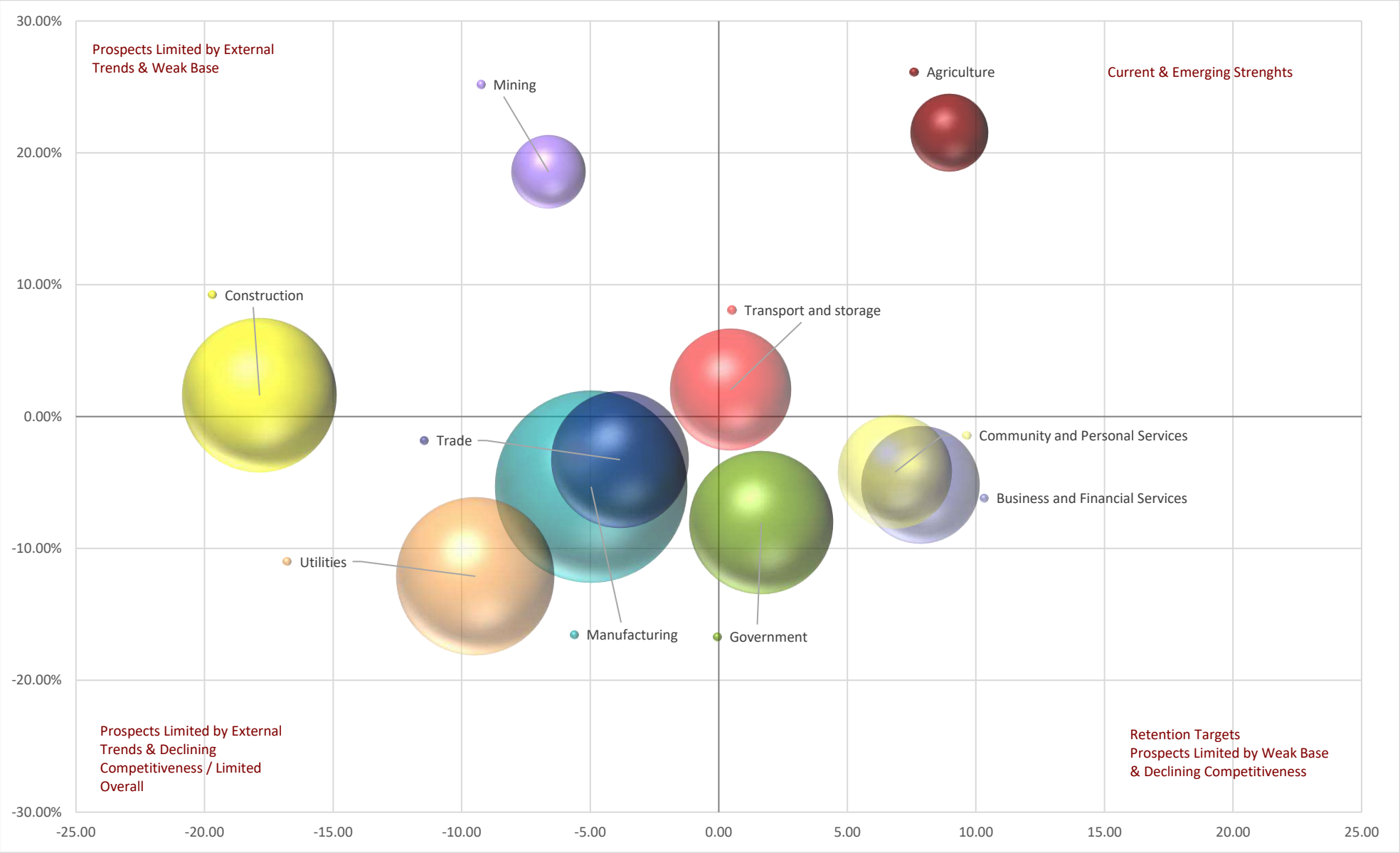
Sectors falling within the lower right quadrant are classified as retention targets (if large enough) because they are growing in the aggregate economy but more slowly locally. Smaller industry groups in this quadrant are deemed to have limited prospects.

Sectors within the upper right quadrant are growing in the aggregate economy and locally. These industries represent the strengths and emerging strengths of the local economy.

If the circles are large, it represents current strengths and if the circles are smaller then it reflects emerging strengths. In business terminology industries in the upper right quadrant are increasing their market share in an expanding market, whereas the industries in the lower right quadrant are losing market share in an expanding market.

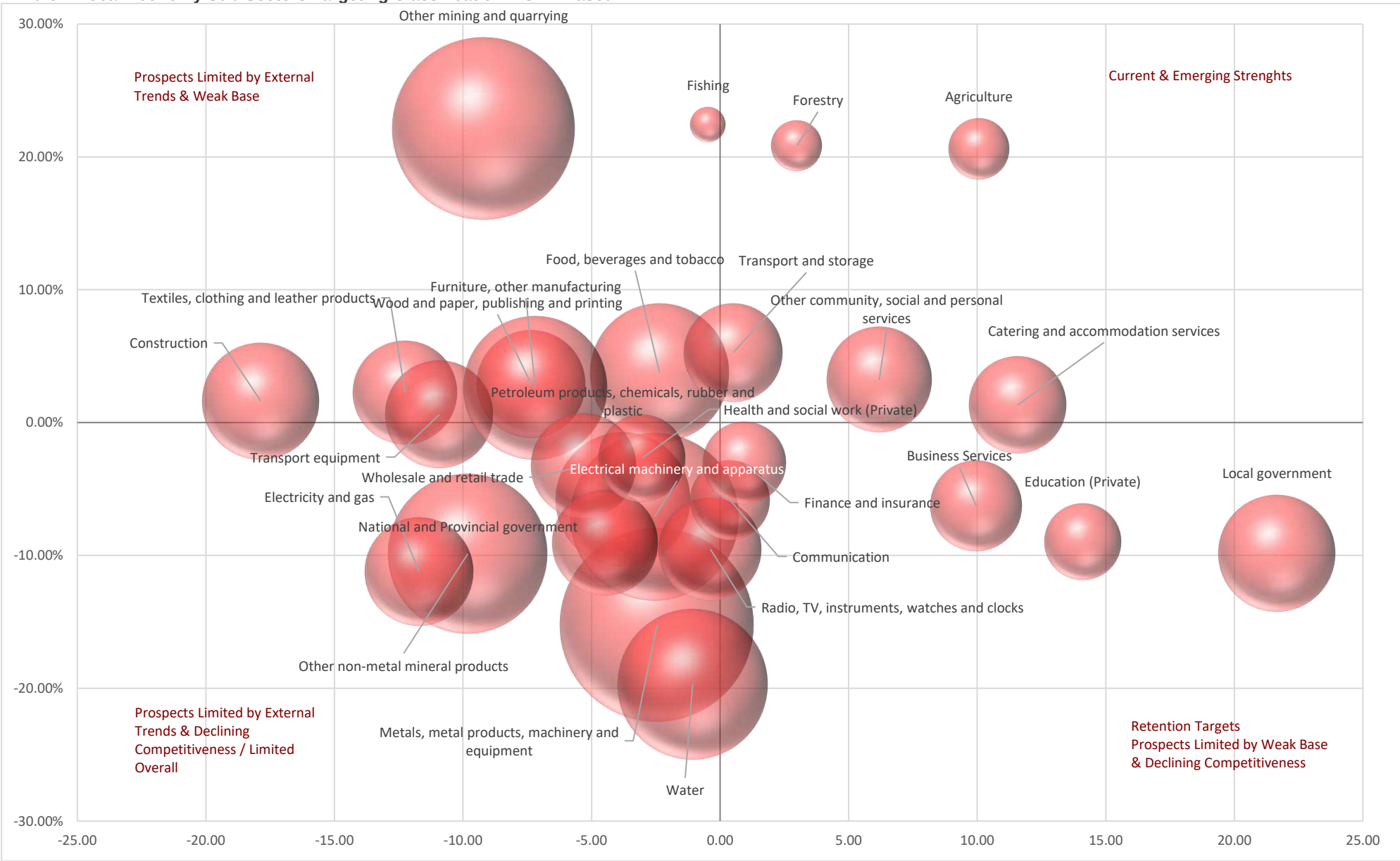
According to the industry targeting classification, the Agriculture and Transport and Storage sectors are the only current or emerging strengths. The analyses therefore suggest that the Vaal Aerotropolis can act as economic infrastructure that can support sectors and industries of the economy that form the basis of the economy.

Emfuleni Local Economy Primary Economic Sectors Targeting Classification – GVA Based



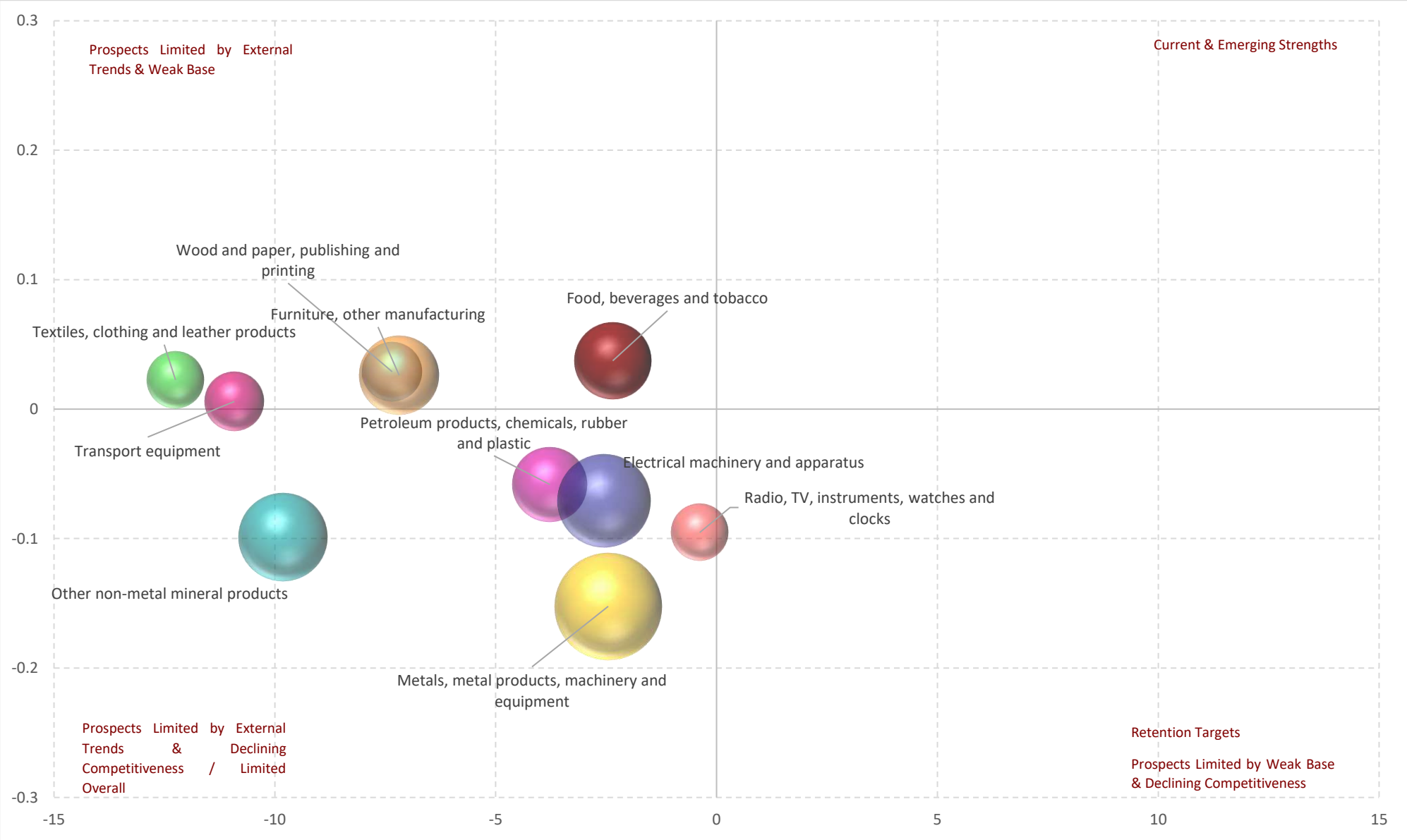
Source: DEMACON Calculations, 2024

Emfuleni Local Economy Sub-Sectors Targeting Classification – GVA Based



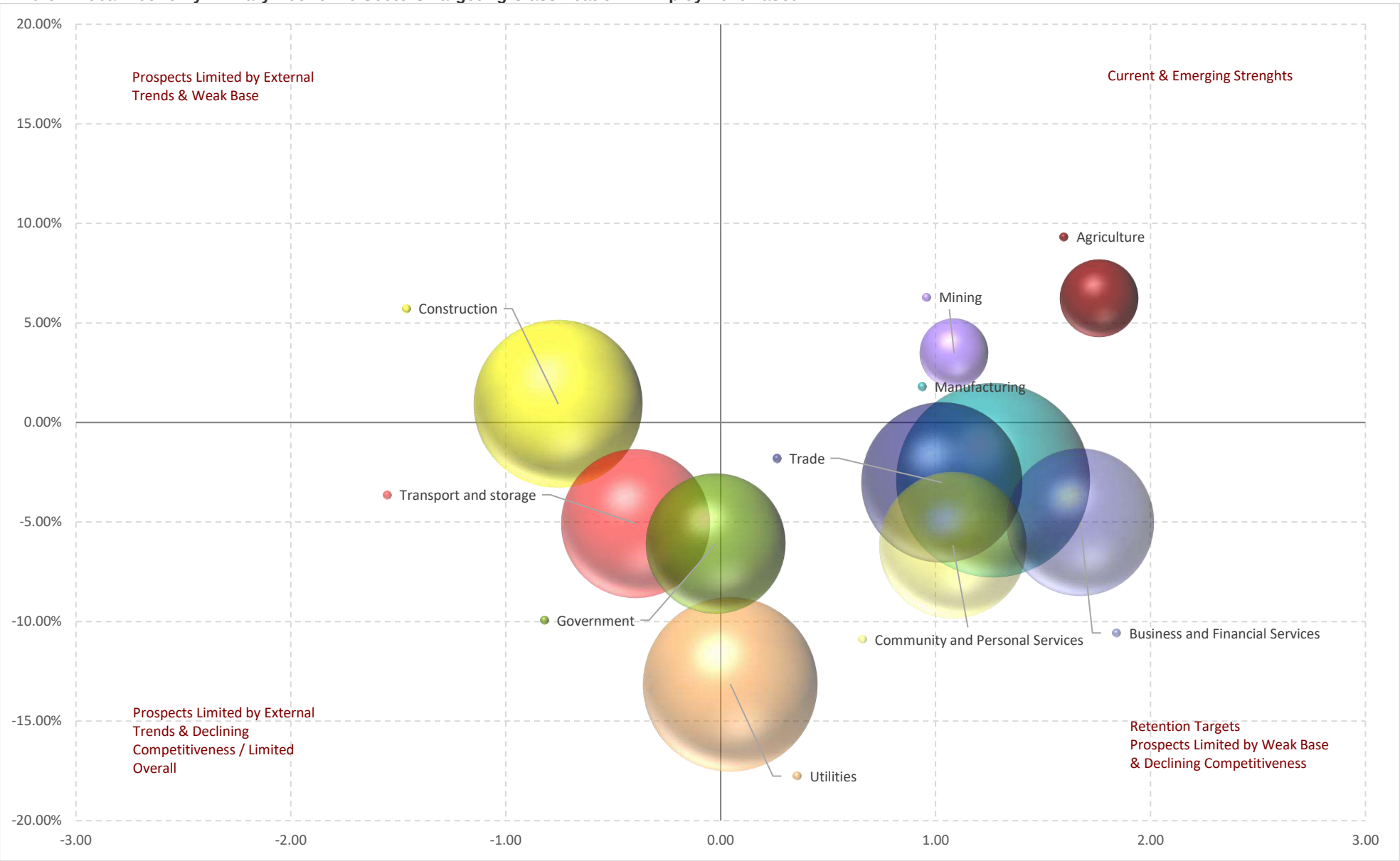
Source: DEMACON Calculations, 2024

Emfuleni Local Economy Manufacturing Sub-Sectors Targeting Classification – GVA Based



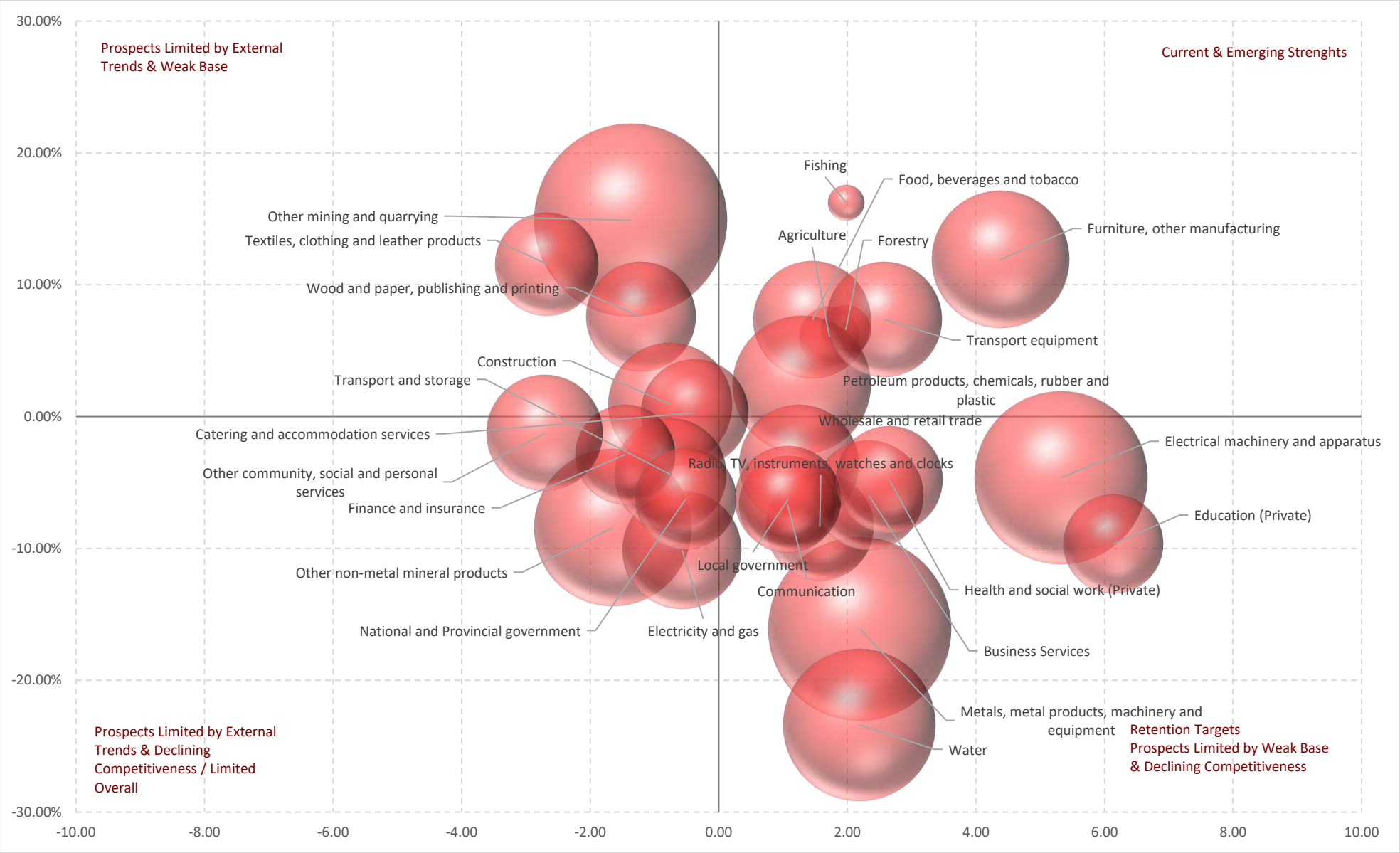
Source: DEMACON Calculations, 2024

Emfuleni Local Economy Primary Economic Sectors Targeting Classification – Employment Based



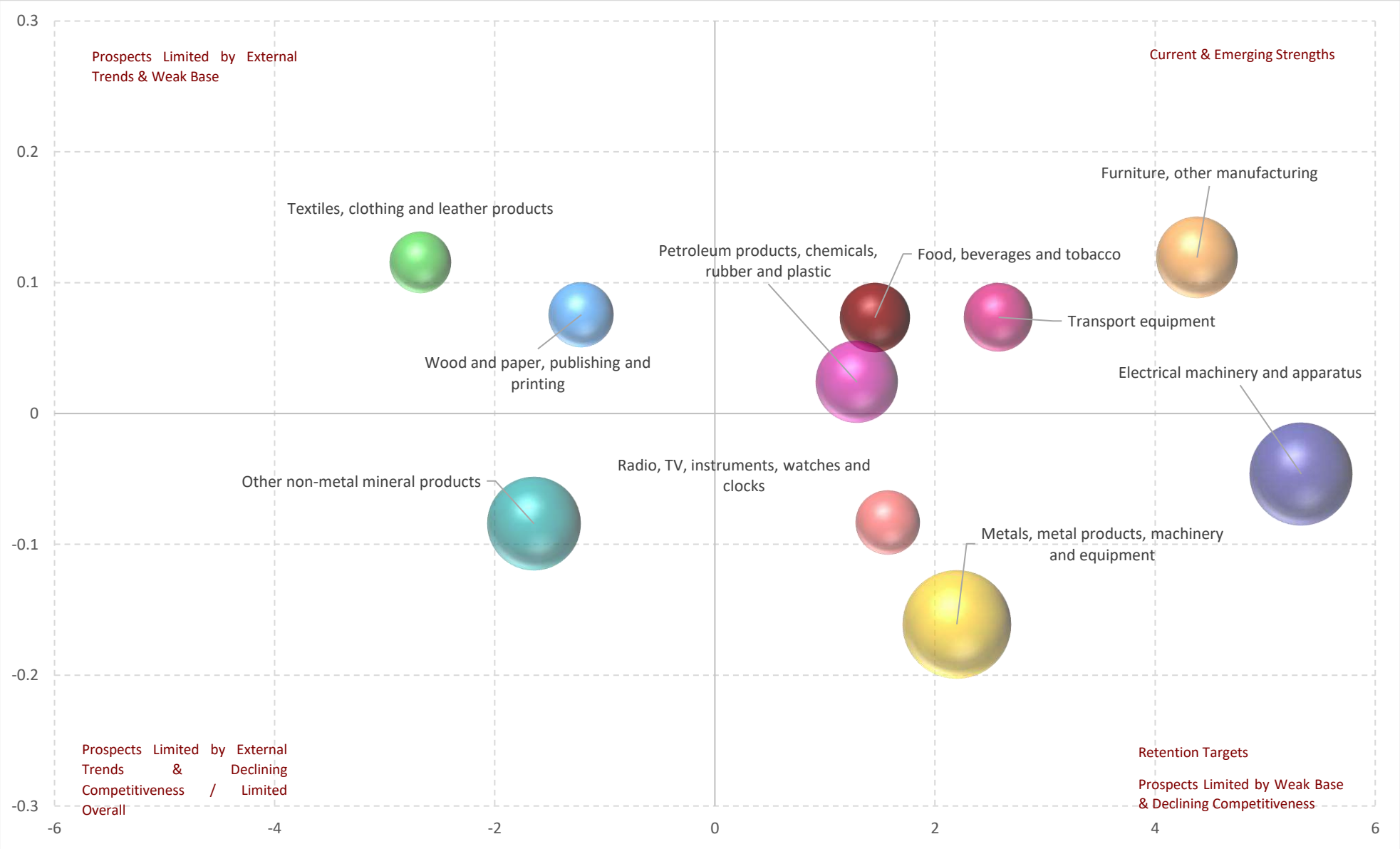
Source: DEMACON Calculations, 2024

Emfuleni Local Economy Sub-Sectors Targeting Classification – Employment Based



Source: DEMACON Calculations, 2024

Emfuleni Local Economy Manufacturing Sub-Sectors Targeting Classification – Employment Based



Source: DEMACON Calculations, 2024

CLUSTER ANALYSIS

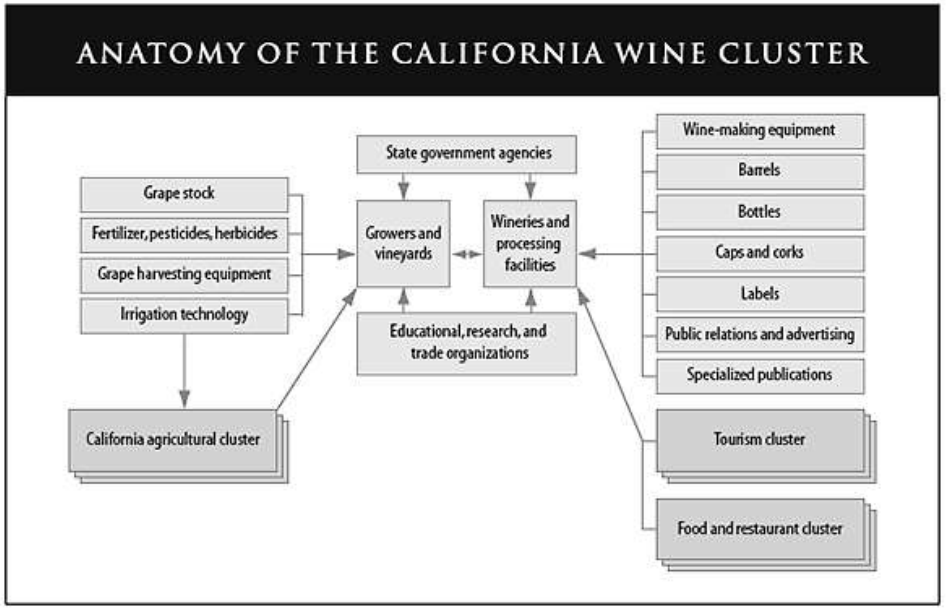
When considering the concept of economic clusters, it is important to make a distinction between the concept of agglomeration and clusters. The two concepts target a similar grouping of economic activity, but the broader concept includes and excludes sections of economic activity.

The agglomeration effect of economic activity identifies that firms of similar industries tend to locate in similar geographic localities due to the benefit of economies of scale and market mass. Clustering focuses on the same tendency of comparable firms from specific industries to locate in similar locations, but also considers the broader context of economic interdependency. In other words, clustering focuses on not only firms from a specific industry but also the proximity of supporting value chain industries, technology, skills and institutional support.

In the context of this report as well as the intended outcome of this analysis, the key concept of this analysis is economic clusters, otherwise also referred to as industrial clusters. According to Porter (1998) – the pioneer and driver of cluster theory – clusters are "geographic concentrations of interconnected companies and institutions in a particular field". Considering the definition and work completed by Porter (1998), clusters are a critical component to competition because clusters encompass an array of linked industries and other entities. Linked industries and entities for instance include enterprises engaged in a specific industrial activity that has access to not only suppliers of specialised inputs, skills and institutional capacity, but also downstream channels and customers as well as manufacturers of complementary products. Clusters often include a degree of skills development, research and development as well as technological advances, typically also supported by governmental institutions and organisations.

Clusters are therefore concentrations, or agglomerations, of typical value chain components and support infrastructure that enables an overarching industry to be competitive not only locally but internationally. For example, the most widely known and recognised clusters in the world can be identified as Silicon Valley, Hollywood, Car manufacturing in Southern Germany, and the Italian footwear industry. The diagram below provides an example of the wine cluster found in California:

Examples of a Cluster (California Wine)



Source: DEMACON ex Porter (1998)

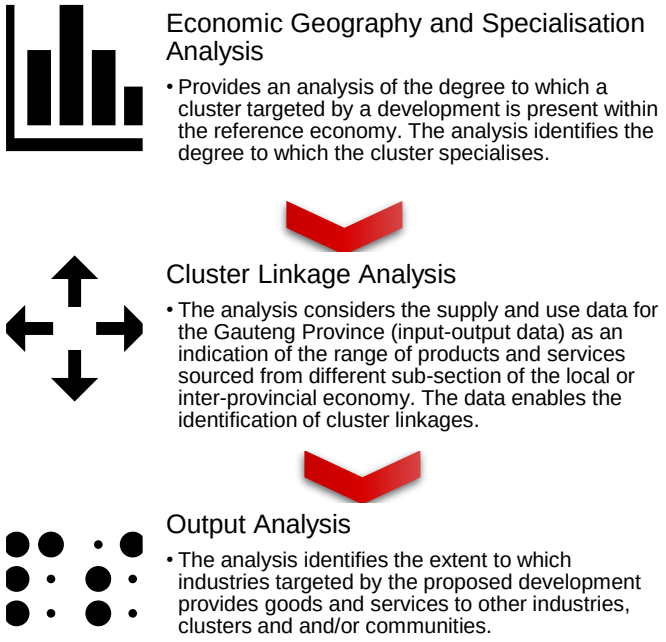
The diagram shows that clusters are the result of sections of an industry's value chain grouping together and driving productive economic activity between various elements of the value chain. As noted by the United Nations (2001), "clusters are interdependent due to the flow of goods and services between them and to the fact that their products typically are functionally interrelated. They are linked not only by their commonalities but also by their complementarities".

Considering the preceding, an analysis of the clusters that represent the industries targeted by the proposed development is important to:

- Understand the extent of cluster formation not only in and around the local Emfuleni Economic node but the broader regional economy as well,
- Understand whether target industry clusters have sufficient economic weight and agglomeration factors to support growth,
- Understand key drivers that could be tapped into or enhanced by the proposed development.

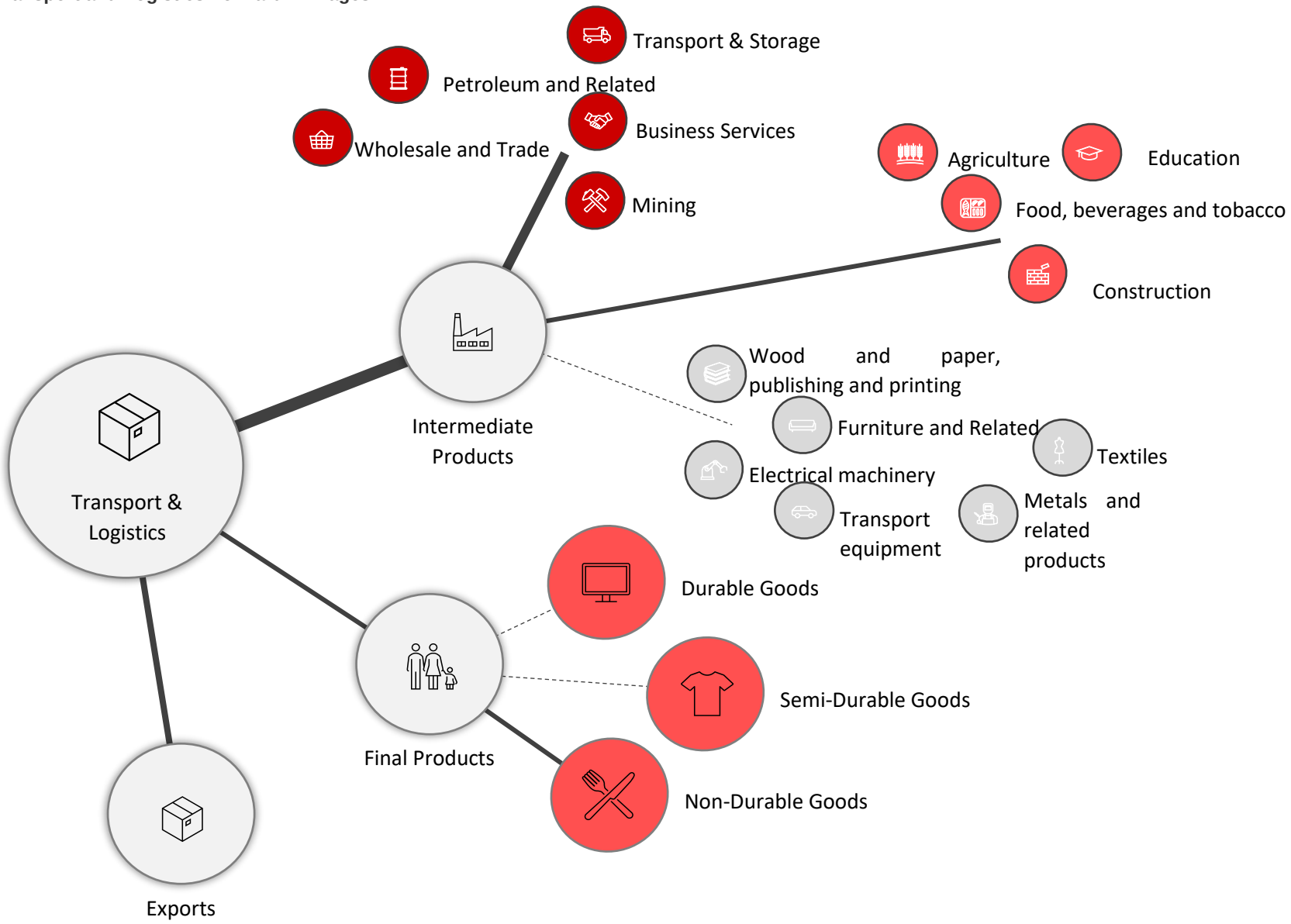
Clusters typically encompass entire industries and are not fully concentrated within a single environment. A development rather plays a supporting and inter-linked role in the context of clusters by attracting and establishing enterprises through foreign or domestic direct investment. A development forms part of an industry's value chain by enhancing the growth and development of industries that support a clusters productivity or export potential.

To undertake the cluster mapping analysis, three phases of analysis are employed. The three phases of analysis are outlined in the following diagram.



The following diagrams provide the findings of the cluster analysis, firstly for the transport and logistics sector and then the agro-processing sector.

Transport and Logistics Forward-Linkages



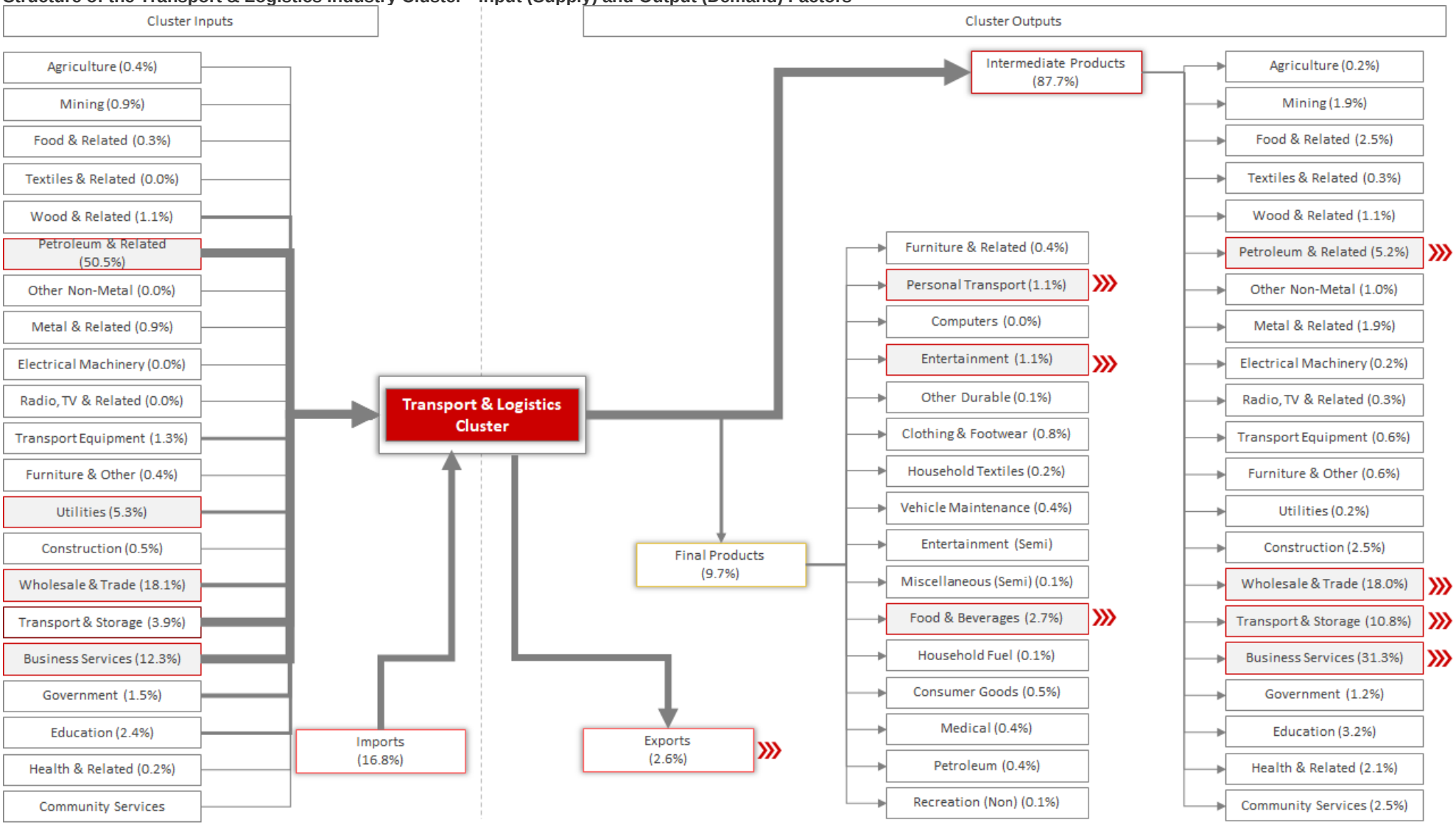
Source: DEMACON ex 2024

Output Table of the Transport and Logistics Industry – Output Analysis

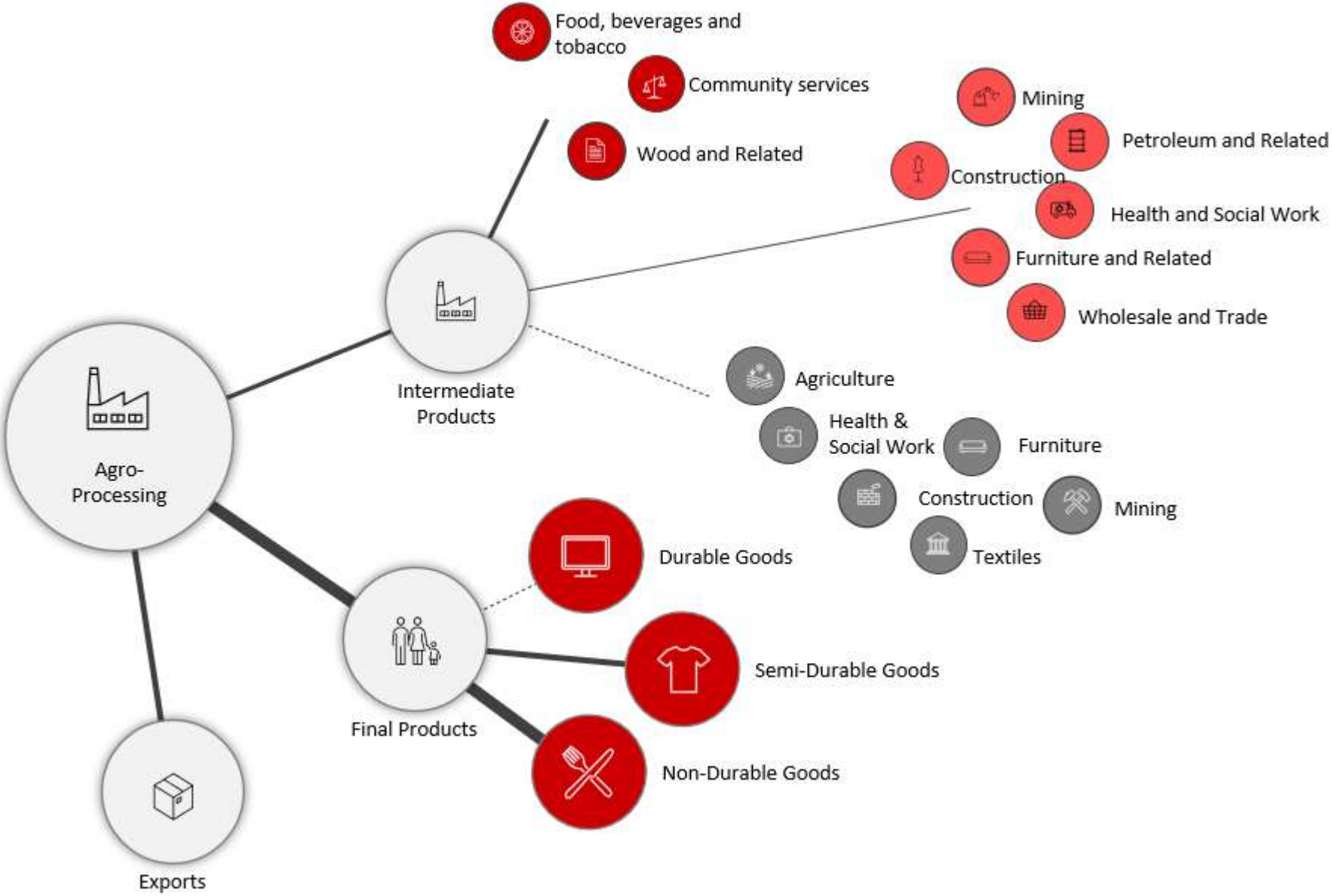
Consumer Sector / Goods	Primary Output-Sub-Cluster		% Distribution of Total Output Acquired per Consumer Sector / Good	Link Classification	Local vs National Markets		Demand Driver
	Main Output Sub-Cluster	% Output Acquired by Consumers			Gauteng	Remainder of SA	
Agriculture	Transport & Storage	100.0%	0.2%	Less Pronounced	40.0%	60.0%	
Mining	Transport & Storage	100.0%	1.9%	Less Pronounced	100.0%	0.0%	
Food, beverages and tobacco	Transport & Storage	100.0%	2.5%	Moderate Link	38.5%	61.5%	Secondary Driver
Textiles, clothing and leather products	Transport & Storage	100.0%	0.3%	Less Pronounced	88.6%	11.4%	
Wood and paper, publishing and printing	Transport & Storage	100.0%	1.1%	Less Pronounced	73.0%	27.0%	
Petroleum products, chemicals, rubber and plastic	**Transport & Storage**	**100.0%**	**5.2%**	**Strong Link**	**73.1%**	**26.9%**	**Demand Driver**
Other non-metal mineral products	Transport & Storage	100.0%	1.0%	Less Pronounced	75.5%	24.5%	
Metals, metal products, machinery and equipment	Transport & Storage	100.0%	1.9%	Less Pronounced	53.0%	47.0%	
Electrical machinery and apparatus	Transport & Storage	100.0%	0.2%	Less Pronounced	57.2%	42.8%	
Radio, TV, instruments, watches and clocks	Transport & Storage	100.0%	0.3%	Less Pronounced	100.0%	0.0%	
Transport equipment	Transport & Storage	100.0%	0.6%	Less Pronounced	18.5%	81.5%	
Furniture, other manufacturing	Transport & Storage	100.0%	0.6%	Less Pronounced	54.5%	45.5%	
Utilities	Transport & Storage	100.0%	0.2%	Less Pronounced	32.3%	67.7%	
Construction	Transport & Storage	100.0%	2.5%	Moderate Link	100.0%	0.0%	Secondary Driver
Wholesale and retail trade	**Transport & Storage**	**100.0%**	**18.0%**	**Strong Link**	**100.0%**	**0.0%**	**Demand Driver**
Transport and Storage	**Transport & Storage**	**100.0%**	**10.8%**	**Strong Link**	**7.6%**	**92.4%**	**Demand Driver**
Business Services	**Transport & Storage**	**100.0%**	**31.3%**	**Strong Link**	**44.2%**	**55.8%**	**Demand Driver**
Government	Transport & Storage	100.0%	1.2%	Less Pronounced	98.4%	1.6%	
Education (Private)	Transport & Storage	100.0%	3.2%	Moderate Link	100.0%	0.0%	Secondary Driver
Health and social work (Private)	Transport & Storage	100.0%	2.1%	Moderate Link	66.5%	33.5%	Secondary Driver
Other community, social and personal services	Transport & Storage	100.0%	2.5%	Moderate Link	66.5%	33.5%	Secondary Driver
Durable goods	Transport & Storage	100.0%	2.4%	Moderate Link	76.4%	23.6%	Secondary Driver
Semi-durable goods	Transport & Storage	100.0%	2.0%	Less Pronounced	76.9%	23.1%	
Non-durable goods	**Transport & Storage**	**100.0%**	**5.4%**	**Strong Link**	**77.5%**	**22.5%**	**Demand Driver**

Source: DEMACON Calculations, 2024

Structure of the Transport & Logistics Industry Cluster - Input (Supply) and Output (Demand) Factors



Agro-Processing Forward-Linkages



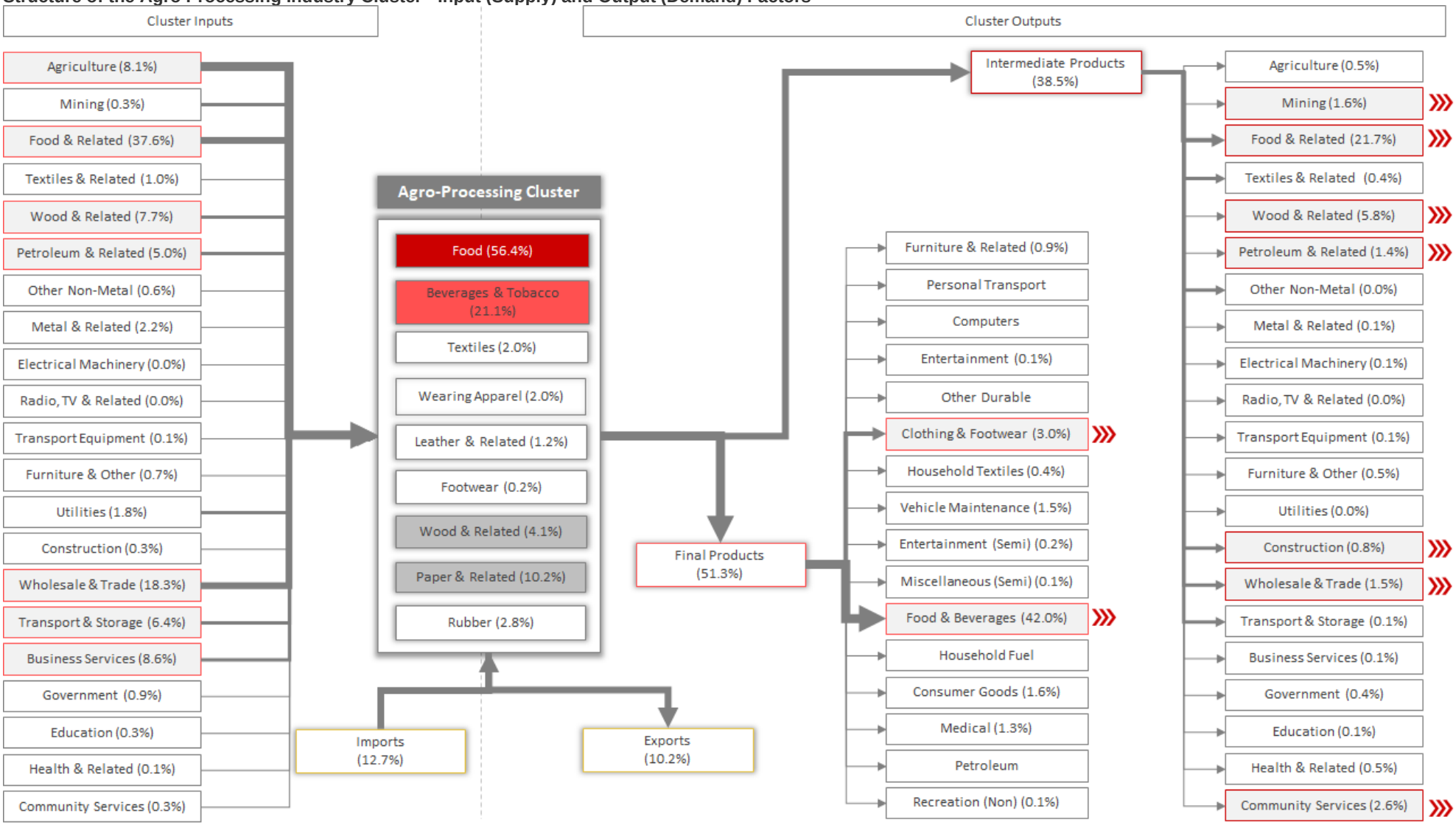
Source: DEMACON ex 2024

Output Table of the Agro Processing Industry – Output Analysis

Consumer Sector / Goods	Primary Output-Sub-Cluster		% Distribution of Total Output Acquired per Consumer Sector / Good	Link Classification	Local vs National Markets		Demand Driver
	Main Output Sub-Cluster	% Output Acquired by Consumers			Gauteng	Remainder of SA	
Agriculture	Food	78.9%	0.5%	Less Pronounced	67.2%	32.8%	
Mining	Wood and wood products	77.2%	1.6%	Moderate Link	7.3%	92.7%	Secondary Driver
Food, beverages and tobacco	**Food**	**90.4%**	**21.7%**	**Strong Link**	**92.9%**	**7.1%**	**Demand Driver**
Textiles, clothing and leather products	Textiles	79.7%	0.4%	Less Pronounced	86.6%	13.4%	
Wood and paper, publishing and printing	**Paper and paper products**	**94.0%**	**5.8%**	**Strong Link**	**87.7%**	**12.3%**	**Demand Driver**
Petroleum products, chemicals, rubber and plastic	Food	52.3%	1.4%	Moderate Link	77.4%	22.6%	Secondary Driver
Other non-metal mineral products	Wood and wood products	64.6%	0.0%	Less Pronounced	21.2%	78.8%	
Metals, metal products, machinery and equipment	Food	46.5%	0.1%	Less Pronounced	50.4%	49.6%	
Electrical machinery and apparatus	Wood and wood products	77.8%	0.1%	Less Pronounced	49.6%	50.4%	
Radio, TV, instruments, watches and clocks	Paper and paper products	85.3%	0.0%	Less Pronounced	68.6%	31.4%	
Transport equipment	Rubber products	26.1%	0.1%	Less Pronounced	6.0%	94.0%	
Furniture, other manufacturing	Wood and wood products	42.8%	0.5%	Less Pronounced	81.9%	18.1%	
Utilities	Food	39.4%	0.0%	Less Pronounced	25.2%	74.8%	
Construction	Wood and wood products	70.4%	0.8%	Moderate Link	94.3%	5.7%	Secondary Driver
Wholesale and retail trade	Food	72.1%	1.5%	Moderate Link	95.5%	4.5%	Secondary Driver
Transport and Storage	Rubber products	45.9%	0.1%	Less Pronounced	5.5%	94.5%	
Business Services	Wood and wood products	57.4%	0.1%	Less Pronounced	3.1%	96.9%	
Government	Food	71.3%	0.4%	Less Pronounced	80.9%	19.1%	
Education (Private)	Paper and paper products	98.9%	0.1%	Less Pronounced	68.3%	31.7%	
Health and social work (Private)	Food	73.4%	0.5%	Less Pronounced	67.4%	32.6%	
Other community, social and personal services	**Food**	**62.7%**	**2.6%**	**Strong Link**	**91.9%**	**8.1%**	**Demand Driver**
Durable goods	Paper and paper products	30.8%	0.9%	Moderate Link	77.2%	22.8%	Secondary Driver
Semi-durable goods	**Wearing apparel**	**43.3%**	**5.2%**	**Strong Link**	**83.8%**	**16.2%**	**Demand Driver**
Non-durable goods	**Food**	**54.2%**	**45.2%**	**Strong Link**	**45.5%**	**54.5%**	**Demand Driver**

Source: DEMACON Calculations, 2024

Structure of the Agro Processing Industry Cluster - Input (Supply) and Output (Demand) Factors



Primary Market Area Demographic Analysis

To gain insight into the socio-economic character of potential market participants to the proposed development, a market area is delineated. A market area assists with determining the main socio-economic market characteristics affecting the proposed development. The primary market area for the project is based on a polygon (±30-minute drive time isochrone).

Demographic Size and Composition

Population Size

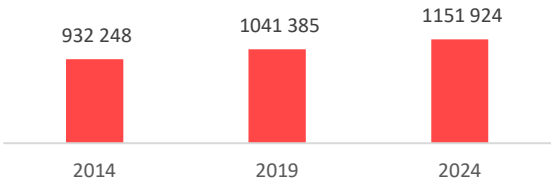
1 150 135
PEOPLE IN THE
PRIMARY
TRADE AREA

Population
Average Annual
Growth Rate
2.20%

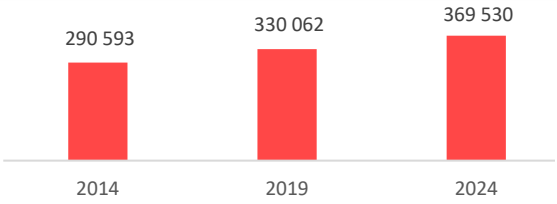
368 875
HOUSEHOLDS

Household
Average Annual
Growth Rate
2.52%

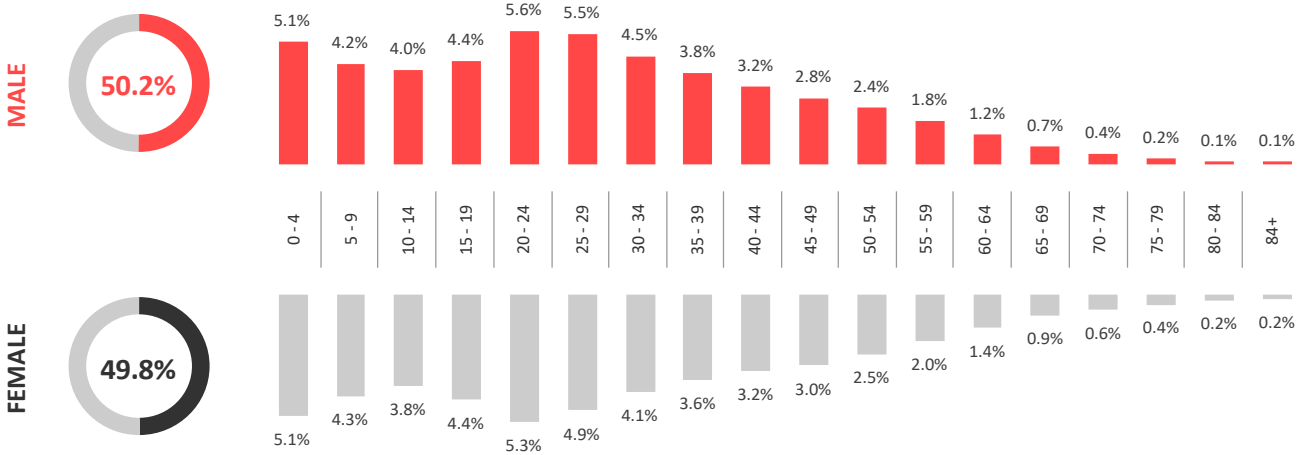
Population Growth



Household Growth



Age and Gender Profile



Population Group

Black African	84.1%
Coloured	3.1%
Indian / Asian	2.6%
White	10.2%

Migration Profile

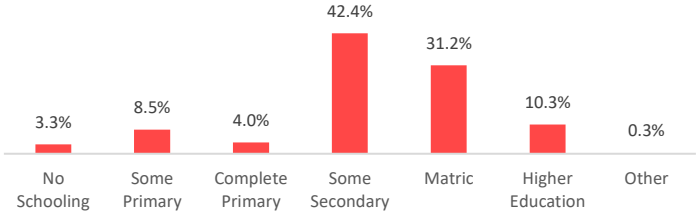
Data indicates that 36.4% of people migrated to the receiving environment since 2011

Education Profile

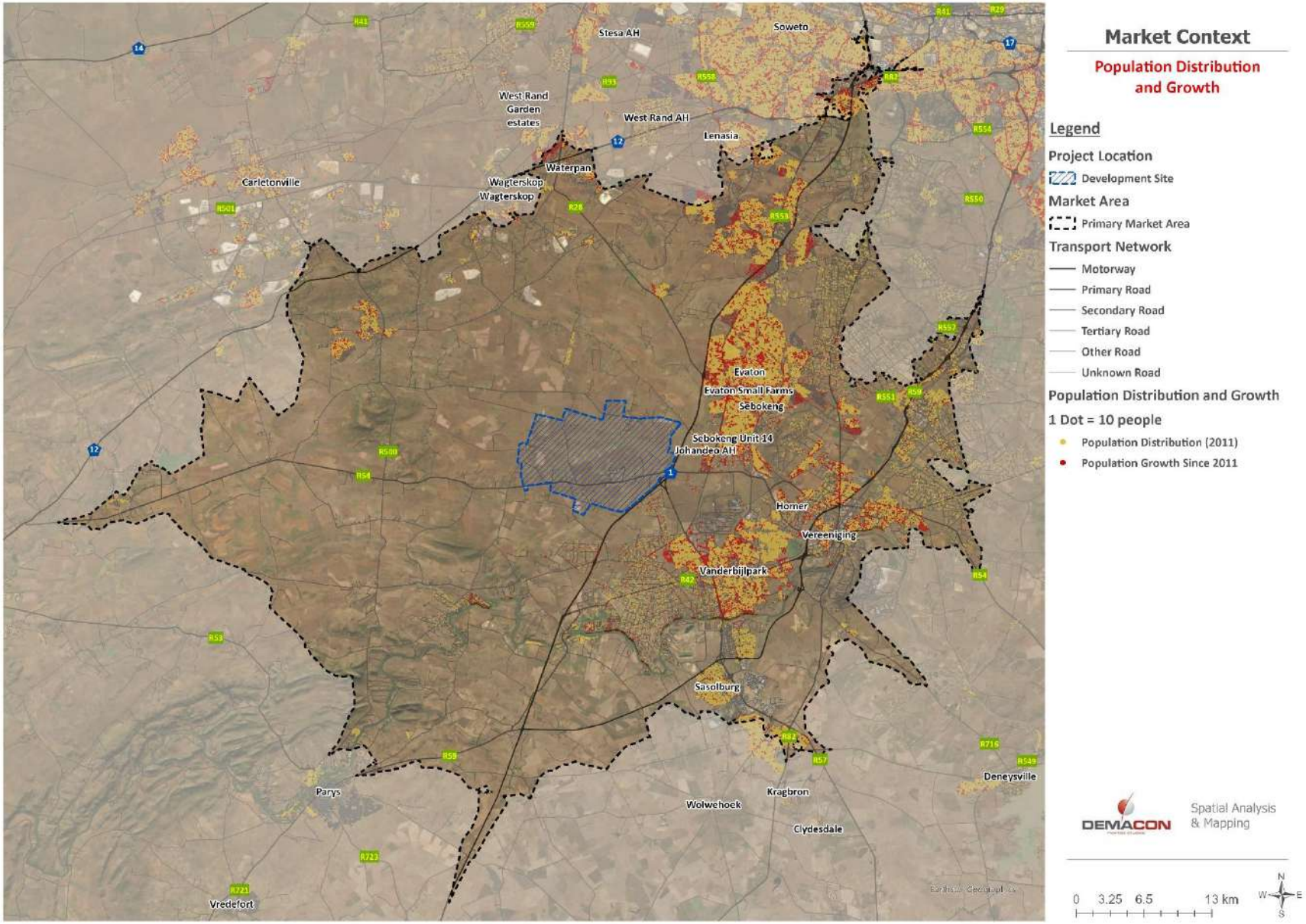
Educational Institution Attendance (Persons 20+ Years)

43.0%	20.0%	17.4%
attend an UNIVERSITY	attend an FET COLLEGE	attend a ORDINARY SCHOOL

Highest Level of Education Obtained – Working Age Population (15 to 64)



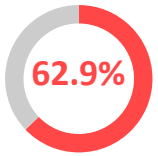
Population Distribution and Growth



Labour Force Profile

Economically Active Segment

ECONOMICALLY
ACTIVE
Population

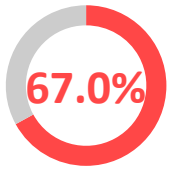


37.1% Not Economically Active

Economically active population refers to a person of working age 15 to 65 who are either employed or unemployed.

Not economically active population refers to a person of working age 15 to 65 who are unable to work or persons engaged in educational activities or are homemakers.

Employment Profile



Employed
Economically
Active

33.0% Unemployed Economically Active

Employed and unemployed persons are considered to be economically active and thus is a segment of the economically active percentage.

Occupation Profile

Skilled Occupations
19.8%

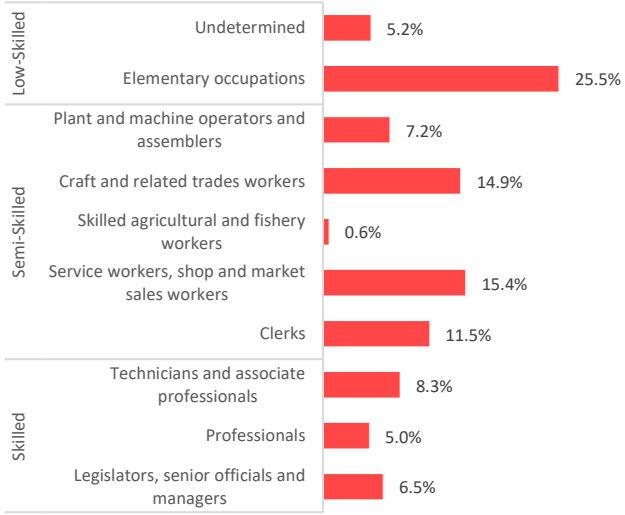
Semi-Skilled Occupations
49.6%

Low-Skilled Occupations
25.5%

ELEMENTARY
ARE MOST POPULAR
25.5%

SERVICE WORKERS, SHOP AND MARKET SALES WORKERS
ARE THE SECOND MOST POPULAR
15.4%

TECHNICIANS AND ASSOCIATE PROFESSIONALS
ARE THE THIRD MOST POPULAR
14.9%



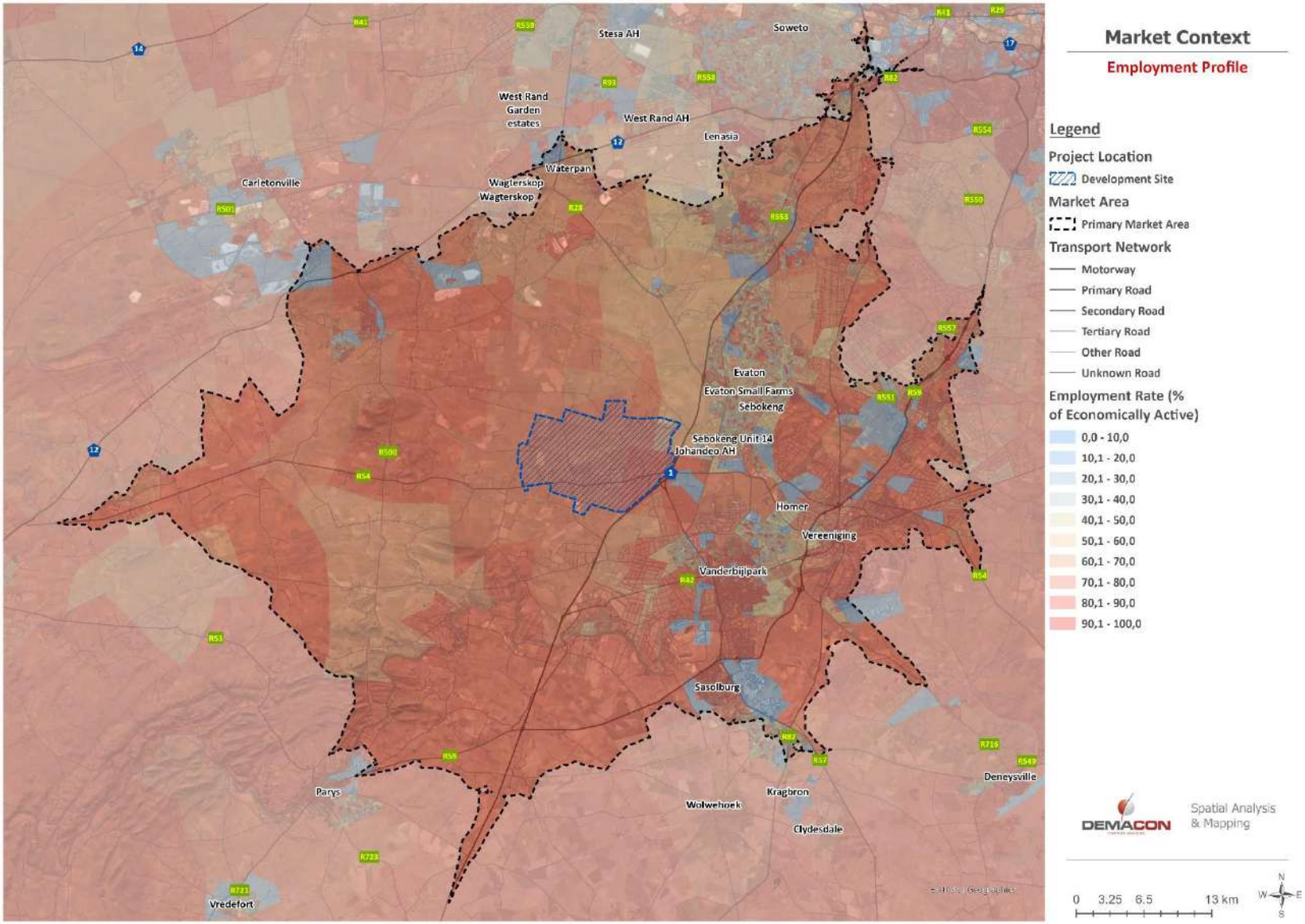
Employment per Industry

6.2%
Employed in the
Primary Sector

24.4%
Employed in the
Secondary Sector

57.2%
Employed in the
Tertiary Sector

Employment Rate Distribution



Source: DEMACON ex StatsSA, 2024

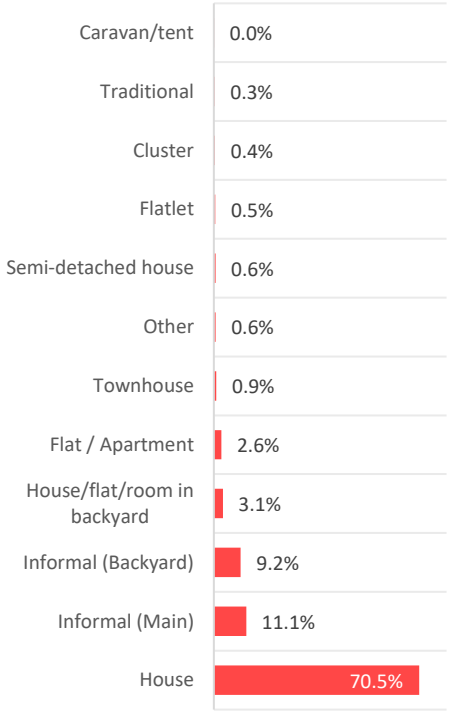
HOUSEHOLD PROFILE

DWELLING TYPOLOGY

Majority of Households Reside in a **Formal Dwelling** **79.2%**

20.5% of households reside in an **informal dwelling**

0.3% of households reside in a **traditional dwelling**



TENURE STATUS

36.6% of households **own** and have **paid** for the property where they reside

12.9% of households **own** but have **not finished paying** for the property where they reside

27.5% of households **rent** the property where they reside

23.0% of households **occupy** the property where they reside **rent free**

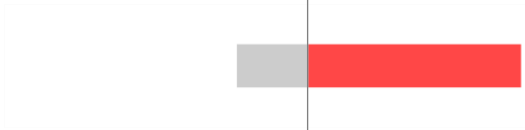
HOUSEHOLD INCOME PROFILE

Average annual household income for all SEM Groups (2024)

R103 938

Average annual household income for SEM Groups 2+ (2024)

R309 465



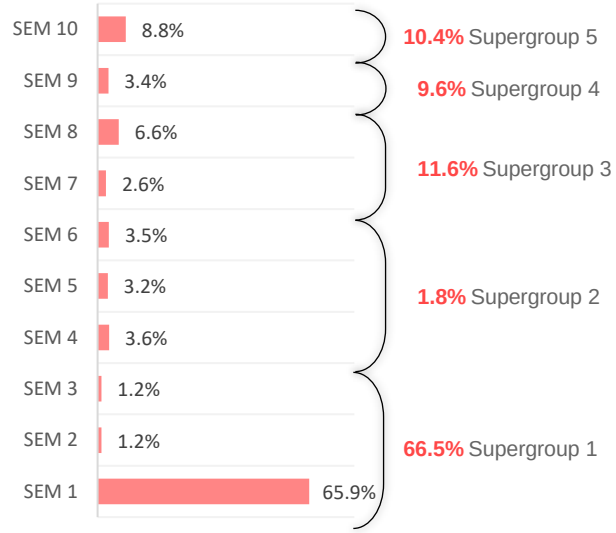
Average monthly household income for all SEM Groups (2024)

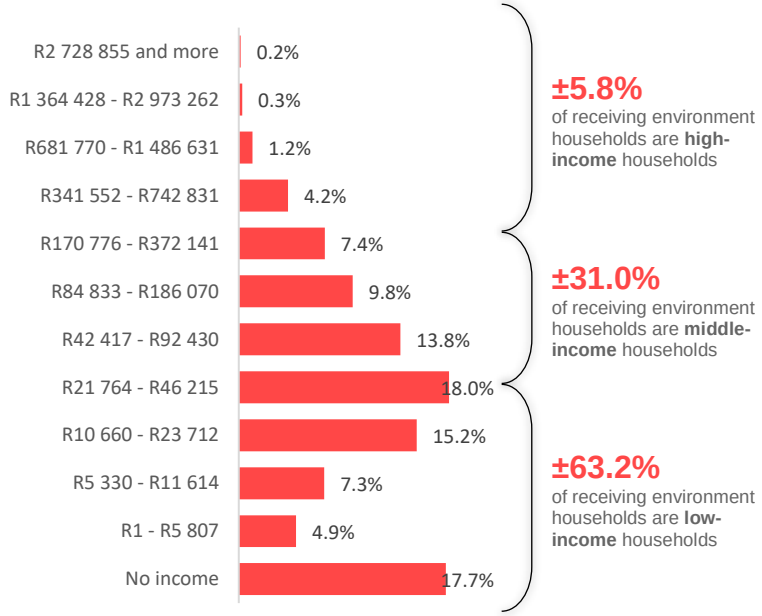
R8 661

Average monthly household income for SEM Groups 2+ (2024)

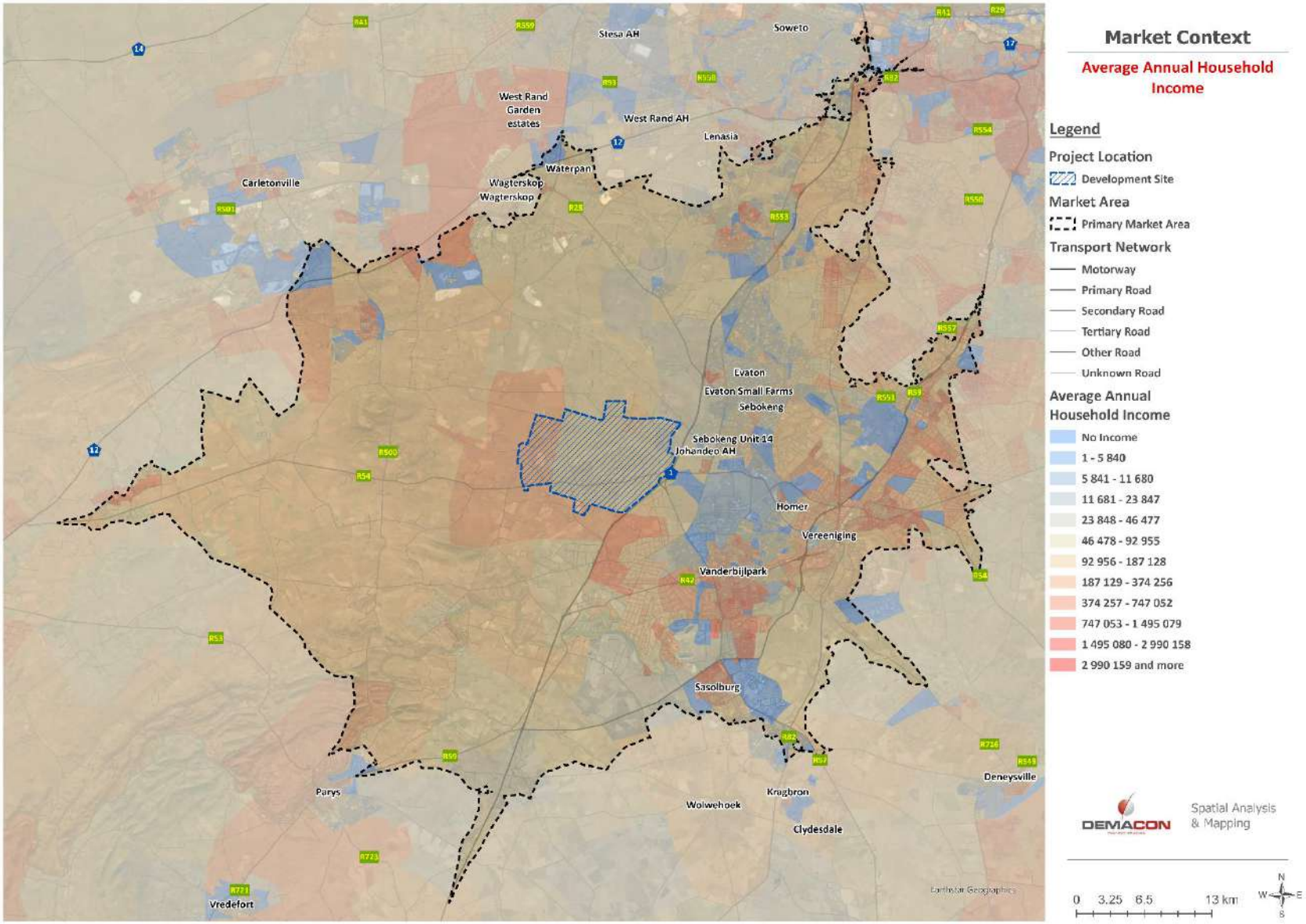
R25 789

SOCIO-ECONOMIC MONITOR



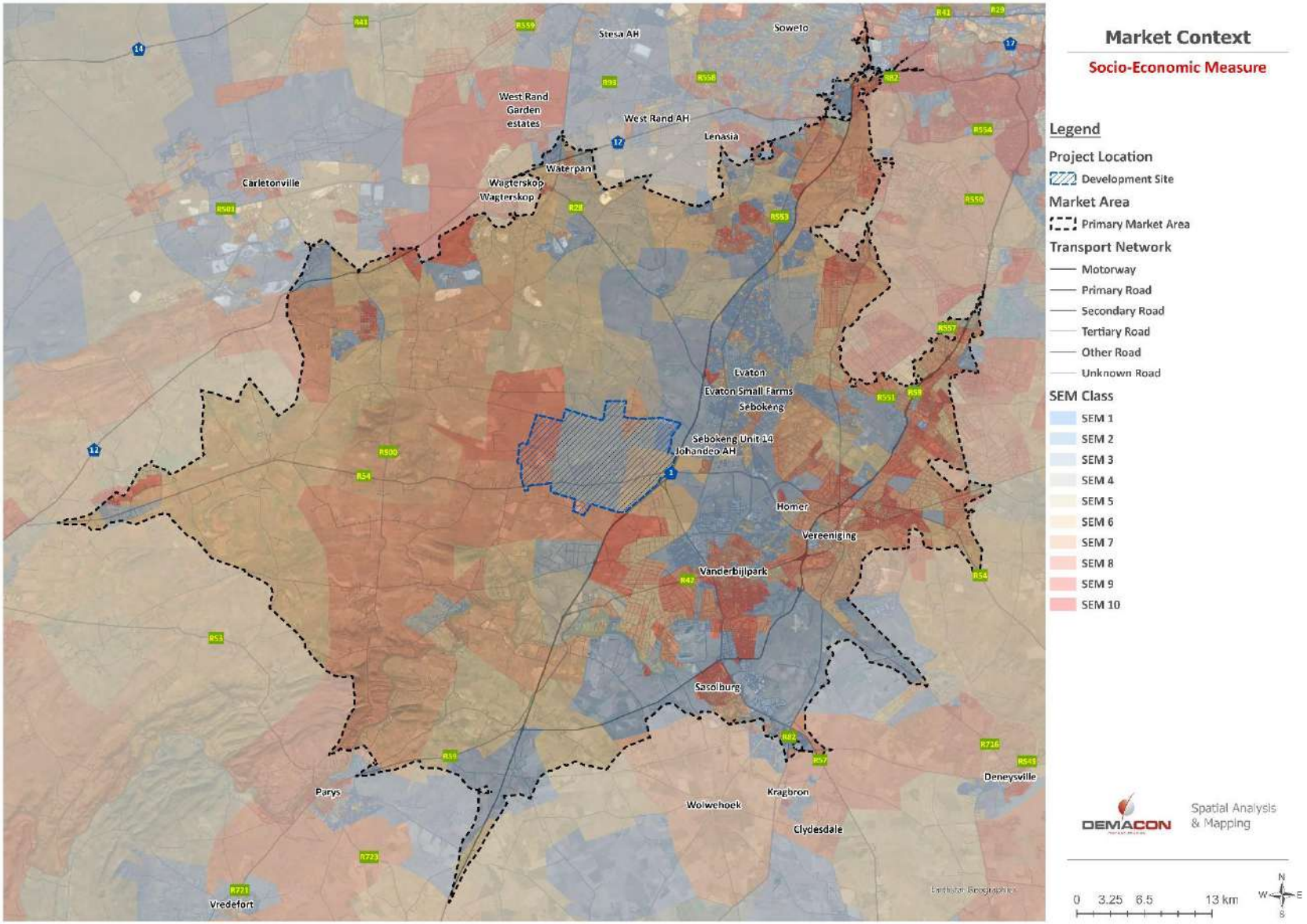


Average Annual Household Income



Source: DEMACON ex StatsSA, 2024

Socio-Economic Measure (SEM)



Source: DEMACON ex StatsSA, 2024

60 Minute Drive Time Demographic Analysis

The larger market area (based on an approximated 60 minute drive time isochrone) was analysed based on the regional impact of potential Aerotropolis.

Population Size

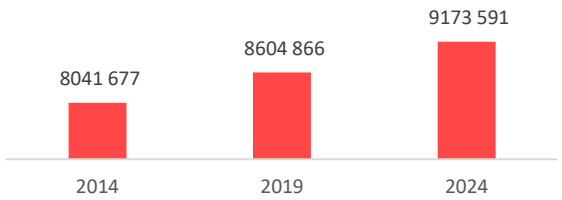
9 173 591
PEOPLE IN THE
PRIMARY
TRADE AREA

Population
Average Annual
Growth Rate
1.36%

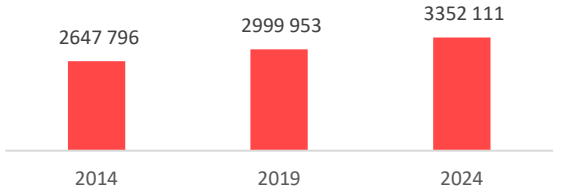
3 352 111
HOUSEHOLDS

Household
Average Annual
Growth Rate
2.48%

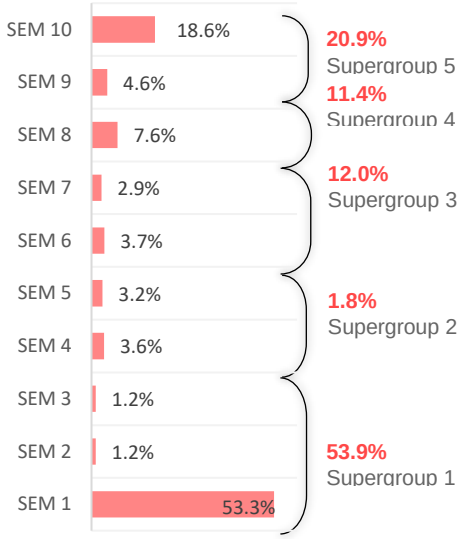
Population Growth



Household Growth



Socio-Economic Monitor



Population Group

Black African	72.5%
Coloured	5.0%
Indian / Asian	3.6%
White	18.9%

Migration Profile

Data indicates that 26.7% of people migrated to the receiving environment since 2011

Household Income Profile

Average annual household income for all SEM Groups (2024)

R214 896

Average annual household income for SEM Groups 2+ (2024)

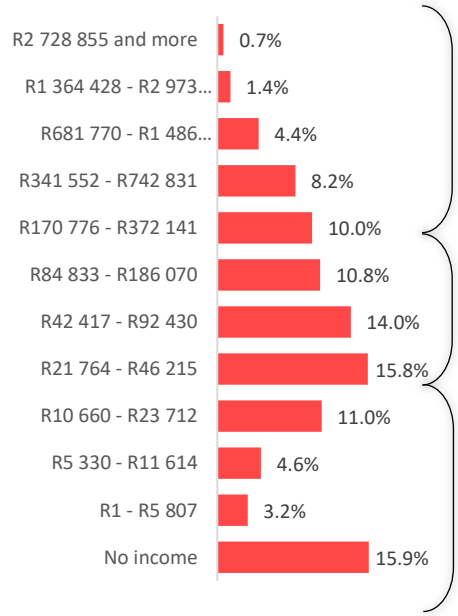
R488 928

Average monthly household income for all SEM Groups (2024)

R17 908

Average monthly household income for SEM Groups 2+ (2024)

R40 744

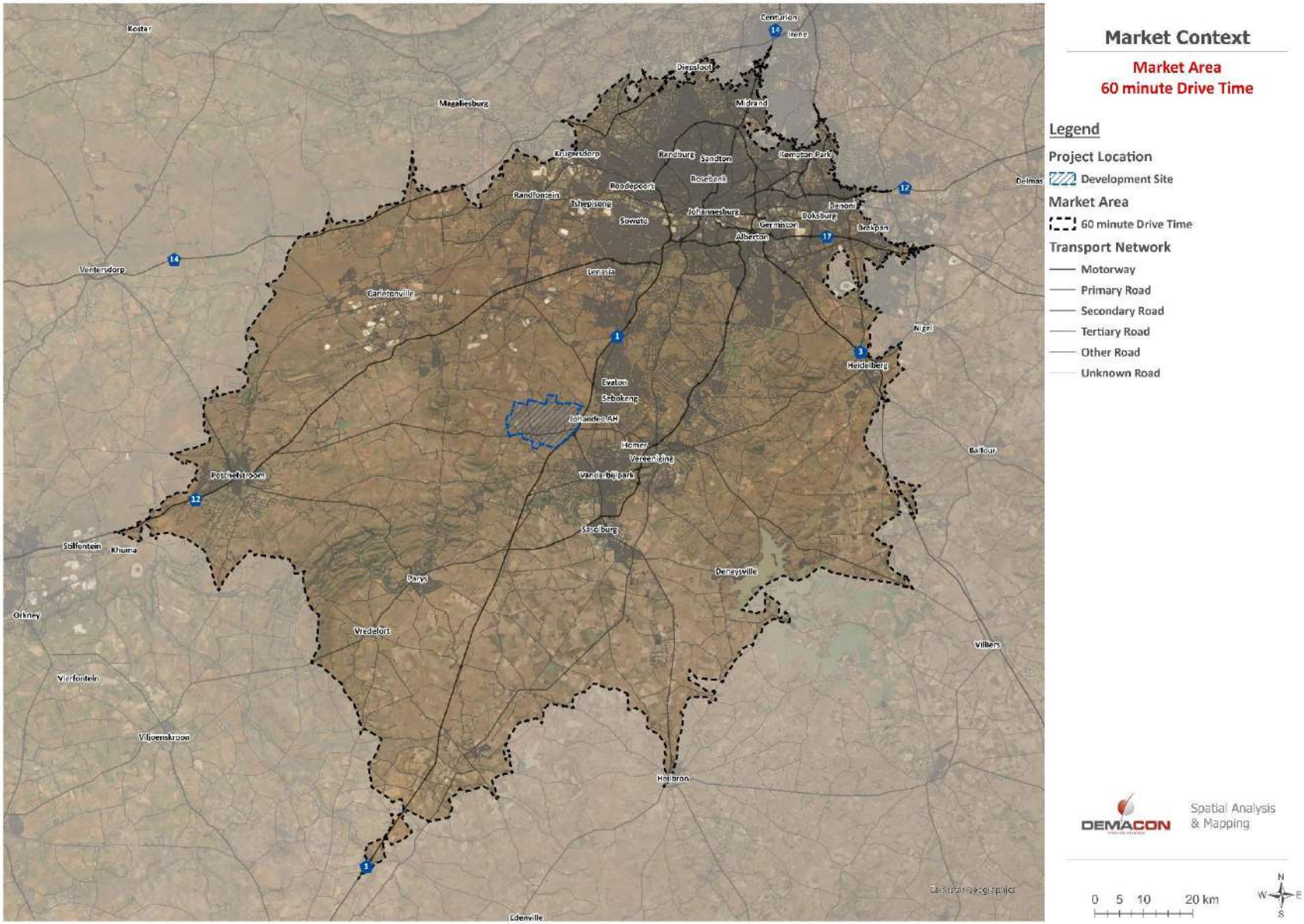


±5.8%
of receiving environment households are **high-income** households

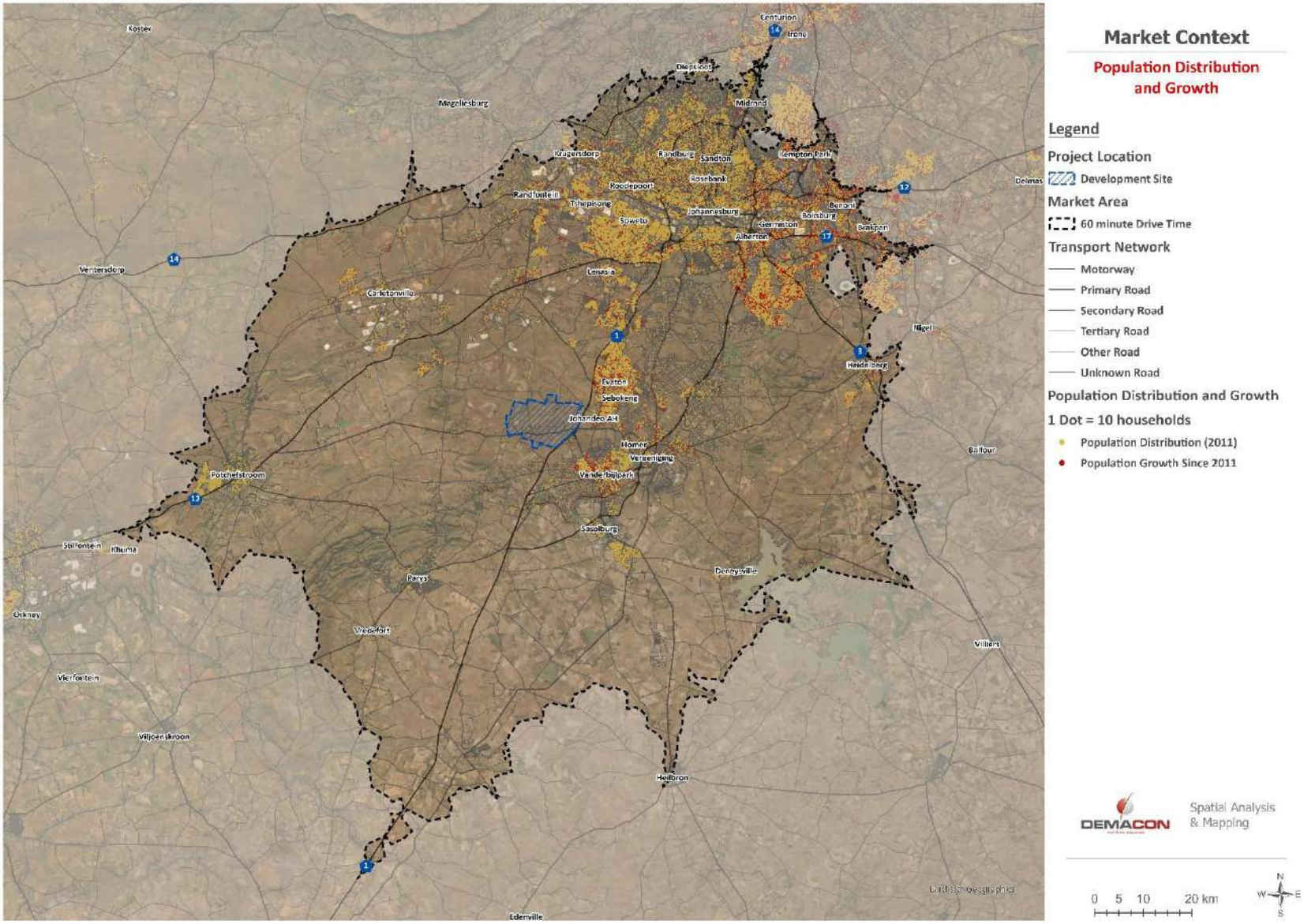
±31.0%
of receiving environment households are **middle-income** households

±63.2%
of receiving environment households are **low-income** households

60 Minute Drive Time Demographic Analysis



60 Minute Drive Time Demographic Analysis – Population Distribution and Growth



Market Context

Population Distribution and Growth

Legend

Project Location
- Development Site

Market Area
- 60 minute Drive Time

Transport Network
- Motorway
- Primary Road
- Secondary Road
- Tertiary Road
- Other Road
- Unknown Road

Population Distribution and Growth

1 Dot = 10 households
- Population Distribution (2011)
- Population Growth Since 2011

DEMACON Spatial Analysis & Mapping

0 5 10 20 km

N W E S

Gauteng City Region Demographic Analysis

The Gauteng City Region was analysed to provide background on the population of the O.R Tambo International Airport, Lanseria International Airport as well as the potential Vaal Aerotropolis.

Population Size

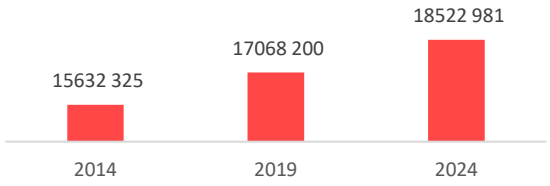
18 522 981
PEOPLE IN THE
PRIMARY
TRADE AREA

Population
Average Annual
Growth Rate
1.76%

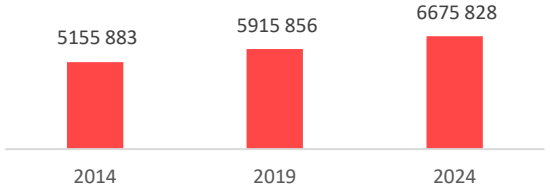
6 675 828
HOUSEHOLDS

Household
Average Annual
Growth Rate
2.74%

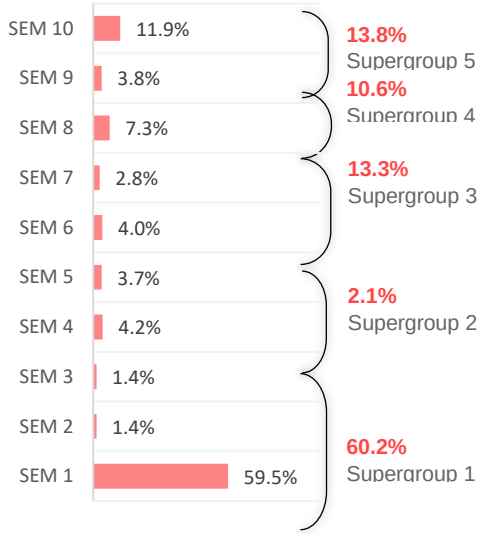
Population Growth



Household Growth



Socio-Economic Monitor



Population Group

Black African	79.6%
Coloured	2.5%
Indian / Asian	1.6%
White	16.4%

Migration Profile

Data indicates that 11.4% of people migrated to the receiving environment since 2011

Household Income Profile

Average annual household income for all SEM Groups (2024)

R140 383

Average annual household income for SEM Groups 2+ (2024)

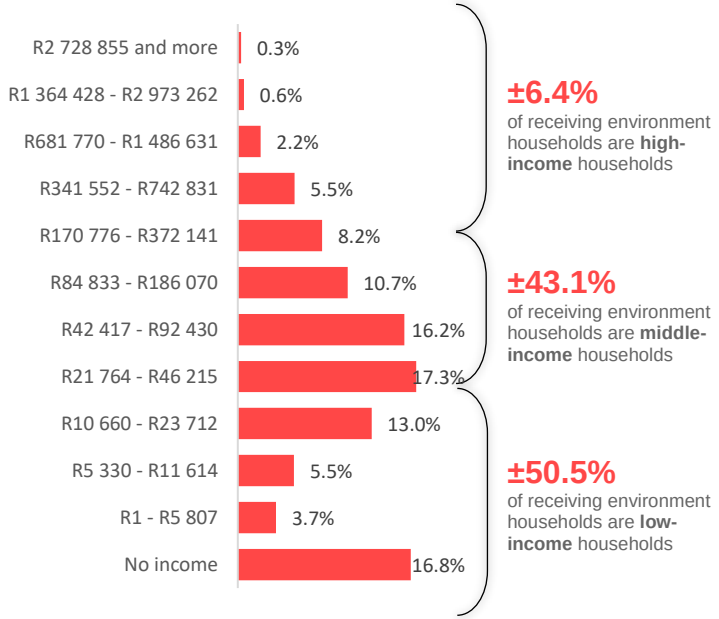
R366 213

Average monthly household income for all SEM Groups (2024)

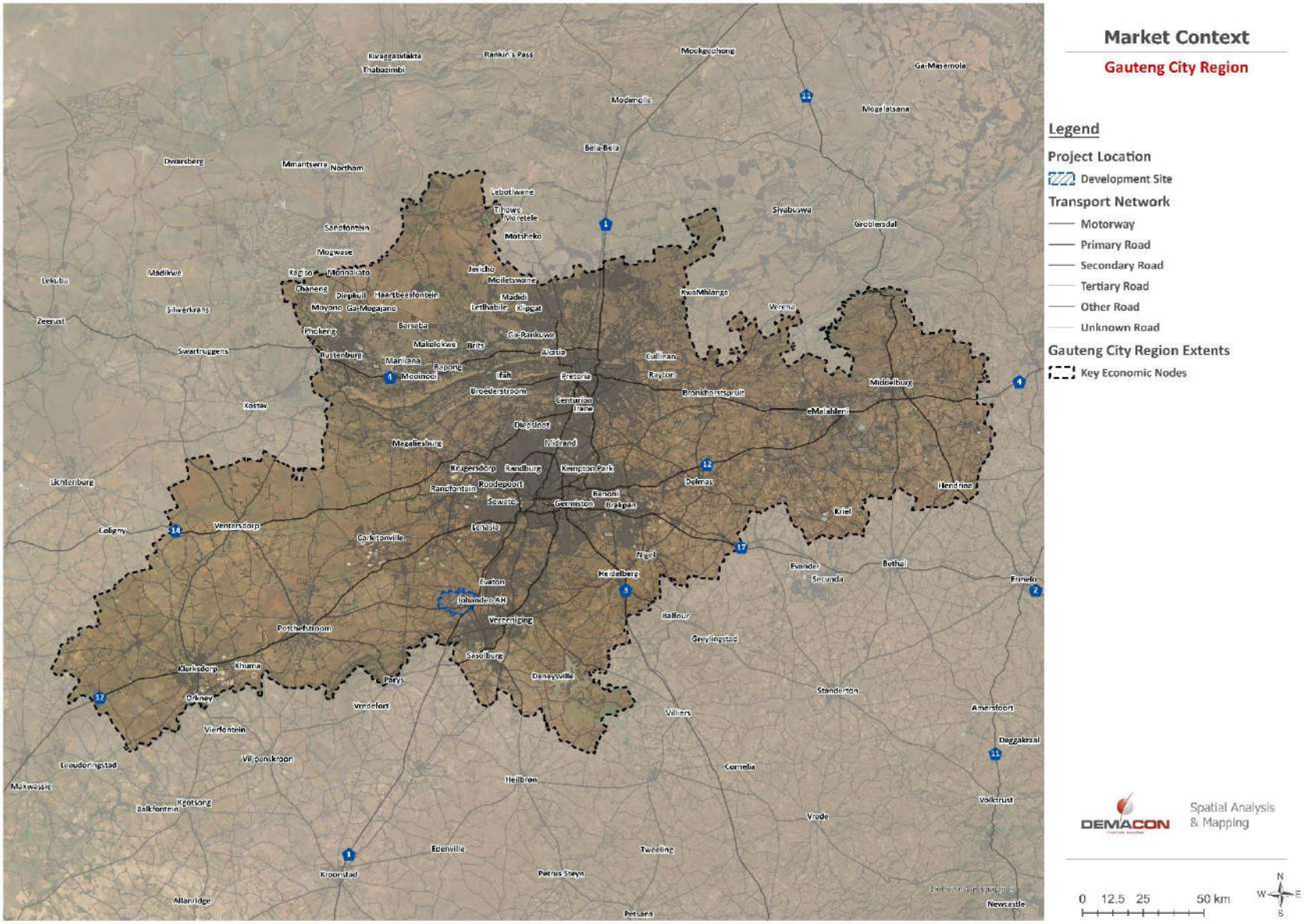
R11 699

Average monthly household income for SEM Groups 2+ (2024)

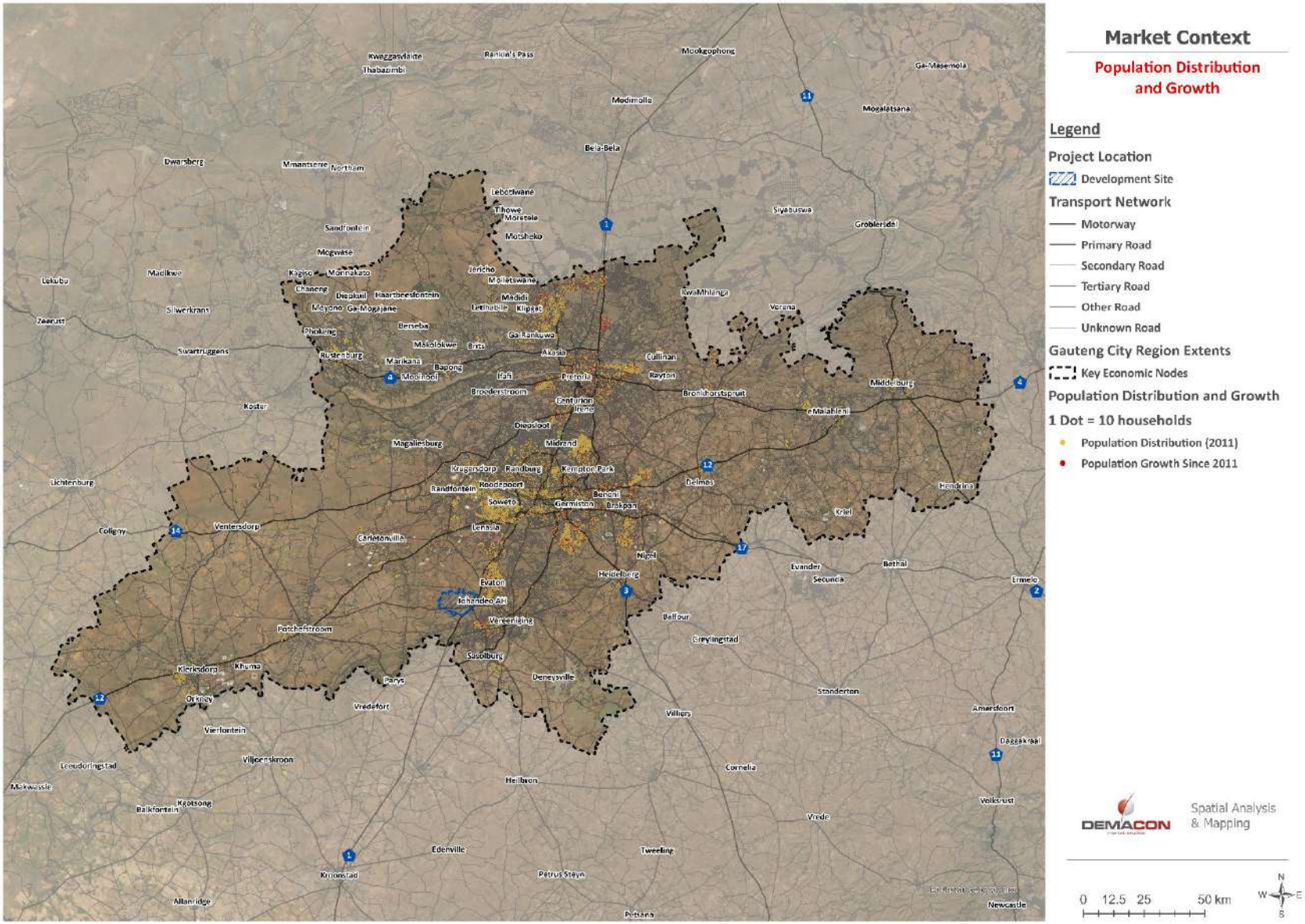
R30 518



Gauteng City Region Demographic Analysis



Gauteng City Region Population Distribution



AIRPORTS AND INDUSTRIAL DEVELOPMENT

AIRPORT LAND USE PROFILE

Traditionally, property in the immediate vicinity of airports accommodated aeronautic activities in direct support of aviation activities of the airport. As economies evolved, land around airport became increasingly vital locations for commercial and industrial activities. As economies and cities grew more complex and dynamic, so has the demand and land use profiles of property near airports.

Land uses typically associated with airports in a modern day context include:

- Industrial including light manufacturing, warehousing and logistics
- Commercial
- Hotels
- Entertainment
- Conferencing and convention centres.

The mentioned mix of activities is driven by the need for international and local businesses to be located in an environment that offers convenience, accessible office space, and necessary complementary facilities and activities, including accommodation and entertainment.

Airports are set to become the new centres of future development in the form of aerotropolis. Aerotropolis is a new city layout in response to the needs of 21st century businesses. Generally, an aerotropolis refers to a fusion of airport and metropolitan where a city has at its centre, an airport development, just like the traditional CBD of cities. This layout encourages the moving of goods and people with minimum inconvenience and optimum efficiency. For businesses that rely on time-sensitive air freighting, operate as distribution centres, need warehousing or that have executives who travel frequently, having commercial premises close to an airport is a necessity.

CHANGING DEMAND

In recent years, industrial space around airports have transitioned from a selective and single function space to incorporate a greater variety of space options. In particular, the demand for larger warehousing space – often referred to as maxi-units – has emerged as a new driving force for industrial space demand around airports. This demand for large warehousing space is driven primarily by the needs of logistics companies, in turn supported by downstream retail and trade activities.

The South African economy has transformed in such a way that the moving of raw material is no longer the only driving force behind major logistic activities. There has been a greater demand for the distribution of manufactured goods (intermediate and final goods) which results in the increased demand for warehousing and logistics space.

In addition, imports have come to play a greater role in the South African economy, accounting for 30% of GDP from 2008 to 2017, from 24% in 1996 to 1997. This has contributed to a growing demand for logistics and warehousing which continues to expand.

The growth of imports to the country ha demand for warehousing space is underpinned by the transpiration of perishables (food and beverages, specialised agricultural produce, flowers etc) that requires warehousing space in close proximity to airports and major transport routes. In addition, the popularity of online retailing also contributes significantly to the increased demand for warehousing space in strategic locations.

WAREHOUSING AND DISTRIBUTION SPACE

Key design considerations for warehousing and distribution space include:

- Ease of access to major road networks and airports
- Exposure / high frontage associated with major transportation routes
- Large warehouse space (maxi-units) – especially for distribution and logistics use
- Modern space and finishing
- Energy efficient
    - Reduce water wastage
    - Optimise the use of natural light
    - Energy efficient lighting (Solar and LED installations)
- Hyperflat, hyper hard floors
- Internet connectivity – preferably fibre
- High ceilings to enable better cubic metre usage
- Covered loading areas
- Sprinkler systems
- Good security
- Larger yards with manoeuvring space for interlink
- Highway frontage allowing for outdoor marketing

- Small office component as part of the warehouse – typically a warehouse will accommodate an office component of 10% to 20% of total space
- High tech cold-storage facilities including frozen and super frozen storage offering long term and short term storage.

Appeal Of The Development Site For Industrial/Warehousing Development

The demands associated with the logistics sector has resulted in a high demand for well-located warehousing space with key influencing factors including the following:

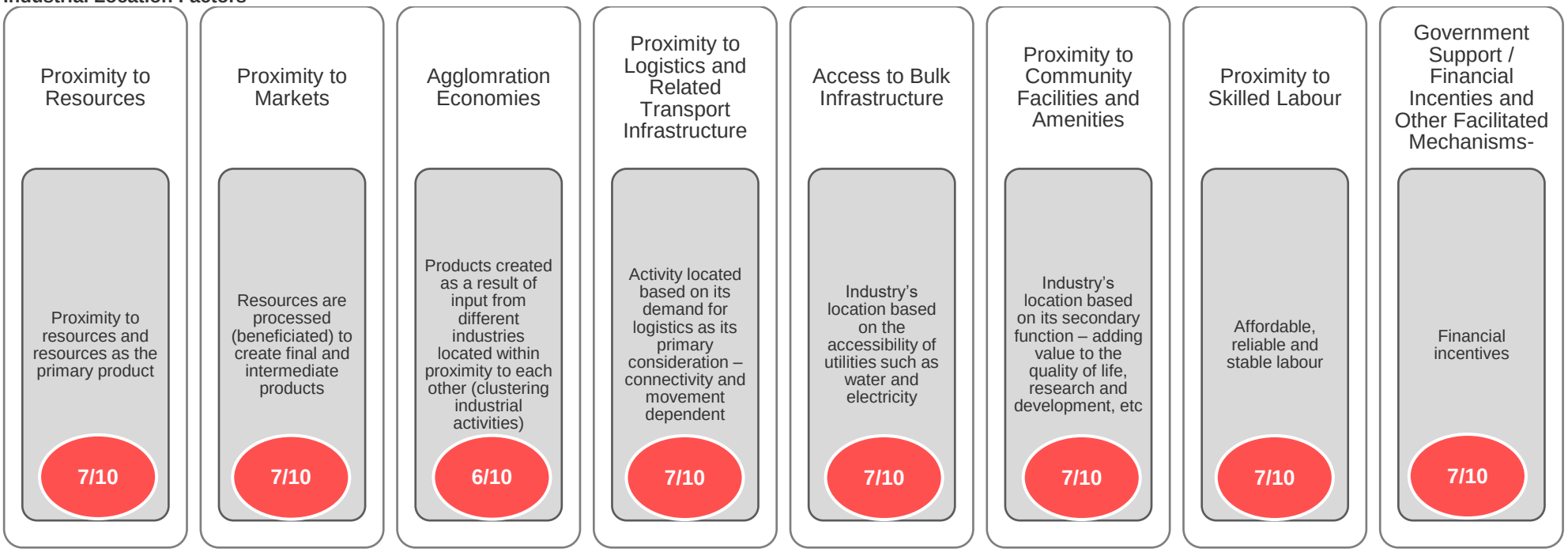
- Proximity to major consumption centres
- Access to global and local trade
- Changing demographics and increasing levels of value-added services enhanced by the importance of proximity to all spheres of the labour market – skilled and unskilled.
- Transport infrastructure
- Total cost to value as investors and tenants is increasingly considering total supply chain costs.

Industrial Location Factors

Industrial location factors consider the location of industrial activity based on several factors that allow industrial activity to exist, operate and sustain itself. The industrial location factors are important in the sense that the proposed development will hinge on manufacturing. The environment enabling such a developmental activity should be conducive to industrial related manufacturing or logistics.

The following indicates industrial location factors were considered.

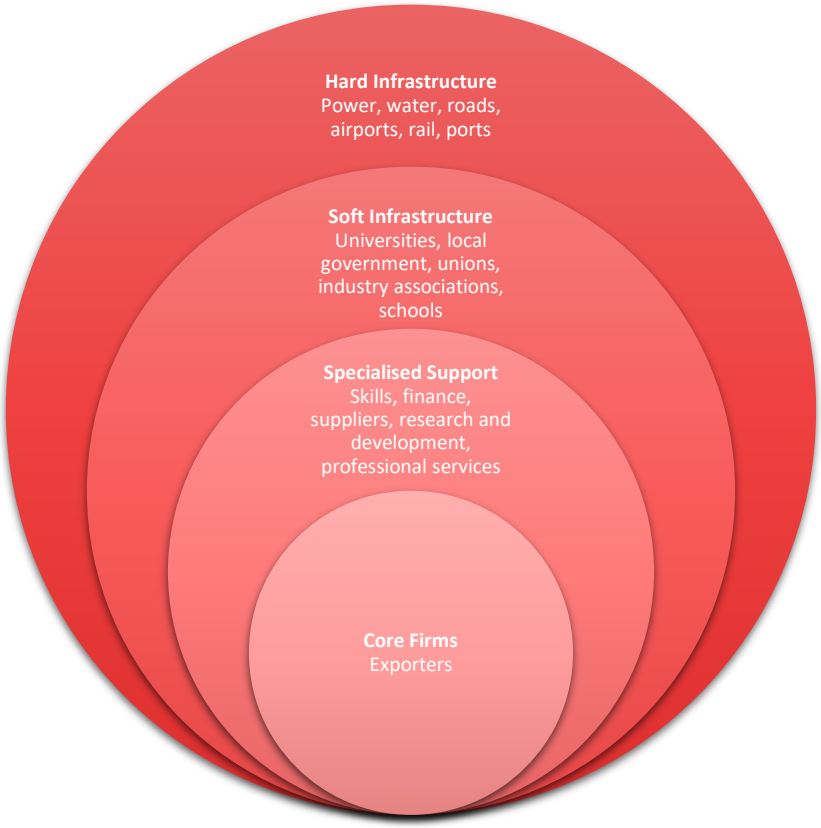
Industrial Location Factors



Components Of A Successful Cluster

Components of a successful cluster focus on the availability of the key elements that allow clusters to be successful, sustainable and able to drive economic growth. The components of a successful cluster are important because the availability and access to clusters provide forward and backward linkages to suppliers of targeted industries and consumers of target industry products. Clusters also speak to agglomerating economies therefore the presence of industry clusters within a local or regional economy indicate that economic functions are agglomerating.

The following components are required for a successful cluster.

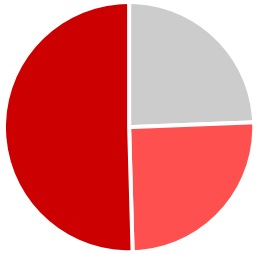


Components of a Successful Cluster

Core Firms	Specialised Support	Soft Infrastructure	Hard Infrastructure
• Businesses of an industry that drive a cluster development and typically source inputs and other elements for the development of products and services sold or exported. These core firms are typically associated with an industry or economic sector	• Businesses that directly or indirectly support core firms, i.e. these businesses provide inputs and intermediate products and services throughout the value chain of a core firm.	• Businesses that provide services and support functions to core firms and specialised support businesses, these typically include skills developers such as educational institutions and training academies, R&D development firms, financial services, insurance services, etc.	• Physical infrastructure such as bulk services (electricity, water, sanitation, etc.) and transportation and related infrastructure (roads, railways, airports, etc.)

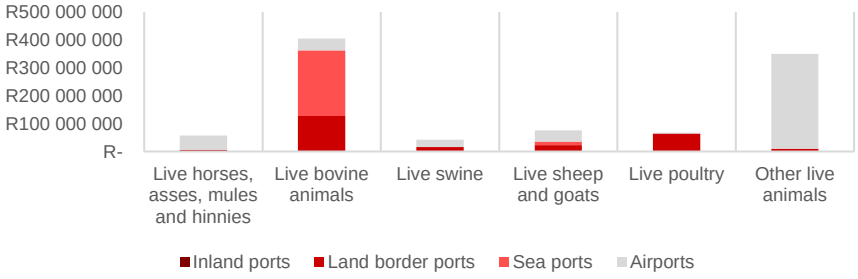
SOUTH AFRICAN EXPORTS OF LIVE ANIMALS

Type of port used for export of live animals (based on Rand value)

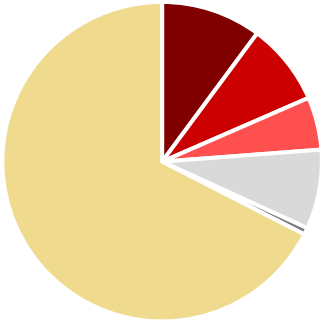


Airports	50.4%
Land border posts	24.4%
Sea ports	25.2%

Means by which live animals are exported



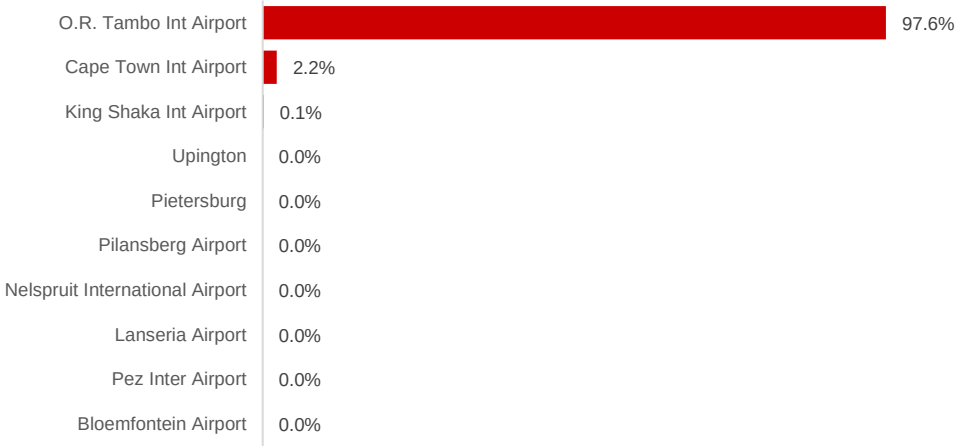
Type of live animals exported through airports



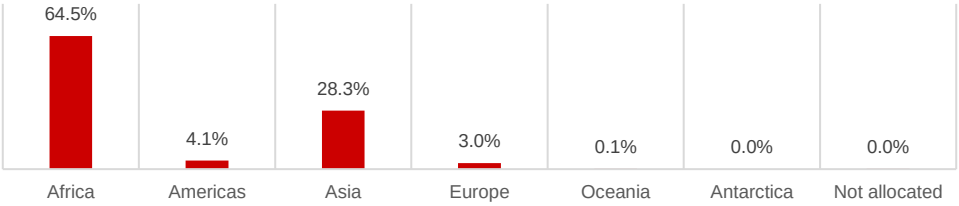
Live horses, asses, mules and hinnies	10.1%
Live bovine animals	8.3%
Live swine	5.3%
Live sheep and goats	8.0%
Live poultry	0.7%
Other live animals	67.5%

Source: DEMACON ex StatsSA, 2024

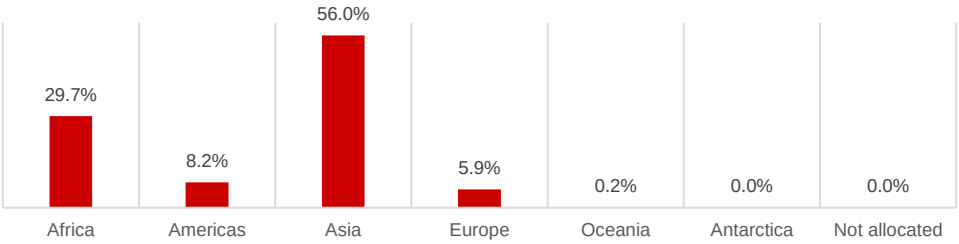
Airports live animals are exported by



Export markets via all ports



Export markets via airports



LEADERS IN ECONOMIC & REAL ESTATE MARKET INSIGHT
DEMACON

The following tables provide an overview of the main countries live animals are exported to.

Top 20 Live Animals Export Countries (All ports)

	Country	Rand Value	Contribution
1	Mauritius	R284 714 552	28.6%
2	United Arab Emirates	R125 703 532	12.6%
3	Zimbabwe	R90 137 668	9.0%
4	Mozambique	R46 632 769	4.7%
5	Lesotho	R43 411 077	4.4%
6	United States	R37 826 750	3.8%
7	Kuwait	R34 986 346	3.5%
8	Angola	R25 965 457	2.6%
9	Lebanon	R25 902 360	2.6%
10	Uganda	R25 318 427	2.5%
11	United Republic of Tanzania	R22 059 051	2.2%
12	Kenya	R20 501 514	2.1%
13	Iraq	R18 937 983	1.9%
14	Zambia	R16 970 672	1.7%
15	Ghana	R15 530 596	1.6%
16	Nigeria	R14 131 843	1.4%
17	Democratic Republic of the Congo	R13 959 259	1.4%
18	Malaysia	R13 563 058	1.4%
19	Saudi Arabia	R13 284 177	1.3%
20	Spain	R11 837 925	1.2%

Top 20 Live Animals Export Countries (Airports)

	Country	Rand Value	Contribution
1	United Arab Emirates	R125 703 532	25.0%
2	United States	R37 826 750	7.5%
3	Mauritius	R35 798 408	7.1%
4	Kuwait	R34 786 574	6.9%
5	Lebanon	R25 902 360	5.2%
6	Angola	R25 763 349	5.1%
7	Uganda	R25 318 427	5.0%
8	Kenya	R20 286 514	4.0%
9	Iraq	R18 937 983	3.8%
10	Ghana	R15 530 596	3.1%
11	Nigeria	R14 131 843	2.8%
12	Malaysia	R13 563 058	2.7%
13	Saudi Arabia	R13 284 177	2.6%
14	Spain	R11 837 925	2.4%
15	India	R10 512 510	2.1%
16	Thailand	R9 767 635	1.9%
17	Netherlands	R9 420 651	1.9%
18	Qatar	R6 441 106	1.3%
19	Maldives	R5 674 997	1.1%
20	Japan	R4 501 248	0.9%

Between 2013 and 2023, South Africa officially exported more than 16 million live wild creatures, which included:

- 3 366 796 birds, mostly parrots;
- 23 803 mammals, including a huge number of marmosets and many lions, lechwes, tamarins, servals, cheetahs, tigers and grey wolves;
- 12 951 599 fish, dominated by sturgeon and including 252 000 seahorses; and
- 1 420 reptiles, mainly crocodiles and -tortoises.

The following table provides detail on the type of live animals exported via airports over the past year (2023:Q4 – 2024:Q3).

Type of Live Animals Exported via Airports

Type of Live Animal	Rand value	Contribution
Live horses, asses, mules and hinnies	**R50 995 730**	**10.1%**
Pure-bred breeding animals	R0	0.0%
Pure-bred breeding animals	R0	0.0%
Other (-2001)	R0	0.0%
Asses, mules and hinnies	R0	0.0%
Pure-bred breeding animals	R40 813 220	8.1%
Other	R10 181 317	2.0%
Asses	R0	0.0%
Other	R1 193	0.0%
Live bovine animals	**R41 833 693**	**8.3%**
Pure-bred breeding animals	R0	0.0%
Pure-bred breeding animals	R1 427 700	0.3%
Other	R29 005 639	5.8%
Pure-bred breeding animals	R0	0.0%
Other	R1 200	0.0%
Other	R11 399 154	2.3%
Live swine	**R26 842 697**	**5.3%**
Pure-bred breeding animals	R3 238 122	0.6%
Weighing less than 50 kg	R2 722 295	0.5%
Weighing 50 kg or more	R20 882 280	4.2%
Live sheep and goats	**R40 418 323**	**8.0%**
Sheep	R19 811 791	3.9%
Goats	R20 606 532	4.1%
Live poultry, that is to say, fowls of the species Gallus domesticus, ducks, geese, turkeys and guinea fowls	**R3 477 552**	**0.7%**
Fowls of the species Gallus domesticus	R3 312 220	0.7%
Turkeys (1996-)	R0	0.0%
Ducks (2012-)	R0	0.0%
Geese	R0	0.0%
Guinea fowls	R0	0.0%
Other	R0	0.0%
Fowls of the species Gallus domesticus	R0	0.0%
Fowls of the species Gallus domesticus, weighing not more than 2 000 g	R0	0.0%
Fowls of the species Gallus domesticus, weighing more than 2 000 g	R0	0.0%
Fowls of the species Gallus domesticus	R0	0.0%
Other	R165 332	0.0%
Other live animals	**R339 292 982**	**67.5%**
Other live animals	R0	0.0%
Primates	R8 376 760	1.7%
Whales, dolphins and porpoises (mammals of the order Cetacea); manatees and dugongs (mammals of the order Sirenia); seals, sea lions and walruses (mammals of the suborder Pinnipedia)	R0	0.0%
Camels and other camelids (Camelidae)	R0	0.0%
Rabbits and hares	R0	0.0%
Other	R105 259 970	20.9%
Reptiles (including snakes and turtles)	R11 851 941	2.4%
Birds of prey	R1 011 757	0.2%
Psittaciformes (including parrots, parakeets, macaws and cockatoos)	R184 728 573	36.7%
Ostriches; emus (Dromaius novaehollandiae)	R2 132 963	0.4%
Other	R8 354 436	1.7%
Bees	R0	0.0%
Other	R8 631 515	1.7%
Other	R8 945 067	1.8%
Total	**R502 860 977**	**100.0%**

VAAL AEROTROPOLIS HIGH LEVEL DEMAND ASSESSMENT

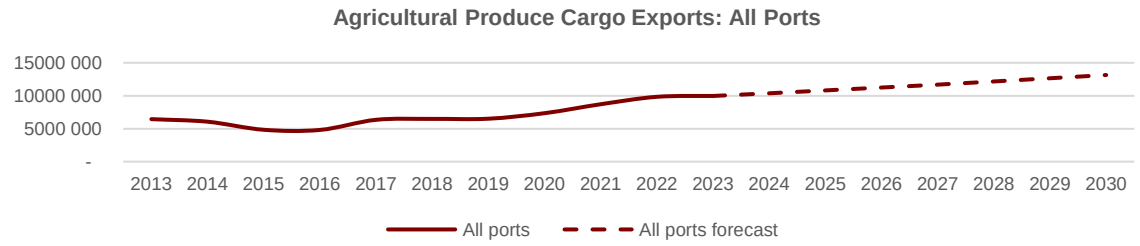
METHOD 1 – SOCIO-ECONOMIC QUANTUMS AND THE ECONOMIC PRODUCTION FUNCTION

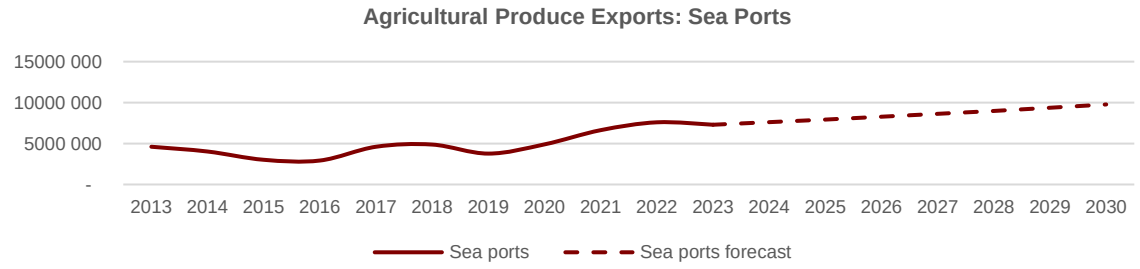
The following table provides a high-level initial demand assessment for an airport in the Vaal Region.

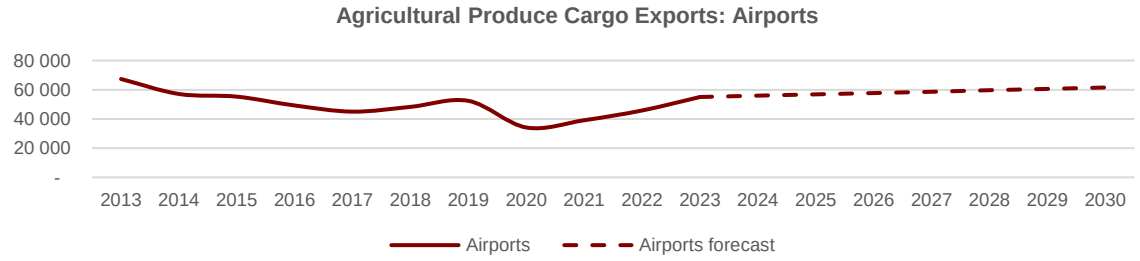
		OR Tambo International Airport	Cape Town International Airport	King Shaka International Airport	Vaal Aerotropolis Trade Area	
					Low Scenario	High Scenario
Socio-Economic Profile (Delineated by a 50km radius)	Population 2024	11 034 194	5 211 503	4 115 006	4 090 852	
	Population growth rate	1.66%	2.17%	1.59%	1.8%	
	Households	4 128 907	1 619 666	1 111 825	1 346 059	
	Household growth rate	2.75%	2.85%	1.24%	2.0%	
	SEM 4-5	30.10%	34.2%	24.20%	19.9%	
	SEM 4-5 population	3 321 292	1 779 955	995 831	814 080	
Passengers	International	7 054 616	2 754 405	274 882	1 252 066	1 407 439
	Regional	707 178	169 961	2 514	109 222	122 776
	Domestic	10 005 667	7 093 292	4 706 511	2 707 473	3 043 451
	Unscheduled	85 108	16 694	3 754	13 106	14 733
	Total	17 852 569	10 034 352	4 994 178	4 082 677	4 589 307
	Ratio Passengers per SEM 4-5	**5.38**	**5.64**	**5.02**		
Cargo	Import (tonne)	3 072 697	14 882	2 995	11 331	3 649
	Export (tonne)	71 342	36 129	2 800	404	11 518
	Total (tonne)	3 144 039	51 011	5 794	11 736	15 167
Economic Analysis (Sub-Regional Economy)	Total Provincial GVA (R' million)	2 088 550	874 038	1 031 171		
	Economic Production Function	1.51	0.06	0.01		

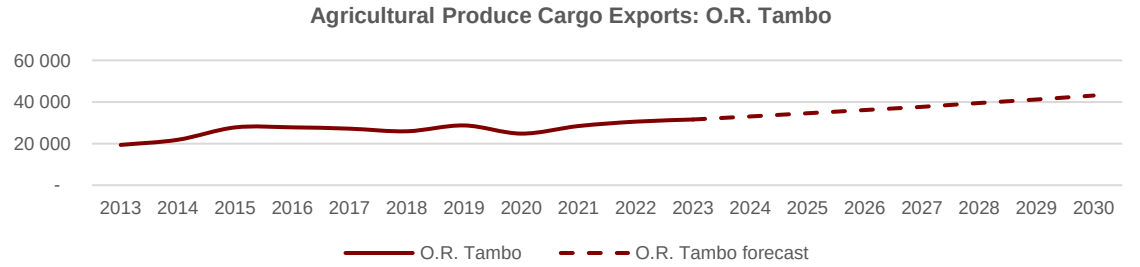
The above is a high-level demand assessment for an airport development at the Vaal Aerotropolis site. Initial findings indicate that the airport could potentially generate demand upwards of **4.5 million annual passengers** and **15 167 ton of cargo, 5+ years after becoming operational.** This would be subject to marketing, management and related considerations, as well as the ability to secure critical contracts. It is worthy to note that Lanseria (with 9.5 million people within a 50km radius) commenced with commercial flights in 2006. Following various restructurings of flights, destinations and service providers, the airport currently accommodates ±2.5 million passengers per annum. From the above, it would appear that the proposed Vaal Airport would have a strong business case for cargo, provided key anchors could be procured.

METHOD 2 – AGRICULTURAL PRODUCE CARGO EXPORT POTENTIAL









Source: DEMACON ex StatsSA, 2025

Agricultural Produce Cargo Export Average Annual Growth Rate (2013 – 2023)

All Ports	4.0%
Sea Ports	4.3%
Airports	-1.8% (17.3% 2020-2023)
O.R. Tambo Int Airport	4.5%

Agricultural produce cargo exports from South Africa increased by 4.0% per annum over the last ten years, indicating high positive growth.

Even though a seemingly negative long term trend can be observed at airports, it is worthy to note that the post-2020 annual growth exceeded 15% (17.3%). This resonates with the international trend in terms of which exponential increase in e-commerce post COVID 19 is being observed.

O.R. Tambo Int Airport experienced a long term growth rate of 4.5% in agricultural produce cargo, outperforming national trends over the corresponding period.

Given the above trends, agricultural produce cargo is set to increase with approximately 454 129 ton per annum. Agricultural produce cargo export from O.R. Tambo is set to increase with approximately 1 654 ton per annum.

The potential VAAL Aerotropolis cargo volume will be a combination of new growth as well as a share of existing exports, resulting in potential exports of between 11 000 and 15 000 ton at 2032 (potential operational date), increasing to between 25 000 and 30 000 ton over the long term.

Vaal Aerotropolis Export Potential

Year	2032	2037	2042
Cargo Export	11 000 – 15 000 ton	15 000 – 20 000 ton	25 000 – 30 000 ton

The Vaal Aerotropolis location is ideally suited to provide enough space for holding areas for various animals, adhering to veterinary and quarantine requirements and creating a more humane option.

AIRPORT PASSENGER TRENDS

Passenger Arrivals

	18/19	23/24	29/30 estimate
O.R. Tambo			
International	4 531 711	3 502 027	3 647 398
Regional	445 388	356 824	365 425
Domestic	5 612 691	4 996 859	5 823 136
Unscheduled	37 240	43 065	39 809
Total	**10 627 030**	**8 898 775**	**9 817 518**
Cape Town International			
International	1 193 628	1 356 966	2 190 993
Regional	101 683	86 524	107 843
Domestic	4 087 310	3 549 727	4 052 577
Unscheduled	3 821	7 199	5 869
Total	**5 386 442**	**5 000 416**	**6 096 844**
King Shaka International			
International	178 965	132 320	206 518
Regional	7 898	1 304	13 025
Domestic	2 794 623	2 352 482	2 916 210
Unscheduled	4 102	5 450	3 550
Total	**2 985 588**	**2 491 556**	**3 129 934**
Grand Total	**18 999 060**	**16 390 747**	**19 044 296**

Source: DEMACON ex StatsSA, 2025

Passenger Departures

	18/19	23/24	29/30 estimate
O.R. Tambo			
International	4 624 806	3 552 589	3 700 059
Regional	446 338	350 354	358 799
Domestic	5 580 820	5 008 808	5 837 061
Unscheduled	34 949	42 043	38 864
Total	**10 686 913**	**8 953 794**	**9 878 217**
Cape Town International			
International	1 212 966	1 397 439	2 319 770
Regional	93 934	83 437	101 682
Domestic	4 122 300	3 543 565	4 065 778
Unscheduled	8 095	9 495	8 408
Total	**5 437 295**	**5 033 936**	**6 195 993**
King Shaka International			
International	188 742	142 562	222 199
Regional	7 775	1 210	11 447
Domestic	2 807 053	2 354 029	2 923 810
Unscheduled	4 003	4 821	3 579
Total	**3 007 573**	**2 502 622**	**3 150 703**
Grand Total	**19 131 781**	**16 490 352**	**19 224 913**

Source: DEMACON ex StatsSA, 2025

Arriving Passenger Growth Rates

	O.R. Tambo		Cape Town		King Shaka	
	Long term	Short term	Long term	Short term	Long term	Short term
International	-1.5%	-2.3%	6.7%	1.2%	1.5%	-2.7%
Regional	-1.3%	-2.0%	1.6%	-1.5%	-5.6%	-15.1%
Domestic	0.5%	-1.1%	0.2%	-1.3%	0.6%	-1.6%
Unscheduled	0.5%	1.3%	1.9%	5.9%	-0.1%	2.6%
Total	**-0.4%**	**-1.6%**	**1.6%**	**-0.7%**	**0.6%**	**-1.6%**

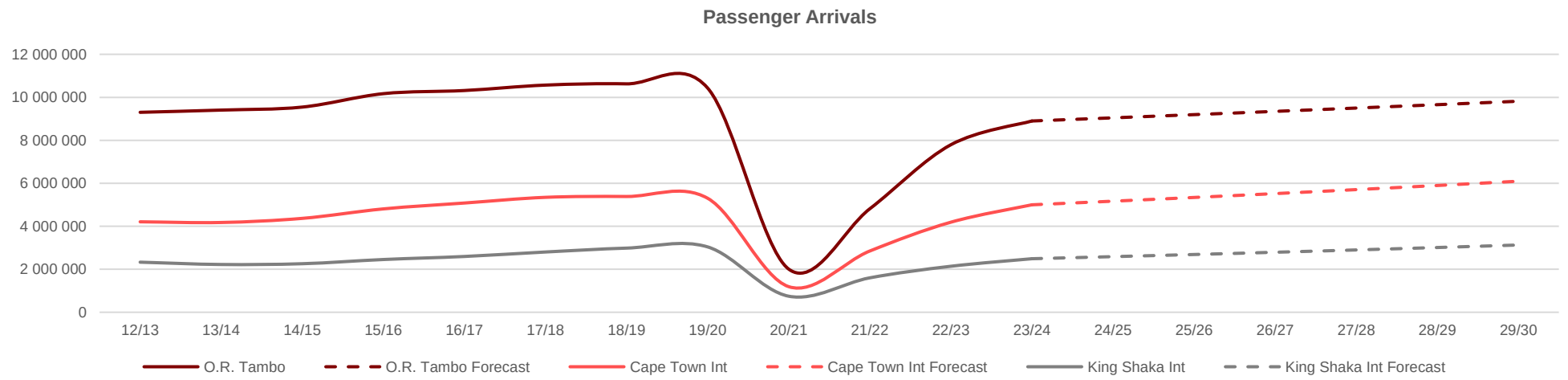
Source: DEMACON ex StatsSA, 2025

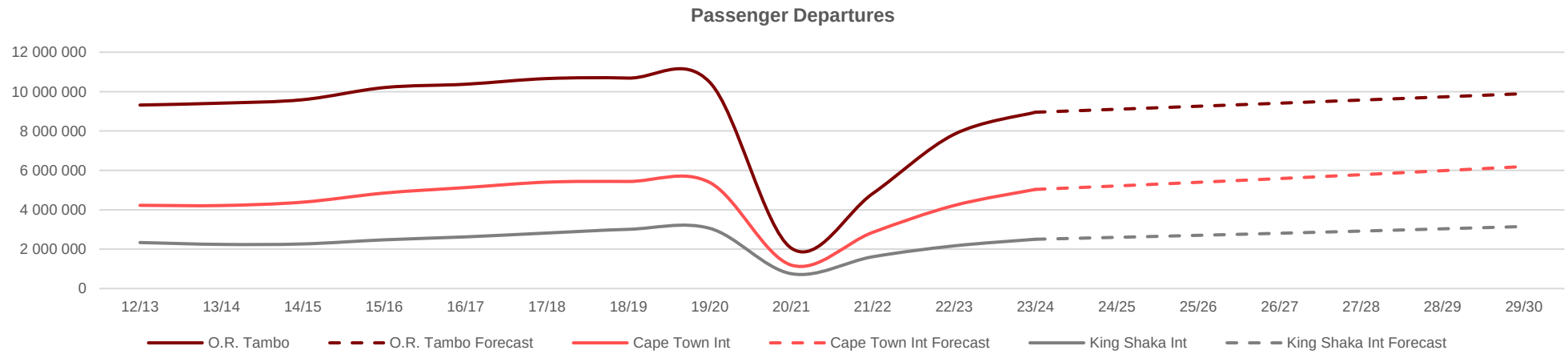
Departing Passenger Growth Rates

	O.R. Tambo		Cape Town		King Shaka	
	Long term	Short term	Long term	Short term	Long term	Short term
International	-1.4%	-2.4%	7.0%	1.3%	2.0%	-2.5%
Regional	-1.6%	-2.2%	1.5%	-1.1%	-7.1%	-15.6%
Domestic	0.5%	-1.0%	0.2%	-1.4%	0.5%	-1.6%
Unscheduled	0.5%	1.7%	1.9%	1.5%	-1.2%	1.7%
Total	**-0.4%**	**-1.6%**	**1.6%**	**-0.7%**	**0.6%**	**-1.7%**

Source: DEMACON ex StatsSA, 2025

PASSENGER GROWTH FORECAST





Source: DEMACON ex StatsSA, 2025

Over the next 5 years, passenger volumes (arriving and departing) at O.R. Tambo are predicted to increase be approximately 1.8 million (±307 194 passengers annually). Passenger volumes at Cape Town International are predicted to increase by approximately 2.3 million over the next five years (±376 414 passengers annually) and passenger volumes at King Shaka International by approximately 1.3 million (±214 410 passengers annually). This would translate into increase of approximately 5.4 million additional passengers at the above airports over the next 5 years. The Vaal Airport could potentially make inroads into the market share of existing airports and also stands to benefit from a steady increase in demand over time.

CRITICAL URBAN THRESHOLD INDICATORS

The table provides a qualitative analysis of the current urban threshold of the primary market area. This analysis assesses the potential and scale of the economic and socio-economic market in terms of its capacity to support a multi-billion-rand SEZ development and its associated investments. The qualitative analysis considers factors such as the market area demographics, the size and growth of the local economy, and the extent of local economy diversification.

Critical Urban Threshold Analysis

Criteria		Score					Vaal Aerotropolis Trade Area
		1	2	3	4	5	
Demographics	Population (persons)	Less than 500 000	500 000 – 2 million	2 million – 3.25 million	3.25million – 5 million	5 million +	2/5
	Number of households	Less than 100 000	100 000 – 400 000	400 000 – 700 000	700 000 – 1 million	1 million +	2/5
	Size (km^2)	Less than 2 000km^2	2 000km^2 – 3 500km^2	3 500km^2 – 5 000km^2	5 000km^2 – 6 000km^2	6 000km^2+	3/5
	Population per km^2	Less than 500	500 – 1 000	1 000 – 2 000	2 000 – 3 000	3 000+	1/5
	Households per km^2	Less than 50	50 - 350	350 -600	600 -1 000	1 000+	2/5
Economic Growth & Size	Economic growth (2013-2023)	Negative growth	1.0% - 0.1%	2.5%- 1.0%	3.5%- 2.5%	3.5%+	1/5
	Economic growth (2018-2013)	Negative growth	1.0% - 0.1%	1.5% - 1.0%	2.0% - 1.5%	2.0%+	1/5
	Total GVA (R millions)	Less than 50 000	50 000 – 75 000	75 000 – 100 000	100 000 – 150 000	150 000+	2/5
	Per Capita GVA (R)	Less than R50 000	R50 000 – R75 000	R75 000 – R100 000	R100 000 – R150 000	R150 000+	2/5
	Employment rate (%)	Less than 72.5%	75.0% - 72.5%	77.5% - 75.0%	80.0% - 77.5%	80.0%+	1/5
Economic Diversification	Main economic sector	Little/no diversification	Less diversified	Moderately diversified	More diversified	Highly diversified	3/5
	Secondary sector contribution to total GVA (%)	Less than 12.5%	15.0% - 12.5%	17.5% - 15.0%	20.0% - 17.5%	20.0%+	5/5
	Tertiary sector contribution to total GVA (%)	Less than 70.0%	75.0% - 70.0%	80.0% - 75.0%	85.0% - 80.0%	85.0%+	1/5
	Secondary sector contribution to employment (%)	Less than 10.0%	15.0% - 10.0%	20.0% - 15.0%	25.0% - 20.0%	25.0%+	4/5
	Tertiary sector contribution to employment (%)	Less than 70.0%	75.0% - 70.0%	80.0% - 75.0%	85.0% - 80.0%	85.0%+	2/5

The qualitative analysis measures the urban threshold of the market area based on several demographic and economic criteria. Each criterion is scored out of 5, and the overall score provides a threshold measure of the local market capacity to support the development. Based on the qualitative analysis, the project market area (comprising economic and demographic factors) scored 2.2 out of 5, or 42.7%. This score indicates that the market area falls below the desired threshold of 50%. Factors influencing this score include: a relatively low population concentration and substrate economic conditions affected by long-term contraction. However, the economy is moderately diversified, supported by a large secondary sector. If significant infrastructure investment is implemented and at least two anchor tenants are secured, accelerated growth could be enabled, potentially elevating the urban threshold beyond the 50% tipping point.

SUMMARY OF DEMAND ANALYSIS

The following table provides a summary of the land use demand potential for the project.

Development Prospects	Proposed Size	Development Prospects	OPME	Notes
Residential	5 000 units	**Moderate to High**	2027+	• Modelling portrays demand and take-up based on prevailing (historic short and long term) market trends. As such, it can be expected that demand conditions may continue to improve. • The model consists of two sections, 1) total market and 2) project specific. Between 2024 and 2029 an estimated 13 584 new households will seek accommodation in the target geographic market area, resulting in an annual growth in demand of approximately 2 717 units (across the full housing spectrum, including informal and subsidy). • Under present market conditions, the finance-linked and bonded segment (36.8%) will yield a take-up rate of between 2 358 and 3 715 units per annum (including new households and resales). • A total of 5 000 units could be developed and taken-up within approximately 14 years (80% take-up). • The optimum point of market entry is 2027+. • A first phase of up to 1 000 units is recommended.

Optimum Distribution Range Configuration (based on market demand profile)

Residential Typology	Percentage	Nr of Units	Price Range	Composition	Unit Sizes
Apartments	17.0%	850	R410 000 - R450 000	0.5 bedroom, 1 bathroom	45-55
	25.5%	1 274	R500 000 – R650 000	1 bedroom, 1 bathroom	55-70
Freestanding houses	19.2%	962	R680 000 - R780 000	1.5 bedrooms, 1 bathroom	60 - 70
	12.8%	641	R800 000 - R1.1 million	2 bedrooms, 2 bathroom	80 - 90
	11.0%	550	R1.2 million - R1.5 million	3 bedrooms, 2 bathrooms	110-130
	7.3%	367	R1.6 million - R2.3 million	4 bedrooms, 3 bathrooms	130-160
	7.1%	356	R2.4 million+	4+ bedrooms, 3+ bathroom	160-200
Total	**100.0%**	**5 000**			

Social Housing	3 100 units	**Moderate to High**	2028+	• The modelling portrays market-based take-up based on medium to long-term market growth trends. • Under present market conditions, this segment of the market (48.4%) demands 2 388 to 3 103 units per annum (including new households and resales). • Approximately **3 100 social housing units** could be developed and taken-up within the medium to longer term (9 years). • A first phase of 800 to 1 000 units is recommended.

Development Prospects	Proposed Size	Development Prospects	OPME	Notes

Social Housing Target Market Groups	SHRA Income Bands		SHRA Unit Split Aspiration	Market Reality *	Number of Units	Composition	Square Meters	Min Rental Rates	Max Rental Rates	Average Rental Rates
	Lower	Upper								
Sub-Primary	R1 850	R3 500	5%	32.9%	1 021	Bachelor	18m² to 25m²	R500	R945	R722
Primary	R3 501	R6 700	25%	30.2%	936	Studio	18m² to 25m²	R1 015	R1 943	R1 479
Secondary (Band 1)	R6 701	R11 300	25%	18.9%	585	1 Bedroom, 1 Bathroom	25m² to 35m²	R2 077	R3 503	R2 790
Secondary (Band 2)	R11 301	R15 000	30%	8.5%	265	2 Bedrooms, 1 Bathroom	42m² to 48m²	R3 729	R4 950	R4 340
Secondary (Band 3)	R15 001	R22 000	15%	9.5%	294	3 Bedrooms, 2 Bathrooms	52m² to 60m2	R5 250	R7 700	R6 475
Total					3 100					

	Proposed Size	Development Prospects	OPME	Notes
Retail	±47 188m² GLA	**Moderate**	2034+	• In the context of the retail demand modelling, indications suggest, that there is retail potential of approximately ±47 188m² GLA • The optimum point of market entry for the retail land uses could be 2034+ • In the event that the full retail capacity as calculated is constructed and operational, annual sales of approximately R1.5 billion (based on benchmark trading densities and the baseline analysis) could be achieved and ±1 573 permanent on-site jobs could be created. • Ample parking should be provided at a ratio of at least 4 to 6 bays per 100m² retail GLA. • The centre should provide ±2 831 parking bays. • The centre will be classified as a regional centre.

Industrial & Warehousing	840 464m² (±168.1 ha)	**Moderate**	2027+	• Industrial sector market demand for the Emfuleni Sub-Regional Economy increases cumulatively from 20 hectares in 2029 to 280 hectares by 2044.
				• Viable market-based take-up for the site and its land use opportunities over the medium- to long-term is approximately 840 464m² gross lettable area (GLA).
				• The optimum point of market entry for industrial uses within the sub-regional economy and market is from 2027+.
				• The industrial demand is modelled based on an industrial sub-sector demand forecast which may ultimately be influenced by the nature and quantum of anchor tenants successfully procured.
				• The bulk of industrial demand could originate from sectors such as:
				  • Metals, metal products, machinery and equipment
				  • Food, beverages and tobacco
				  • Furniture and other manufacturing
				  • Petroleum products.

Automotive	9 372m² GLA	**Moderate to High**	2034+	• Trade and Automotive sector market demand for Emfuleni Sub-Regional Economy increases cumulatively from 26 684m² GLA in 2029 to 557 191m² GLA in 2044.

Development Prospects		Proposed Size	Development Prospects	OPME	Notes
					• Viable market based take-up for the development over the medium to longer term is approximately 9 327m^2 • Optimum point of market entry: 2034+, once the aerotropolis development has gained traction. • This floor space could include dealerships, automotive workshops, speciality shops and related activities.
	Office	40 007m^2 GLA	**Moderate**	2027+	• Market demand for office floor space in the sub-regional economy, increases cumulatively from 57 146m² GLA in 2029 to 198 113m² GLA in 2044 • Over the medium to longer term, the project could attract office take-up of approximately 40 007m² GLA. • Optimum point of market entry: 2027+ • This space includes GLA for offices and related facilities, but excludes parking, storage and basements
	Hotel	147 keys	**Moderate to High**	2034+	• Total tourist bed-nights in the Gauteng Province for 2029 is expected to amount to approximately 94.7 million. • This results in a demand of approximately 10.9 million hotel bed-nights for 2029 increasing to 29.3 million by 2044 • The Emfuleni local economy has a share of approximately 3.7%, resulting in a demand of 401 172 bed-nights (2029), increasing to approximately 1 073 331 bed-nights over the long term (2044) • The project could attract approximately 22 064 bed-nights over the medium term and 59 033 bed-nights over the long term (2044) • Ultimately short-stay accommodation with 147 keys can be developed over the medium to longer term. As well as a restaurant with approximately 295seats and a conference / function venue catering to approximately 250 people could be developed.
	Social Facilities	54.6 ha	**High**	2027+	• The development of approximately 8 000 residential units (social housing, FLISP & bonded units) necessitates the development of various social facilities, i.e. schools, creches, clinics, open spaces, SASSA paypoints etc. • Approximately 54.6 ha will required for the social facilities.

SYNTHESIS & LAND BUDGET

The following table indicates the land required for each land use over the medium term.

Vaal Aerotropolis Mixed Use Development Medium to Long Term Demand Potential Summary

Development Prospects	Proposed Size	Total Demand (ha)	Net Demand (including roads and surplus buffer) (ha)	Composition (%)	Development Prospects	OPME
Residential	5 000 units	200.0	253.0	40.9%	Moderate to High	2027+
Social Housing Units	31 00 units	22.1	28.0	4.5%	Moderate to High	2028+
Retail	±47 188m^2 GLA	13.5	17.1	2.8%	Moderate	2034+
Industrial & Warehousing*	840 464m^2 (±168.1 ha)	186.8	236.3	38.2%	Moderate to High	2027+
Automotive	2 277m^2 GLA	2.7	3.4	0.5%	Moderate to High	2034+
Office	40 007m^2 GLA	6.7	8.4	1.4%	Moderate	2027+
Hotel	147 keys	3.0	3.8	0.6%	Moderate to High	2034+
Social Facilities	54.6ha	54.6	69.1	11.2%	High	2027+
Total		**489.4**	**619.0**	**100.0%**		

** Includes overlap with larger Gateway precinct.*

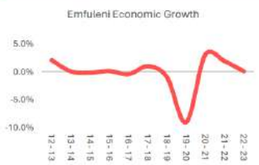
A total of **619 hectares** could be developed and taken up over the medium to longer term. This includes 281.0 ha (45.4%) for residential uses, and 338.0 ha (54.6%) for non-residential uses. The industrial and warehousing space will require approximately 38.2% of land.

The successful implementation of the Vaal Aerotropolis will ultimately hinge on the procurement of anchor tenants to drive industrial and warehousing demand.

The development site is ideally located to serve a vast rural community with various large-scale farmers residing in the North West and Free State. This agricultural market could provide the necessary demand required for a cargo hub exporting and importing live animals. The main destinations for South African export animals include bordering countries, but also Spain, Italy, United States, Hong Kong, Qatar, United Arab Emirates, China and Qatar. The exports of animals via flight could not only fast track exports, but also ensure safer and more humane travelling for live animals.

VAAL AEROTROPOLIS DEVELOPMENT – KEY CONSIDERATIONS

Economic Considerations



Economic Growth

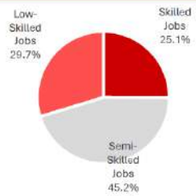
The economy contracted over the short to long-term, -0.4% over the short-term (5-year average) , -1.0% over the long term(10-year average)

Economic Profile

Tertiary sector orientated with a large **manufacturing base**

- Metallurgical & steel manufacturing – **dwindling prospects**
- Manufacturing sector reflected positive growth

Labour Profile



Skills Profile

Semi-skilled orientated

- 23 625 jobs
- 3 272 jobs added since 2013

Largest Employing Occupations

- **Elementary 25.5%**
- Service workers, shop and market sales workers 15.4%
- Technicians and associate professionals 14.9%

Cluster Analysis

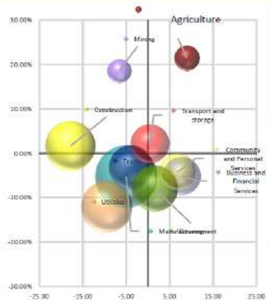
Industry Drivers of Transport and Logistics Sector Activity

- **Petroleum products, chemical, rubber and plastic**
- Wholesale and retail trade
- Transport and storage
- Business services

Industry Drivers of Agro Processing

- **Food, beverages and tobacco**
- Wood and paper, publishing and printing
- Community, social and personal services

Carvalho & Industry Targeting



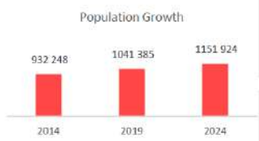
Current & Emerging Strengths (GVA Based)

- Agriculture
- Transport and storage
- Manufacturing sub-sectors:
  - **None**

Current & Emerging Strengths (Employment Based)

- Agriculture
- Mining
- Manufacturing sub-sectors:
  - **Petroleum products, chemicals, rubber and plastic**
  - Food, beverages and tobacco
  - Furniture and other manufacturing
  - Transport equipment

Socio-Economic Profile



Population Size & Growth (30 minute)

- 1 150 135 people / **368 875 households**
- 2.2% population growth rate / 2.5% household growth rate

Household Income Profile

- All SEM Income: **R8 661 per month**
- SEM2+ Income: R25 789 (33.5% of households)

Location Characteristics and Attributes

Proximity to Resources — 7

The development site is located in close proximity to a steel manufacturing hub, however the steel manufacturing hub has dwindling potential

The development site is furthermore in close proximity to a petroleum hub.

A large agricultural base exist in the northern sections of the Free State and eastern sections of the North West.

Proximity to Markets — 7

The area forms part of the Gauteng City Region, ensuring access to the larger Gauteng market.

Potential markets exist in the North West and Free State provinces.

Agglomeration Economies — 6

Currently the site is not situated in close proximity to transport / logistics / manufacturing land uses, however, agglomeration can be achieved through the development.

Proximity to Logistics and Related Transport Infrastructure — 7

The development site is located next to the N1 and a railway line.

Road upgrades will be needed.

Access to Bulk Infrastructure — 7

Bulk infrastructure will have to be provided.

Proximity to Community Facilities and Amenities — 7

The development of an aerotropolis will have to ensure that it creates access to schools, clinics, hospitals, retail facilities and other amenities.

Proximity to Labour — 7

The area has a large number of semi-skilled employees.

Skilled employees will have to be enticed to move to the area.

Government Support / Financial Incentives and Other Facilitated Mechanisms — 7

Support from the government is critical.

The creation of a SEZ could ensure access to financial incentives.

Vaal Aerotropolis High Level Demand Assessment

Passengers (annual)	Up to 4.5 million passengers
Cargo (tonne)	Up to 3.1 million tonne
Residential (FLISP & Bonded)	5 000 units
Residential (Social)	3 100 units
Retail	±47 188m² GLA
Industrial & Warehousing	168.1 ha
Office	40 007m² GLA
Trade	2 277m²
Hotel	147 keys
Social facilities	45.6 ha

Market Analysis Summary

- The Emfuleni local economy has continuously contracted over the short- and long-term with key sectors such as manufacturing dwindling as a result of result of newer technology, specifically green energy, and more enhanced, lighter, and more affordable products compared to steel.
- The economic sectors targeted by the SEZ show mixed future potential prospects with the transport and storage sector identified as an emerging strength while the manufacturing sector as a whole is identified as a sector that has limited prospects and declining competitiveness when aggregated against the National Economy.
- The benchmarking of the Aerotropolis location and socio-economic context against the South African International Airports indicates that the size of Vaal Aerotropolis compares to the King Shaka Airport – the analysis reveals a similar operational context indicating that the Vaal Aerotropolis could move up to 4.5 million passengers annually.
- The identification and procurement of an anchor tenant can act as a catalyst for investment and growth and will assist with the long-term success of the project. An anchor tenant enables agglomerating principles through attracting complimentary and value chain industries as part of a cluster of economic activity.

Critical Path Forward

Demand base expansion

2025

Step 1
Concept design, feasibility, marketing and investment strategy

Step 2
Successfully procure a desirable anchor tenant and associated support services / industries

Step 3
Refine concept plan & precinct plans. Develop phasing plan, including early provision of various housing typologies

2030

Step 4
Develop initial phases including bulk infrastructure & servicing of land as per phasing plan

Step 5
Airport and anchor tenant development

INTRODUCTION AND PROJECT BRIEF

1

1 INTRODUCTION AND PROJECT BRIEF

1.1 INTRODUCTION AND PURPOSE OF THE REPORT

Chapter 1 of the report provides an introduction and concise roadmap of the demand assessment for the Vaal Aerotropolis located in the Emfuleni Local Municipality (Gauteng Province). To understand the scope, objectives and outline of this document, Chapter 1 seeks to introduce the project brief and its intended outcomes and outline the contents of the remainder of the report.

1.2 PROJECT BRIEF

DEMACON Market Studies has been appointed by **Vaal Aerotropolis Design (Pty) Ltd** to undertake **demand assessments** as part of a broader process to develop the Vaal Aerotropolis located in Emfuleni Local Municipality, Gauteng Province. The purpose of developing the aerotropolis relates to unlocking the economic growth and employment generating potential of the local economy by investing into the development of an airport, agri-zone and logistics and manufacturing hub.

It is understood that a socio-economic analysis, a market analysis and a cost-benefit analysis is required for the Vaal Aerotropolis development which includes an international airport, trade zone, logistics, manufacturing and Agri-hubs zone.

In the context of the above, a market study is therefore required to assess the viability and optimum composition of a potential development concept in terms of, *inter alia*:

Site Location

Market/ Industry Identification and Forecasts

Demand Projections and User Projections

Policy Analysis and Stakeholder Mapping

Economic Impact Projections

DEMACON's approach is purely market-based, and we will apply our extensive involvement as well as recent research and market intelligence on the subject matter to complement the market study

1.3 PROJECT OVERVIEW

The Vaal aerotropolis development is located 9 km west of the N1 motorway in the Emfuleni municipality.(See locality plan). The aerotropolis will comprise mainly of an international airport, a logistic hub and an Agri zone.

The Vaal International Airport will be developed, operated, and managed by Vaal Aerozone (Pty) Ltd. It will be the only airport in Gauteng where integrated air cargo services are designed and planned as a priority. It will have four flexible freighter stands, accommodating either two wide body or four narrow body aircraft. It will be planned initially with a capacity of:

- Cargo Terminal: 150 000 tons per annum.
- Passenger Terminal: 7.2 million passengers per annum.
- Planned final capacity of 45 million passengers per annum.

The Aerotropolis will be managed through a Special Economic Zone(SEZ) to ensure that effective and efficient management is achieved and financial benefits associated with SEZ are accessed timeously to ensure that the development is not delayed in its implementation. The area of the SEZ will be around 12000 ha providing large tracks of land for agricultural purposes and solar farming beside the airport required land.

Airport City
• Premium office, retail, hospitality, medical uses including specialist clinics/hospital and leisure spaces in an urban green precinct

Agri zone

- Integrated perishable supply chain.
- A high tech agricultural cluster including climate controlled greenhouses, packhouses, a tissue culture lab, and providing the first air platform in Africa for export of live animals.

Cargo Terminal

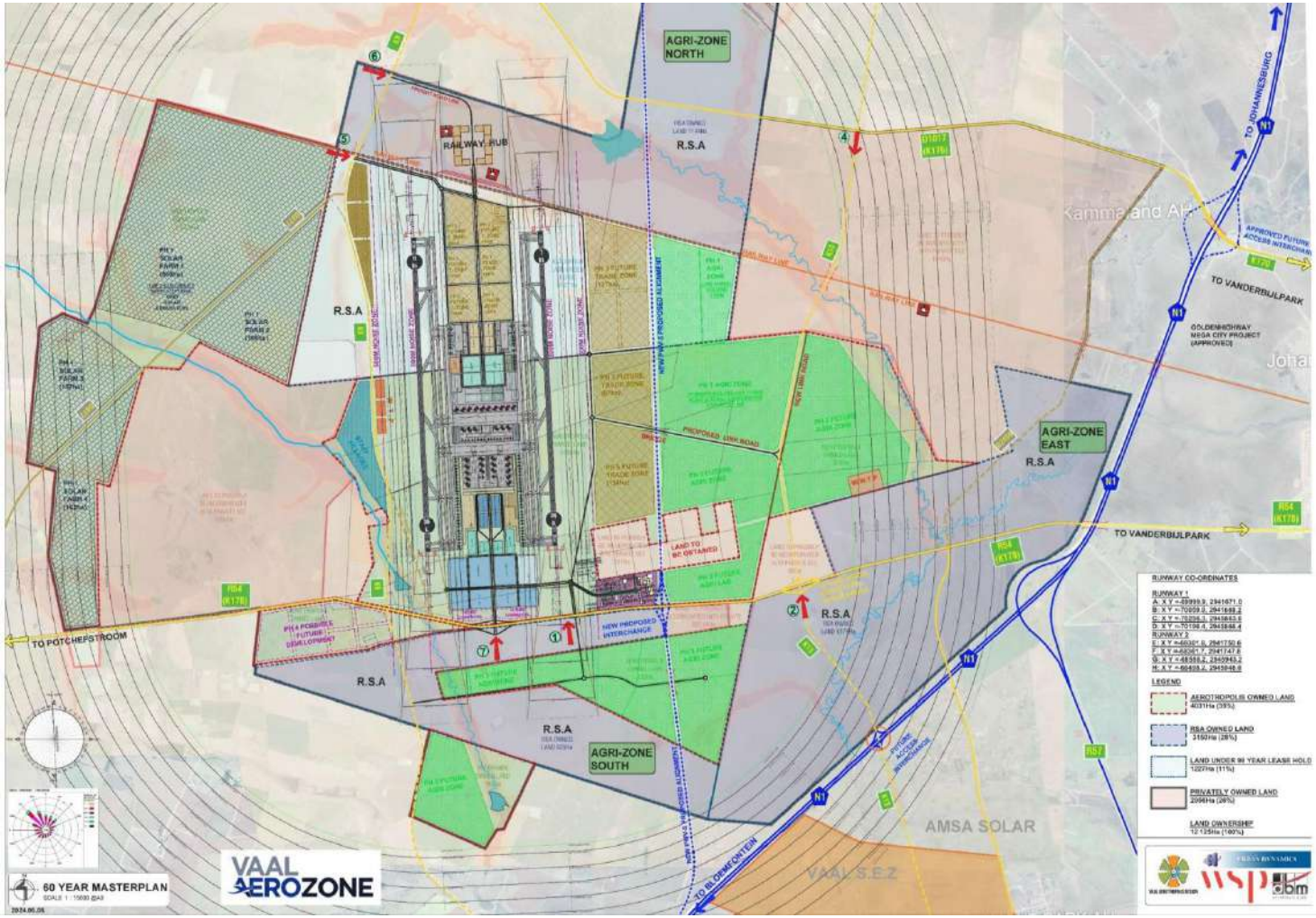
- The most secure and state of the art cargo terminal in Africa.
- The first live animal holding area in Africa.

Trade Zone

- Directly linked to the cargo terminal, with airside access to manufacturers, assemblers, and distributors.

Solar Farm

- 1 000 ha solar farm will be included catering to local consumption (20%) with additional electricity sold to private purchase customers (80%) in the area.



Map 1.1: Local Context of Vaal Aerotropolis

1.4 RESEARCH METHODOLOGY

As discussed in the previous section on the project brief of the market demand assessment report, a research methodology is employed to guide the overall market demand assessment of the proposed Tier 1 Harbour (development location). The methodology consists of six steps to identify, assess and determine the viability and optimum composition of land uses that could be supported on the proposed development location as part of a spatial development concept. The following diagram (overleaf) provides a concise overview of the approach employed for the study.

Diagram 1.1: Research Methodology

Step 1: Small harbour Overview

Step 1 entails an overview of the small harbour in order to establish, *inter alia*:

- The location of the small harbour
- The study area of the small harbour
- The current configuration and land use drivers of the harbour
- The current and planned development proposals (proposed land use drivers) relevant to the small harbour
- Factors that could support or hinder the development potential of a small harbour

Step 2: Macro and Micro Market Analysis

Step 2 entails a baseline assessment of *inter alia*:

- The strategic context of the small harbour in terms of the long-term developmental objectives of the harbour as an opportunity or economic and community growth
- The economic context of the local economy of the small harbour along with a competitive advantage analysis of industries that should be targeted for economic development
- The socio-economic context of the community affected by and supporting the small harbour

Step 3: Land Use Opportunity Identification

Step 3 entails the identification and refinement of land use opportunities relevant to the small harbour by means of:

- Classifying land use opportunities in light of their potential to support, *inter* alia, fishing industry value chain, marine based activities trade and residential uses and tourism industries.
- A SWOT analysis of land use opportunities to determine opportunities with potential
- A location analysis of potential land uses to determine whether the fundamental aspects to support a specific land use is in place

Step 4: Land Use Market Demand Assessment

Step 4 entails the modelling and quantification of the top priority land use opportunities identified for the small harbour. The step focusses on:

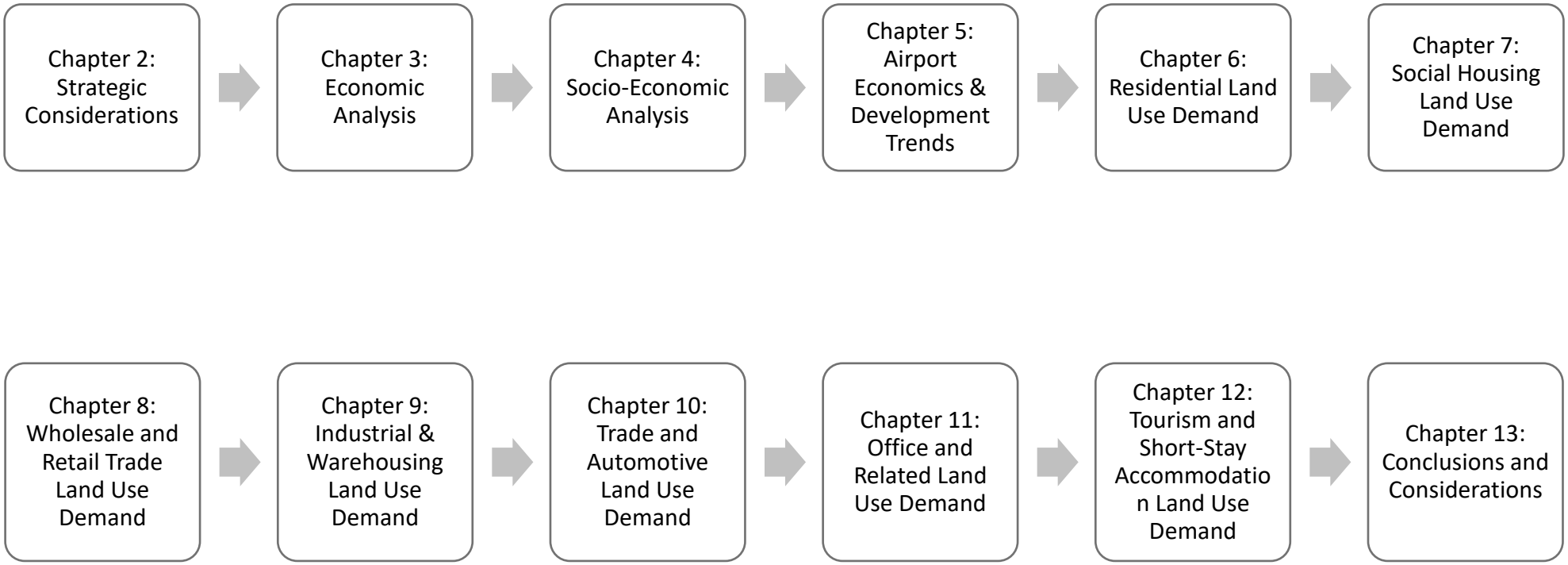
- Modelling the medium- to long-term demand for different land uses and quantifying the space requirement that would be needed to support additional land use demand.
- Determining the effective market gap and development potential per priority land use over a medium- to long-term

Step 5: Land Use Budget and Recommendations

Step 5 entails combining the output from the land use market demand assessment into a land use budget that reflects the space demand potential for different land uses and their configuration options.

1.5 Report Outline

The following diagram provides an indication of the outline of the remainder of the report.



1.6 Data Sources And Quality

DEMACON, in the context of the report, acknowledges the South African Statistical Quality Assessment Framework (SASQAF) as a guiding framework for statistical analysis by both public and private enterprises. The purpose of the framework is to provide a flexible structure for the assessment of statistical products, and can be used for:

- Self-assessment by producers of statistics
- Reviews performed by a DQAT in the context of the NSS work
- Assessment by data users (e.g., financial market participants) based on the producing agency's quality declaration
- Assessment by international agencies (e.g., the International Monetary Fund) based on the quality declaration.

Data quality by the SASQF framework is defined as "fitness for use". In this context, the quality of data is based on eight dimensions. The eight dimensions are:

- Relevance – reflects the degree to which the data meet the real needs of clients. It is concerned with whether the available information sheds light on the issues of most importance to users.
- Accuracy – the degree to which the output correctly describes the phenomena it was designed to measure. Source data available provide an adequate basis to compile statistics.
- Timeliness – the delay between the reference point to which the information pertains and the date on which the information becomes available. It also addresses the periodicity and punctuality of production activities within the statistical value chain.
- Accessibility – the ease with which it can be obtained from the agency. This includes the ease with which the existence of information can be ascertained, as well as the suitability of the form or medium through which the information can be accessed.
- Interpretability – the ease with which users understand statistical information through the provision of metadata.
- Comparability and coherence – the ability to compare statistics on the same characteristic between different points in time, geographical areas or statistical domains.
- Methodological soundness – the application of international, national, or peer-agreed standards, guidelines and practices to produce statistical outputs.
- Integrity – values and related practices that maintain users' confidence in the agency producing statistics and ultimately in the statistical product.

DEMACON makes use a varied number of established and qualified data sources in order to provide the most current, relevant and statistically accurate information.

The study sourced data from reputable sources such as:

- Statistics South Africa
- Quantec Easy Data
- ESRI

Further information is sourced from other sources such as:

- Department of Forestry, Fisheries and the Environment
- Department of Agriculture, Land Reform and Rural Development
- Department of Planning, Monitoring and Evaluation
- Gauteng Provincial Government
- Sedibeng District Municipality
- Emfuleni Local Municipality
- Transnet
- The Centre for Affordable Housing
- Banking Groups such as FNB and ABSA
- The Reserve Bank of South Africa
- South Africa Council for Shopping Centres
- Property Brokers
- Etc

STRATEGIC CONSIDERATIONS AND LOCATION ANALYSIS

2

2 STRATEGIC CONSIDERATIONS AND LOCATION ANALYSIS

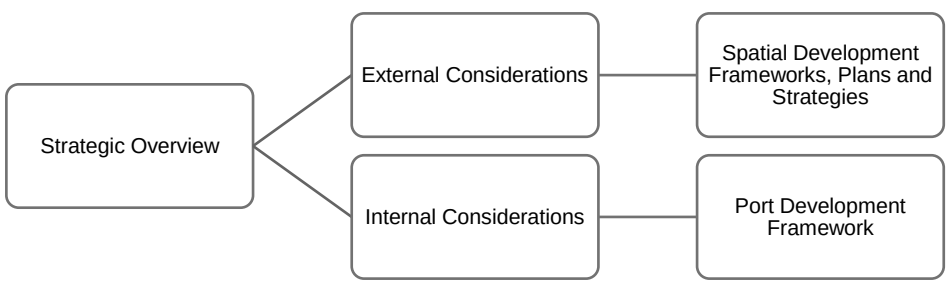
2.1 INTRODUCTION

Chapter 2 of the report provides an overview of strategic considerations that are pertinent and relevant to the small harbour and its short-, medium, or long-term development and role in the community and economy. The purpose of the chapter is to determine the strategic direction and role that different levels of strategic planning, documents and frameworks envision for the Vaal Aerotropolis Development. The aim of the analysis is to identify potential land use opportunities identified by different levels of strategic planning that should be considered for the Vaal Aerotropolis as potential developmental opportunities.

In light of the preceding, the analysis focuses on reviewing various strategic documents and plans related to the broader regional as well as local development direction of Emfuleni and the Vaal Aerotropolis region (external considerations). The analysis also focuses on the strategic directives of the local economy whereby strategic plans related to the future of the municipality is reviewed to determine the context and direction of the municipality as a whole (internal considerations).

The analysis is thus structured to consider external and internal strategic considerations.

Diagram 2.1: Analysis of Strategic Considerations



Source: DEMACON GIS, 2024

2.2 EXTERNAL STRATEGIC CONSIDERATIONS

2.2.1 NATIONAL PLANS AND STRATEGIES

2.2.1.1 NATIONAL DEVELOPMENT PLAN 2030 (2011)

The National Development Plan (NDP) as an action plan for the development of South Africa aims to establish a system within which economic and social development can occur by addressing key weaknesses and tapping into the strengths and opportunities of the country. Rural development, and the inclusivity therefore is a cornerstone objective of the NDP and focusses its attention on the function that small towns play in rural regions and their ability to provide services, enable economic stability and growth, tackle socio-economic issues and allow for greater economic prosperity in rural regions.

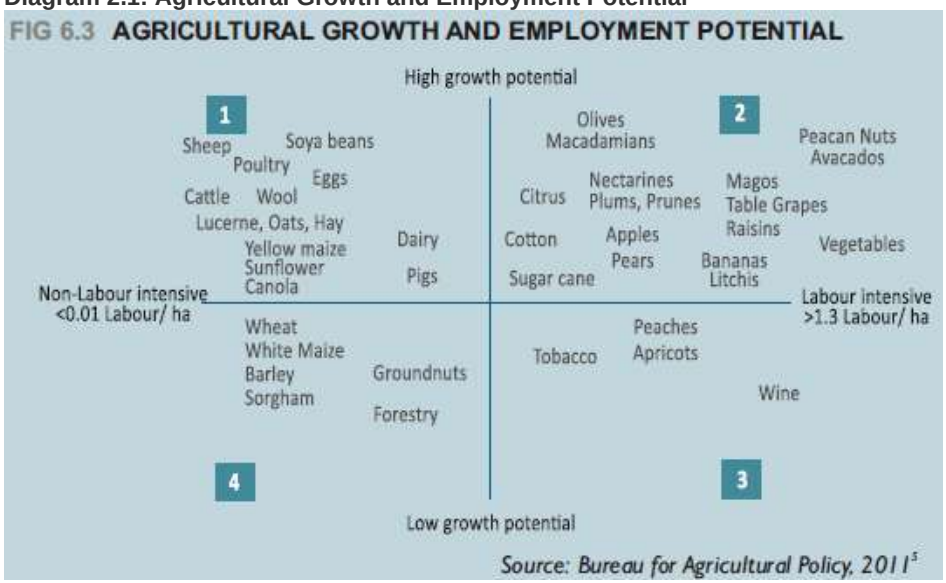
The NDP, in terms of the rural economy identifies that rural economic growth should ideally target three aspects:

- Agricultural development based on successful land reform, employment creation and strong environmental safeguards. To achieve this, irrigated agriculture and dry-land production should be expanded, with emphasis on smallholder farmers where possible. To this end, established agricultural industries must be enabling partners.
- Quality basic services, particularly education, health care and public transport. Well-functioning and supported communities enable people to seek economic opportunities. This allows them to develop their communities further through remittances and the transfer of skills, which will contribute to the local economy.
- In areas with greater economic potential, industries such as agro-processing, tourism, fisheries (in coastal areas) and small enterprise development should be developed with market support. Special focus to enhance skills and capabilities of rural women entrepreneurs with access to land and finance.

The NDP furthermore highlights the need to “provide innovative market linkages”. Make provisions to link small-scale farmers in the communal and land-reform areas to markets in South Africa and further afield on the subcontinent. This will require improved road and rail infrastructure to usher farm products to

and through the value chain and to markets, and improved communications infrastructure to inform agricultural role-players about buying and selling prices and supply-and-demand trends. Linking farmers to markets will also require infrastructure for processing and value addition and new forms of intermediaries, such as cooperatives, to help small producers achieve economies of scale in processing. Farmers also need cold-chain infrastructure if they are to access markets for high-value produce and rural consumers.

Diagram 2.1: Agricultural Growth and Employment Potential



Aggressively expand trade and investment in the region, on the continent and globally. This will require developing hard infrastructure (like road and rail networks) and soft infrastructure (trade facilitation systems, supply-chain management, and customs controls and administration). South Africa should identify specific trade, manufacturing and industrial niches, where the country enjoys competitive advantages to make full use of the strong growth in East Asian economies and their interests on the African continent.

2.2.1.2 National Spatial Development Framework 2018 (NSDF)

The National Spatial Development Framework (NSDF) is a framework within which the long-term strategic spatial plan of South Africa is provided. The NSDF provides a visual representation of the desired national spatial development pattern of South Africa, provides a set of national spatial development directives and identifies a set of national strategic spatial areas that should be targeted for investment.

National Spatial Action Areas (NSAA)

Following on from the directive in the NDP, the NSDF identifies areas of significant national risk and opportunity/potential. In sharp contrast to the centrifugal forces, i.e. 'outward-pushing forces away from the core', that shaped Apartheid national spatial development planning, the NSDF provides a development perspective aimed at 'drawing all South Africans closer to the core':

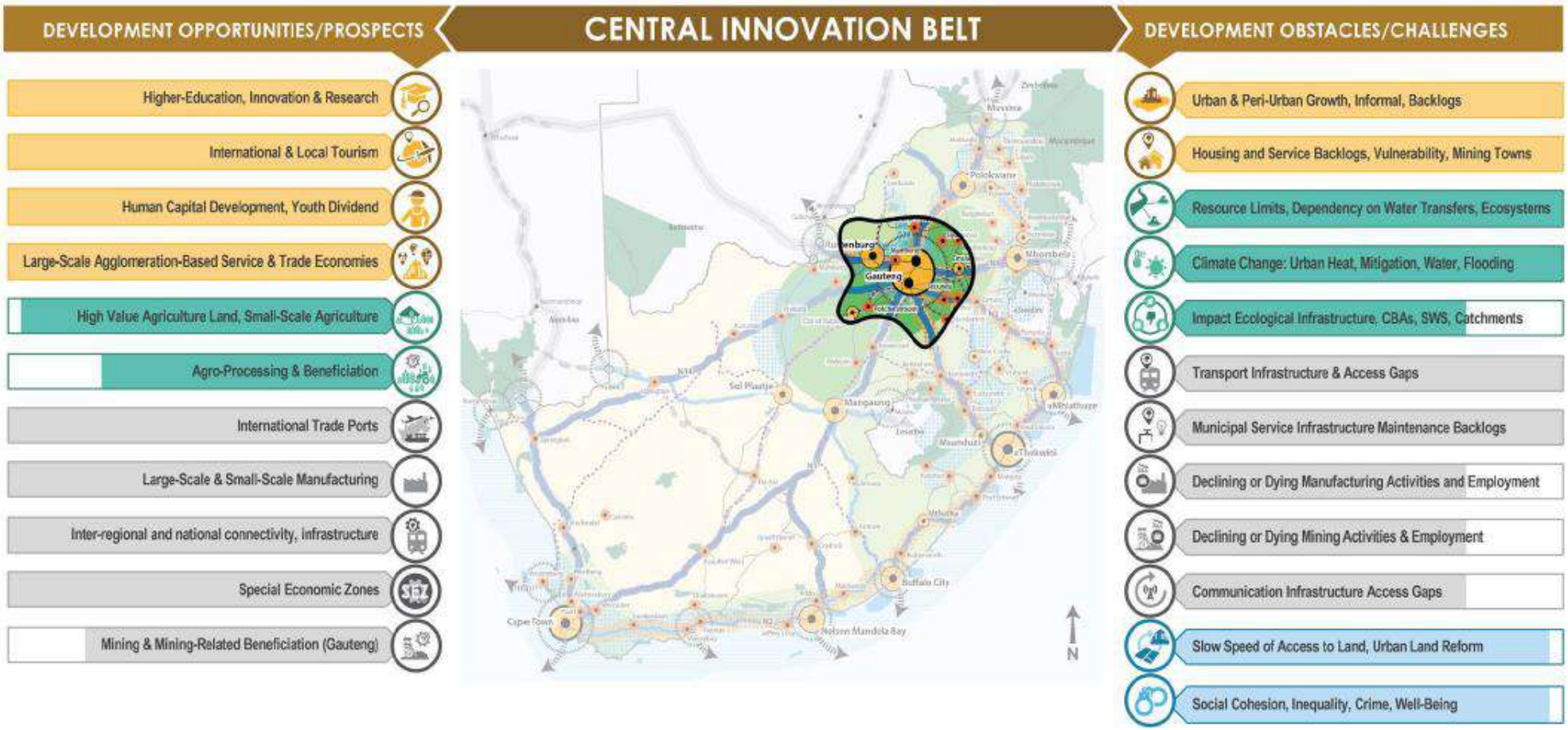
- Nationally, in the form of a shared and smaller, yet more viable, more sustainable and more resilient national spatial footprint that places less pressure on our core national natural resource areas and ecological systems, and is more affordable to service and sustain;
- Regionally, in functionally integrated areas focused on regional development and wellbeing that (1) are supported by regional development collaboration agreements between State and non-State actors, and (2) provide an interface between 'the national and 'the local; and
- Locally, in high-quality, serviced, compact, diverse and connected places with viable, robust and resilient economies.

In order to create such a 'shared, smaller, better connected and more sustainable South Africa', the NSDF identifies the most urgent short-term, strategic spatial development catalysts to (1) bring about radical spatial transformation at scale, (2) manage and mitigate rising national risks, and (3) move our country at speed towards the long-term Ideal National Spatial Development Pattern. These areas, of which there are five types, are called National Spatial Action Areas (NSAAs).

In short, these NSAAs represent:

- The most critical sub-national regions/areas for bringing about and/or catalysing national spatial transformation and economic transition at scale; and/or
- The most stressed sub-national regions/areas in terms of current, rising and anticipated national risks.

The development site forms part of the Central Innovation Belt.



❖ **Significance of the Central Innovation Belt (CIB) as NSAA**

The area surrounding the core of the Gauteng Urban Region is spatially positioned to be an economically strong, diverse production area that forms an integral part of the core economic driver of the country and the sub-continent. The Central Innovation Belt (CIB) is (1) a key contributor to national economic growth and employment, and (2) a crucial surface water production area, i.e. the Vaal Catchment.

The CIB is characterised by:

- A long history of high-value gold, platinum and coal mining and industrial production that is, and has been, experiencing (1) significant shrinkage in some cases, and (2) job losses in a number of areas, with more very likely to come due to automation, and/or the resource being either 'mined out' or too expensive to extract;
- Intensive agriculture and related agro-enterprises, as well as tourism activities that are not necessarily at odds, but also not enhanced by the

mining and heavy industrial activities (and their remnants and legacies) in the same area;

- Sustained strong natural population growth and in-migration, still driven by the prospect of employment in the mining and heavy industrial sectors, but increasingly so the construction, trade and service sectors in the area;
- High levels of regional economic and socio-economic vulnerability, due to the economic decline and job losses and uncertainties about the future of especially mining in the area; and
- Pressures on natural resources, notably productive agricultural land and surface water production by population growth, urban sprawl and pollution.

The eastern part of the Region intersects with another NSAA, i.e. the Olifants River catchment in Mpumalanga, which is a National Resource Risk Area in Mpumalanga, where similar changes in the mining and energy-generation sectors, as well as competition for land and water for food production, require a transition in the regional economy and mitigation of environmental risk factors. The Vaal River catchment area, also a National Resource Risk Area, covers the southern portion of the region, where severe challenges around contamination of the river and its tributaries have been, and are being, experienced.

❖ Focus of Actions and Interventions

Guided by the NSDF Main-Frame and five Sub-Frames, the following proposals are made:

- Support large-scale regional economic and employment change in the region through innovation, diversification, adaptation and the repurposing of existing industrial land and associated infrastructure;
- Expedite urban and rural land reform, consolidate existing small and-medium-scale agriculture support programmes, protect and optimise high-value agricultural land, and strengthen the focus on job-intensive agro-processing in the area;
- Introduce a special collaborative programme in government (including DMRE, DTI, CoGTA, DALRRD, DPME, NT, provincial sector department and municipalities) with a specific focus on ensuring (1) innovation and economic diversification and (2) quality human settlement development in the region, and involve universities, research councils, the private sector, communities and organised labour in this urgent initiative; and
- Establish a joint public-private action group to manage the threat to nationally and regionally important (1) water resources and (2) productive land, with the priority being on the impact of formal and informal urban sprawl, acid mine drainage, the maintenance of productive agriculture – especially for small scale farmers close to urban centres – and the rehabilitation and management of the Vaal River system.

CENTRAL INNOVATION BELT

2.2.2 PROVINCIAL PLANS AND STRATEGIES

2.2.2.1 GAUTENG GLOBAL CITY REGION

The Gauteng City-Region is an integrated cluster of cities, towns and urban nodes that together make up the economic heartland of South Africa.

The core of the city-region is Gauteng, South Africa's smallest but most densely populated province. Gauteng includes the cities of Johannesburg, once the world's most important centre of gold production and today South Africa's financial capital, and Pretoria, the country's administrative capital. It also includes commercial, industrial and mining centres such as Germiston, Springs, Alberton, Boksburg, Benoni, Vereeniging, Vanderbijlpark, Krugersdorp, Randfontein and Westonaria.

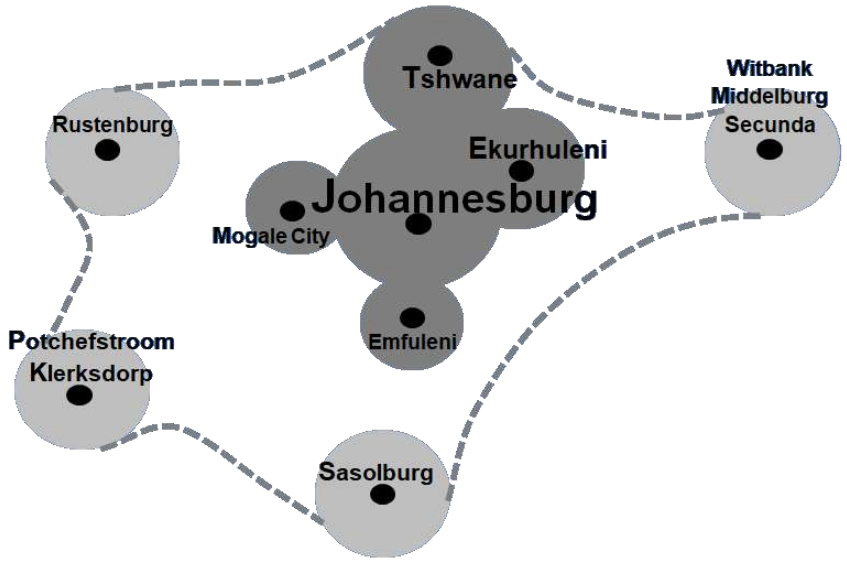
Beyond the boundaries of the Gauteng province is a wider urban region of smaller centres and population concentrations.

To the north-west is the town of Rustenburg, a global centre of platinum mining. As the demand for platinum has increased over the last decade, mining activities have expanded, and the town's growth has accelerated.

To the south, just across the Gauteng border, is Sasolburg, a town centred on the production of oil from coal. To the south-west is a patchwork of towns historically anchored on gold-mining, among them Potchefstroom and Klerksdorp. These centres have seen limited population growth over the last decades as their gold-mining economies have stagnated.

To the east are a number of small to medium sized towns, notably Witbank, Middleburg and Secunda, anchored respectively on coal mining, iron and steel production and energy generation.

To the north east is a swathe of semi-urban settlements – a zone of displaced urbanisation – housing people once barred by apartheid from setting up home in South Africa's whites-only urban centre. This area of over half a million people has little economy of its own. It is functionally connected to the Gauteng economy by subsidised bus transport routes that have historically ferried thousands of workers into central Pretoria on a long-distance daily commute.



2.2.2.2 GAUTENG SPATIAL DEVELOPMENT FRAMEWORK

The GSDF has identified Vereeniging, Vanderbijlpark and Sebokeng in the Emfuleni LM as key urban development nodes of provincial significance.

These nodes are to be linked via movement networks such as rail and road. Emfuleni major road and rail infrastructure are well developed; these traverse the area and are as follows:

- The N1 linking Pretoria with the Free State continuing to Cape Town to the south
- The K178 linking Vereeniging with the N1 and the North West Province
- to the west
- The K53 linking Vereeniging in the south with Johannesburg in the north
- The K59 linking Vereeniging with De Deur, Walkerville and Johannesburg to the north
- The rail line that links Vereeniging and Johannesburg to the north.

The Gauteng Spatial Development Framework has identified the importance of the R59 corridor to link Johannesburg, Ekurhuleni, Meyerton and Vereeniging. The close proximity of Johannesburg to Midvaal, linked by the R59, R82, M61 and N1, has contributed to the development of residential areas in the north of Midvaal as dormitory areas for people working in Johannesburg. Recently industrial/commercial areas have also developed in the northern part of the Midvaal Municipality adjacent to the R59 route, which takes advantage of the accessibility, low land costs and proximity to the Johannesburg, Tshwane and Ekurhuleni Metropolitan areas. Areas of strategic development are mainly focusing on future development along the R59 corridor, Henley-on- Klip, Vaal Marina/Mamello, De Deur, Walkerville and Savannah City. In addition, the densification of existing urban areas and emerging areas such as Riversdale is a key priority for the Municipality.

Table 2.1: Spatial Targeting Focus Area 3: Economic Consolidation

Focus area 3	Promoted	Discouraged	Areas identified /Implementation
Focus area 3: Economic Consolidation Delineated based on spatial analyses of non-residential property development and economic growth trends over the last two decades, as well as their contributions to the provincial economy, and relative accessibility and connectivity to the rest of the province. Although relatively marginal to the provincial core, these areas retain highly productive economies; are often more recent creations or may have lost some of their erstwhile economic vigour; developable land is more readily available; the State owns significant tracts of land; and land prices are less prohibitive than in the core areas. They are ideal sites for integrating functions in an unequal, unjust and fractured spatial economy. This area can serve as an economic connector between the economic heartland and the periphery of the Apartheid City, bringing the erstwhile margins into the economic heart of the province.	**Land use and Economy** • The provincial government needs to support the development of nodes and linkages in the desired network with the necessary transport infrastructure, suitable housing, land identification, land-banking as well as safety and security • Augment urban growth nodes such as Lanseria, Riverfields, Foresthill, etc. • Accelerate the development of SEZs where there is sufficient private sector interest • Address the most critical barriers to investment first (i.e. water, electricity, poor road networks) • Revitalise the CBDs • Municipalities need to identify suitable land; carry out nodal master planning; plan transit oriented development; plan, provide and upgrade long-term bulk infrastructure planning: and manage progressive land use and innovative urban design. • Municipalities must ensure that the private sector is intimately involved in the economic consolidation of these areas, providing a broad mix of compatible land-uses, high-density residential developments and creating opportunities for a broader mix of people of various income and social groups.	• Gated lifestyle estates without integration into the urban system. • New cities unless merit exists	Vaal (Vanderbijlpark, Vereenging) Midvaal Heidelberg Nigel Bronkhorstspruit Cullinan Magaliesberg Fochville Carltonville • **Further policy support for implementing the GLMP:** Since 2016, the LRSP and the GLMP have been prepared. The OOP is setting up a SPV for bulk infrastructure to unlock development • Continued support for the expanded growth of Rosslyn(building of the PWV 9) boosting the logistics hubs into Africa and surrounds • Vereeniging and Vanderbijlpark. • New nodes – Carnival Junction, Aero-Blaaupan, to receive policy support to achieve mixed-use walkable town centres, based around public infrastructure, to promote inclusive environments.

Growing Gauteng Together 2030:

Takeaway GSDF will identify areas of spatial prioritisation linked to the spatial transformation logic determined, and link such with programmatic responses required by provincial sector departments per mandates in order to direct investment and prioritisation linked to strategic planning and budgeting processes (e.g. Strategic Plans, Annual Performance Plans, MTEF Budgets, Infrastructure Delivery Management System processes, etc.) which will feed into both the existing GGT 2030 as well subsequent review.

Existing GGT 2030 Projects to be spatially referenced and bolstered for joint spatial prioritisation across spheres and sectors as per the DDM Districts include the following:

West Rand: "Agri-Business, Agro-Processing, Renewable Energy and Tourism City"

- New Smart City in Lanseria
- Mega Special Agro-processing Park
- Logistics Hub N12 Corridor • Expansion of Busmark manufacturing plant
- Solar farm and urban agricultural projects

Sedibeng: Manufacturing and Agro-Processing City

- Savannah City development
- Vaal River City development
- AB InBev investment project
- Vaal Marina development and logistics and mining investments in Lesedi
- University village (Merging VUT & NWU)
- Highlands development
- **Agrotropolis**

Tshwane: Automotive City-Innovation Hub

- Expansion of BMW & Nissan plants
- Auto City development in Rosslyn
- Ford investment in Silverton
- Automotive Special Economic Zone
- Menlyn Maine Development
- Castle Gateway Precinct
- Renovation of Babelegi, Ga-Rankuwa and Ekandustria industrial parks

GSDF 2030 to contextualize and prioritise the existing and proposed SEZs in the broader Gauteng context including OR Tambo SEZ, TA SEZ and proposed **Vaal SEZ.**

The potential to create decentralised urban economies in the GCR

One of the aspects rated as critical by the GSDF, is the potential to create decentralised urban economies in GCR.

The GSDF indicates that 'Mega Cities' have to be assessed relative to the basics of urban economies: decentralisation is not new in urban policy and the GSDF 2030 polycentric model is a recognition of (a) shifting reliance from only a few urban cores and (b) moving economic opportunity to existing peripheralised 'dormitory' areas. We need to review whether we can realistically create decentralised economies outside of the DTC logic. Similarly, housing projects cannot lead these initiatives and should only follow when the economic armatures of these new initiatives are delivered.

The GSDF 2030 should primarily support investment into well-defined areas of economic prospect: the Greater Lanseria Master Plan shows real potential if well-directed; the existing economic investments into the Automotive Hub west of Mamelodi and Rosslyn north-west of the Tshwane city centre; and possibly the 'Vaal City' initiative as part of an expanded Vaal Triangle consolidation with Sasolburg to the south, across the Free State border).

Development initiatives noted for Syferfontein, however, should only be supported in the GSDF 2030 if the initial focus is on developing a new economic base for the sub-region; a high-tech SEZ initiative adjacent to Ekandustria is too far away from regional spatial integration, airports and the 'knowledge community' that supports such initiatives; Provincial initiatives to resuscitate the industrial initiatives of Ekandustria and Babelegi on the N1 are necessary in

trying to bolster economic support for Ekangala and the wider Hammanskraal areas respectively.

The GSDF furthermore specifies that the GCR must itself be re-defined and re-shaped to reflect a compact, complex pattern: The GCR is a cohesive assembly of contiguous urban areas into a single conurbation, beyond whose limit other disparate urban areas and settlements occur but which are not included in the spatial extents of the GCR itself.

There is merit in redefining the Gauteng city region and introducing a core city region (See related figure that follows for SSDI-3) where consolidation of development occurs. The Gauteng city region core would be defined by the (a) existing east-west urban corridor from roughly Roodepoort on the West Rand through Johannesburg to Boksburg in Ekurhuleni, and stretching from Midrand in the north down to the Southern Suburbs of Johannesburg133; (b) the historic Central Tshwane area (the city centre, its inner suburbs, its expanded activity system south of the Magaliesberg range, its south-western and south-eastern suburbs and as far south, more recently, to include Centurion); and (c) the more recently consolidating broadly defined north-south corridor aligned from the Johannesburg city centre to the Tshwane city centre via Sandton, Waterfall, Midrand, Samrand and Centurion. *The peripheral areas in the Gauteng city region, with their corresponding initiatives in areas such as the Vaal / Vereeniging, Bronkhorstspruit, Carletonville, can be considered as urban centres with increased focus on the trans-provincial relationships between the corresponding adjacent Provincial areas*.

2.2.3 District Plans and Strategies

2.2.3.1 Sedibeng Spatial Development Framework

Regional Context

The following features are notable in terms of the areas surrounding the Sedibeng District:

Three large clusters of low income communities border the Sedibeng District to the north. These include the KwaThema-Tsakane and Duduza complex to the north-east; the Katlehong-Thokoza-Vosloorus complex in the central northern parts; and the Soweto-Ennerdale- Orange Farm complex to the north-west.

All three these areas are located south of the Gauteng Mining Belt and it is common knowledge that the bulk of economic activity in Gauteng Province is located to the north of the mining belt. Hence, there are no areas of major economic activity bordering SDM to the north.

To the east the SDM borders onto high potential agricultural land in Victor Khanye and Dipaliseng Local Municipality and to the west it is very similar with the agricultural activity of Rand West City and JB Marks local municipalities bordering the SDM. It should however be noted that there is extensive gold mining a few kilometres further to the north-west towards Merafong LM and to the north-east the Mpumalanga coal fields and majority of South Africa's power stations are located (Secunda, Witbank, Middelburg).

To the south the dominant economic activity (spatially) is also agriculture, but it should be noted that the Sasol petrochemical plant is located directly adjacent to the south of Sedibeng in the Metsimaholo Local Municipality

Local Context

Major national and provincial roads traversing the municipal area include Route N1, which is the major national north/south freeway linking Musina at the northern border of South Africa to Cape Town in the south, and which passes through the western extents of the area.
The R54, which links Vaal Marina to the R82 in Vereeniging is identified as a prominent road serving the SDM.

Following from the above it is interesting to note that the bulk of urban activity in the Sedibeng District occur along/ in proximity of either route N1, R59, N3 or N17.

The main townships/ settlements occurring in the vicinity of route N1 are Evaton and Sebokeng which forms part of a much larger conurbation of low income settlements which extends northwards into the CoJ area and includes Orange Farm, Sweetwaters, Ennerdale, Lawley, Unaville and Lehae and up to Soweto.

Apart from the Mittal Steel plant to the south there are no areas of significant economic activity along this corridor.

Industrial

The major industrial areas within the Sedibeng District include the Arcelor Mittal Steel plant close to the N1 freeway in Vanderbijlpark; the Duncanville, Leeuwkuil, Powerville and Peacehaven industrial complex around the Vereeniging CBD; Meydustria and the Meyerton industrial area in the vicinity Meyerton CBD; the Daleside-Waterval industrial strip along route R59; and the Heidelberg and Springfield industrial areas in Heidelberg.

Agriculture

In terms of spatial extent agriculture is the dominant land use in the Sedibeng DM covering an area of about 340 418 ha of land which represents about 81% of the total district area.

Approximately 97 674 ha of the SDM area is under cultivation (crop farming), 4662 ha is irrigated and about 238 079 ha is utilised for grazing.

Farmers produce a variety of commodities within each of the local municipalities, of which their performance is very dependent on climatic conditions and may fluctuate from year to year. The following list indicates the dominant commodities within the SDM:

- Maize
- Grain
- Sorghum
- Wheat
- Soya
- Dried beans
- Ground nuts
- Sunflower seeds
- Vegetables
- Milk
- Beef
- Pork
- Mutton
- Lamb
- Goat
- Eggs
- Poultry

It is evident that tunnel/ shade net farming is concentrated around route N1 in the vicinity of the Vaal River and around the Walker Fruit Farms and Homestead Apple Orchards areas in the Midvaal area.

Cattle and chicken farming occur extensively throughout the municipal area with the Karan feedlot to the south-west of Heidelberg being a prominent facility. The Eskort pig abattoir is located in the Springfield industrial area in Heidelberg.

Grain silos are mainly concentrated in the rural area between Meyerton and Heidelberg (four silos), and between Heidelberg and the north-eastern border of the study area (five silos).

The Agri Park initiative was also introduced to the Sedibeng District during 2015/16. Part of the objectives of the Agri-Park project were to identify the four dominant or most feasible commodities within the district. Based on the analysis, the three priority commodities identified for the Sedibeng DM include vegetable, broiler and production. A detailed analysis was conducted of the local, global, capital and commodity markets for each of the selected commodities.
It was proposed that the Rietkuil Agri-Hub (AH) and Sebokeng Agri-Park (AP) will be located in the Sedibeng DM.

a) Rietkuil Agri-Hub

The proposed AH in Rietkuil was chosen by DRDLR for the following locational characteristics:

- There is good road and rail connectivity (next to N1);
- There are at least ± 4 Pick n Pay food stores in the area;
- At least 11 SPAR food stores in the area;
- 28 CASP Projects in the area;

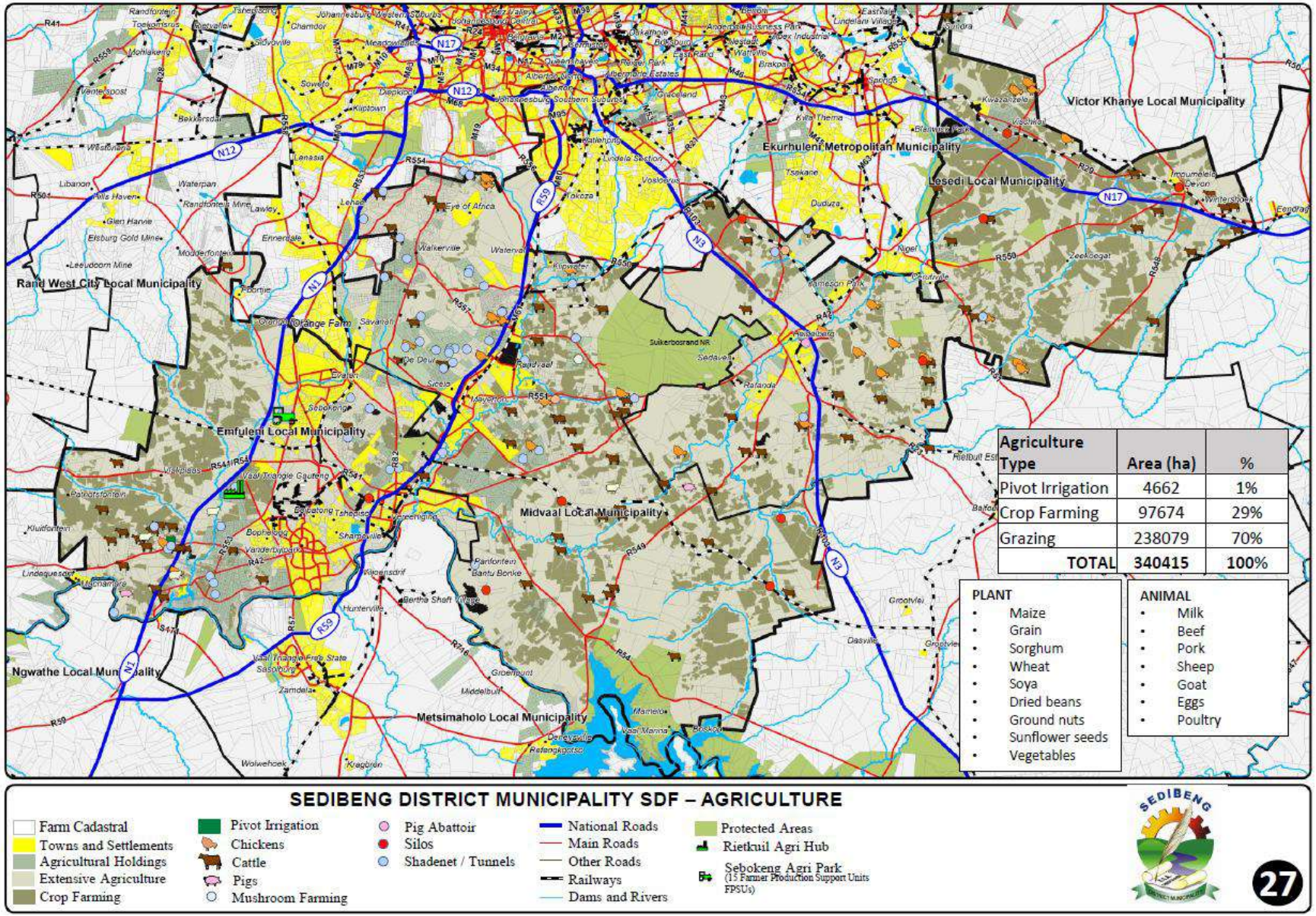
- Land Reform acquisition projects to the west of Doornkuil;
- Moderate and High potential land capability;
- Nine abattoirs in the area;
- Many land reform projects to the north west of Rietkuil;
- Four South African Grain Information Service (SAGIS) processors in the area;
- Potential vacant state land to the north and north west of the location;
- Proximity to the CRDP site to the east of Sebokeng;
- One cooperative close to the Rietkuil location;
- Close proximity to N1 national road between Gauteng and the Western Cape; and
- At least one fresh produce market to the east of Rietkuil.

b) Sebokeng Agri-Park

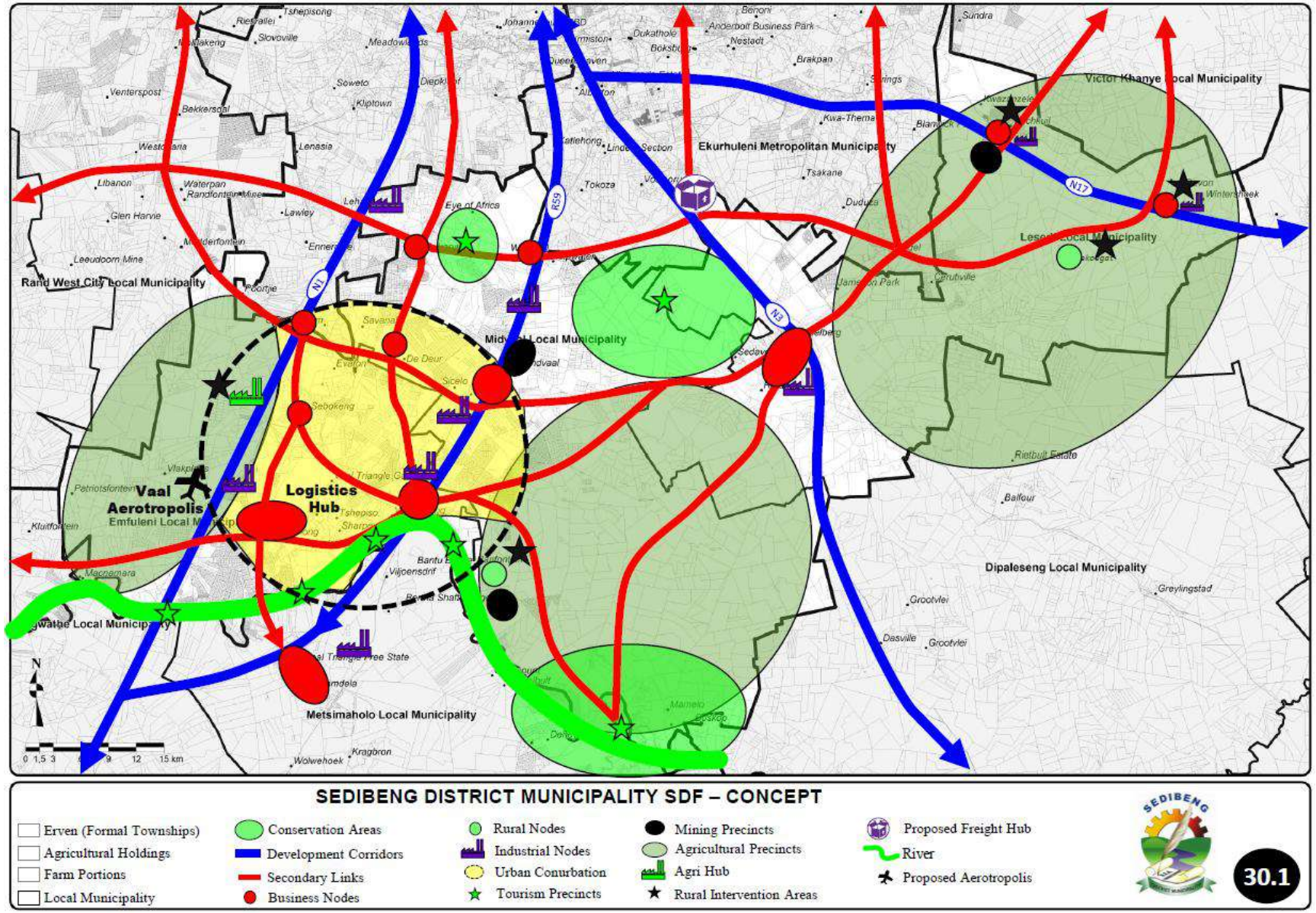
The site indicated for the Sebokeng Agri-Park (AP) is located near Sebokeng. The proposed AP in Sebokeng was chosen for the following locational characteristics by DRDLR:

- Good road and rail connectivity,
- Many PLAS projects to the west of the location,
- CASP projects and Ilima Letsema projects in the area,
- Land Reform acquisition projects to the west of Sebokeng,
- Moderate land capability,
- Fresh produce market,
- At least 11 SPAR food stores in the area,
- Good water supply in terms of rivers in the area,
- Potential vacant state land to the south and north west of the location,
- Proximity to the CRDP site to the east of Sebokeng,
- Location lies within the poorest wards (PIMD),
- Proposed location is surrounded by CASP 15 – 16 projects,
- Close proximity to N1 national road between Gauteng and the Western Cape,
- 2 RID projects to the south east of the proposed location, and
- Close proximity to the Emfuleni Regional Gateway.

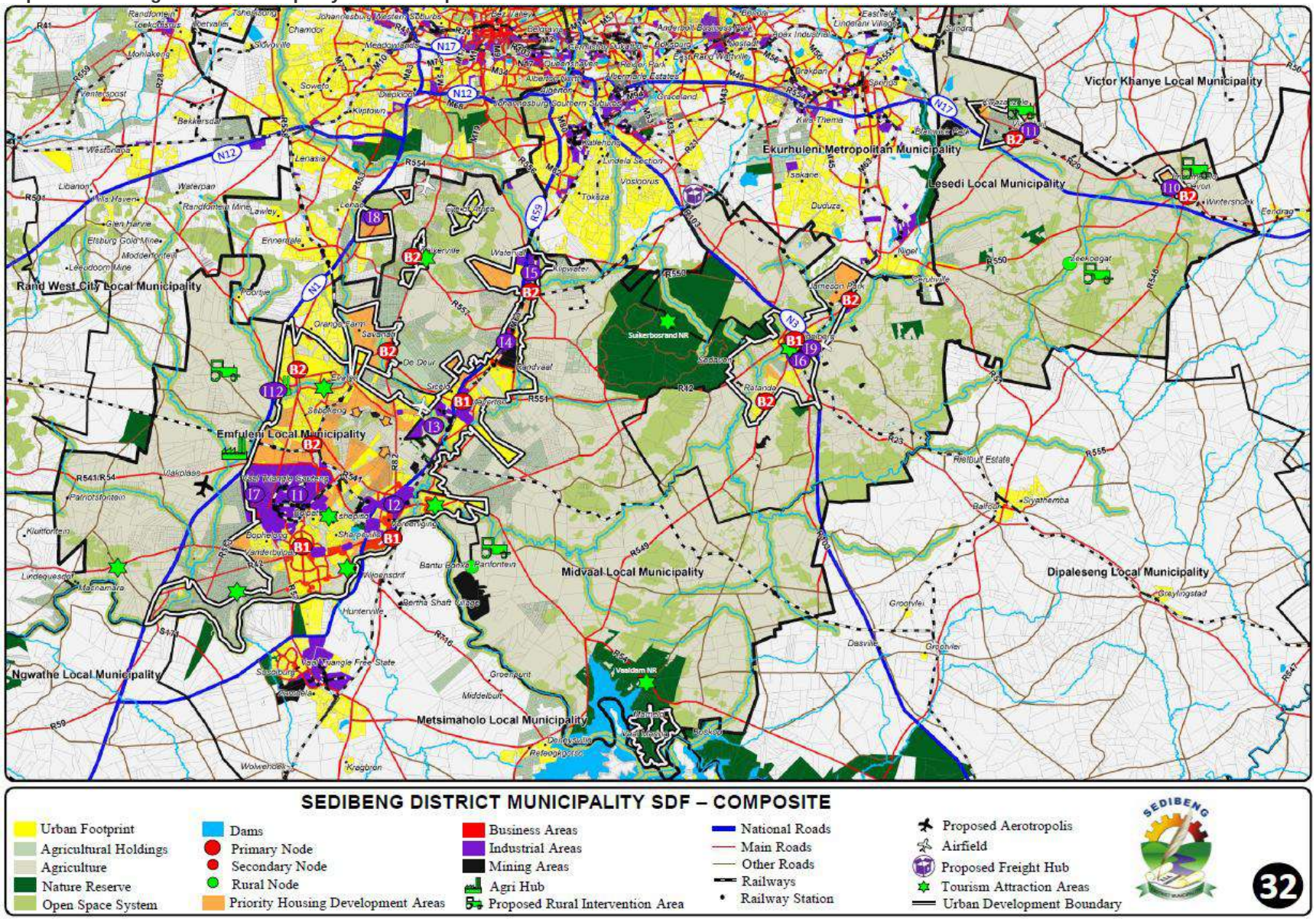
Map 2.3: Sedibeng District Municipality SDF – Agriculture



Map 2.4: Sedibeng District Municipality SDF – Concept



Map 2.5: Sedibeng District Municipality SDF – Composite SDF



Sedibeng District Priority Nodal Hierarchy

Primary Nodes	Secondary Nodes	Rural Nodes
•Vereeniging •Vanderbijlpark •Meyerton •Heidelberg	•Sebokeng •Evaton •De Deur •Walkerville •Savannah City •Waterval •Ratanda •Jameson Park •Devon/ Impumelelo •Kwazenzele/ Vischkuil	•Langzeekoegat •Bantu Bonke

Vanderbijlpark, Vereeniging, Meyerton and Heidelberg towns fulfil the function of primary activity nodes, offering the highest order and widest range of goods and services to other towns and settlements as well as the rural parts of the District. These are also represented as nodes in provincial context in terms of the Gauteng SDF.

2.2.4 Local Plans and Strategies

2.2.4.1 Emfuleni Spatial Development Framework

Within the regional context, Emfuleni is situated at the southern end of the Gauteng urban conurbation. Emfuleni is tied into the rest of Gauteng via two north-south corridors that are aligned along the N1 and the R59 freeways respectively. These corridors also link Emfuleni to areas located in between, such as Orange Farm, Soweto, Meyerton and Germiston. The N1 corridor is paralleled by a commuter railway line, which links Vereeniging to the Johannesburg CBD via Sebokeng and Orange Farm. A freight railway line links Vereeniging to Germiston, via Meyerton. In essence, Emfuleni thus forms the southern anchor of the greater Gauteng urban conurbation.

In addition to the above, Emfuleni is becoming part of an emerging metropolitan area that comprises Sebokeng, Vanderbijlpark, Vereeniging, Meyerton and Sasolburg. As this emerging metropolitan area grows, it will become a similar urban structure south of Johannesburg as Tshwane is north of Johannesburg. It is important to view Emfuleni as part of this emerging metropolitan area in order to understand the development potential that is embedded in it, as well as to make planning decisions to facilitate the emergence of this metropolitan area.

Based on the regional context and the fact that Emfuleni forms part of an emerging metropolitan area, a development concept is proposed that aims to strengthen the role of the Emfuleni area as the southern anchor of the Gauteng urban conurbation. The Development Concept, which is illustrated by the Diagrams below, is made up of the following elements:

a. Urban infill and consolidation

Currently, urbanization within Emfuleni is highly fragmented. It is therefore imperative that future urban development and expansion within Emfuleni be done in a manner that achieves urban consolidation, density and compactness. There are many opportunities for infill development and consolidation within Emfuleni, but two areas in particular stand out. The first is a large tract of land located between Sebokeng and Vereeniging (in the Sonlandpark region including Roodt's Gardens, van der Merwe's kroon and Unitas Park Agricultural Holdings), which has the potential for infill development. The development of this land parcel will help consolidate the existing fragmented urban structure and help strengthen the existing commuter railway line corridor stretching from Vereeniging to Evaton.

Secondly, there is an opportunity for infill development along the Vaal River, between Vanderbijlpark and Sasolburg. If Emfuleni is considered without the provincial boundary and only as a functional urban area, the linkage between Vanderbijlpark and Sasolburg is obvious. Filling in the area between Vanderbijlpark and Sasolburg will place the Vaal River at the centre of this emerging metropolitan area, making it a true river city. It will be the only river city in Gauteng, which will give it a unique characteristic within the Gauteng urban conurbation.

b. Movement pattern and transportation structure

As mentioned, when discussing the regional context, Emfuleni is tied into the rest of Gauteng via two north-south road corridors that are aligned along the N1 and the R59 freeways respectively. In addition to these roads, a primary internal road network serves Emfuleni that connects its nodal structure to the rest of Emfuleni. These primary internal roads include the K83 that connects Evaton to Meyerton, the K53 that connects the Sebokeng CBD to the Vanderbijlpark CBD, the K55 that connects the Sebokeng CBD to the Vereeniging CBD, and the K174 that connect the Vanderbijlpark CBD to the Vereeniging CBD. The network forms a triangle between the Sebokeng CBD, the Vereeniging CBD, and the Vanderbijlpark CBD. This triangular structure forms the bases for the development of a public transport system serving this emerging metropolitan area.

c. Nodal structure

Currently, Emfuleni is served by two established central business districts: the Vanderbijlpark CBD and the Vereeniging CBD. The Sebokeng CBD, situated at Sebokeng hostels and hospital, is an emerging Central Business District within Emfuleni. These central business districts form a triangle within Emfuleni that must become the focal area for urban development within Emfuleni. This can be done by consolidating urban development and expansion within this triangle. If developed appropriately, this triangular structure will not only become the focal area of Emfuleni, but also the focal area of the emerging metropolitan area that includes Meyerton and Sasolburg. The focal area within the triangle will be the Vereeniging CBD. The Vereeniging CBD is the terminus for the Johannesburg-Vereeniging commuter railway line, and it is therefore the regional gateway to Emfuleni. Vereeniging must therefore be strengthened by expanding it towards the Vaal River (the River City Concept). The Vaal River will provide the element that attracts public and private sector investment to this part of Emfuleni, which in turn will establish Vereeniging as the primary core area of Emfuleni.

d. Rail densification and proposed bus network

Developing the public transport network that serves the mentioned emerging metropolitan area can help create the spatial structure proposed above by becoming the backbone of the spatial structure. The first part of creating this public transport network will involve increasing the viability of the only existing public transport system serving Emfuleni, namely the Johannesburg to Vereeniging commuter railway line. To enable this will require the densification of land on both sides of the railway line at its commuter railway stations, using higher-density residential typologies. In addition to this, it will be necessary to create a secondary public transport system that feeds the commuter railway stations with commuters. This secondary public transport system can comprise of a bus network that links the various nodal areas in Emfuleni (including the Meyerton and Sasolburg CBDs) to the commuter railway stations. Because this system will serve three municipal areas (Emfuleni, Midvaal and Sasolburg), the costs of the development and operation of the system can be shared by all three municipalities, making the development and operation of the system more affordable.

The Emfuleni Aerotropolis

The initiative to develop the Emfuleni Aerotropolis has been established in recent years to promote economic development within Emfuleni area. These initiatives are intended to help generate employment opportunities in Emfuleni and thereby reduce the need for Emfuleni residents to travel large distances to access economic opportunities in other parts of Gauteng. Emfuleni Local Municipality envisages an aerotropolis that will currently encompass the Regional Airport, the Logistical Hub and the Agricultural Hub. Typical of any other aerotropolis, Emfuleni aerotropolis will have the proposed Regional Airport as the multimodal commercial central core with rings of other developments permeating outwards. Because an aerotropolis is a powerful engine of local economic growth which attracts many aviation-linked businesses, Emfuleni Aerotropolis will in time develop to form clusters and corridors of airport linked commercial, high-tech, and advanced manufacturing or industrial clusters as well as logistics facilities complemented by retail, entertainment, hotels, conferences, and exhibition centres.

The aim of the proposed regional airport as part of the Aerotropolis is to supplement the Logistics Hub proposed above, and to relieve the OR Tambo International airport and Rand Airport from the growth constraints they are

currently experiencing. Estimates show that the OR Tambo International Airport and Rand Airport are experiencing cargo and passenger growth rates that are unlikely to be satisfied by the future expansion plans of these airports. These expansion plans cannot be amended due to land and infrastructural constraints surrounding these airports. These constraints present an opportunity for the development of a regional airport in Emfuleni to capture some of the growth potential experienced by the mentioned airports.

The location of the proposed regional airport in Emfuleni is critical. The existing airstrips in Emfuleni (such as the existing airstrips near Roshnee and Bophelong) are not suitably located to be converted into a regional airport, because these airports are not located near major transport infrastructure, existing industrial hubs, or the logistical needs of the Vaal region. Consequently, the proposed regional airport was located North of the proposed Logistical Hub. In this locality, the regional airport can serve the proposed Logistical Hub, the Arcelor Mittal industrial hub, and have direct access to the N1 freeway linking the airport to the larger Gauteng region.

The regional airport in Emfuleni is expected to provide infrastructural support and enhance business viability to the proposed Logistical Hub, which will be established immediately south of the proposed airport. In addition, the airport will impact on the land use pattern of the areas immediately surrounding the airport. These will include the Arcelor Mittal industrial Hub, Bophelong residential area, and the Vanderbijlpark CBD. In particular, the strip of land along the P155 will benefit from the regional airport and the proposed logistical Hub.

The newly proposed logistics hub location is within the 5 km radius from the proposed airport site, west of the N1 Freeway. The repositioning of the logistical hub within the aforesaid parameters is directly motivated by numerous local and offshore findings gleaned from various feasibility studies randomly carried out, which demonstrated a proportionally high success rates of aerotropolis economies where logistical hubs are in close proximity to airport sites. A recent study on aerotropolis carried out by the national government arrived at similar findings pointing to much optimised economic success potential of aerotropolis regions where airport sites, logistic hubs and special economic zones (SEZs) are closely located to each other as opposed to haphazardly spread out and far from each other. It is therefore on the strength of the outcomes of studies that ELM proposed the re-location of the logistical hub to the west of the N1 Freeway to ensure turbocharged public and private sector investments incentivised by unleashed economies of scale, infrastructure practicability, enhanced high potential returns on investment, and general regional economic growth.

Emfuleni local Municipality has reached an agreement with a few other role players, such as Transnet, Arcelor Mittal and the Gauteng Department of Economic Development, that a logistical hub in Emfuleni be considered as an important flagship project within the Vaal region. The Gauteng Provincial Government will need to designate the proposed Logistical Hub a Special Economic Zones (SEZ) to increase the potential of this Hub being realized. The potential components of the Logistics Hub include a Transnet container depot, an Industrial Development Zone, an airport, warehouses and storage Facilities, and Intelligence Information Infrastructure.

The proposed Vaal Logistical Hub is expected to provide O.R. Tambo with a suitable regional logistic facility to the mutual benefit of both Emfuleni and Ekurhuleni Municipalities. In addition, the logistical hub will contribute to improving burdening transport costs and traffic congestions, make Emfuleni more attractive to local and foreign investments, and create employment opportunities which may have otherwise not been realized.

The last component of the Aerotropolis is the Agripark. Sedibeng District Municipality in consultation with the Gauteng Department of Agriculture and Rural Development and the Department of Rural Development Land Reform has taken the initiative to develop an Agripark on Rietkuil Farm. Rietkuil Farm is situated within the Emfuleni Local Municipality area, about 66km south of Johannesburg and located in close proximity to the N1 Highway and K178 Road. The site therefore enjoys good visibility along the N1 highway, regionally and beyond. It is approximately 435 hectares in extent. The term Agripark has often been referred to as a networked innovation system of agro-production, processing, logistics, marketing, training and extension services within a district municipality.

In 2015 the national government launched the Agri-parks programme as one of the cornerstones of rural economic transformation. Agri-parks have been identified as the vehicle that will kick-start rural economic transformation and

encourage growth of the smallholder farming sector, thus, in a areas that had seen slow growth due to a lack of resources, including markets for the sale of produce, livestock, skills and infrastructure. The creation of agri-parks will therefore breathe new life into South Africa's rural areas, revitalise small towns, increase employment and contribute to food security and broader economic opportunities. This initiative can create up to 300 000 new small-scale producers as well as 145 000 new jobs in agro-processing in the next five years.

Prior to the refinement and consolidation of the Agri-hub concept by Department of Rural Development and Land Reform (DRDLR) and the Gauteng Department of Agriculture and Rural Development (GDARD), various parcels of land situated west and south-west outside the determined Emfuleni Local Municipality's Urban Development Boundary (UDB) were earmarked collectively as the Agri- hub. However, successive refinements did not only define an Agri-hub but configured the concept within the broader contextual scheme of the overall agricultural programmes. According to DRDLR, an Agri-hub is one of the three primary components constituting an Agri-Park in addition to Farmer Production Support Units (FPSU) and Rural Urban Marketing Centre (RUMC).

"An Agri-park is a farmer-controlled entity that serves as catalyst around which rural industrialisation is planned to take place, according to a statement. The aim is for the park to provide a network of contacts between producers, markets and processors, as well as infrastructure to process agricultural products", as defined by the DRDLR (2017).

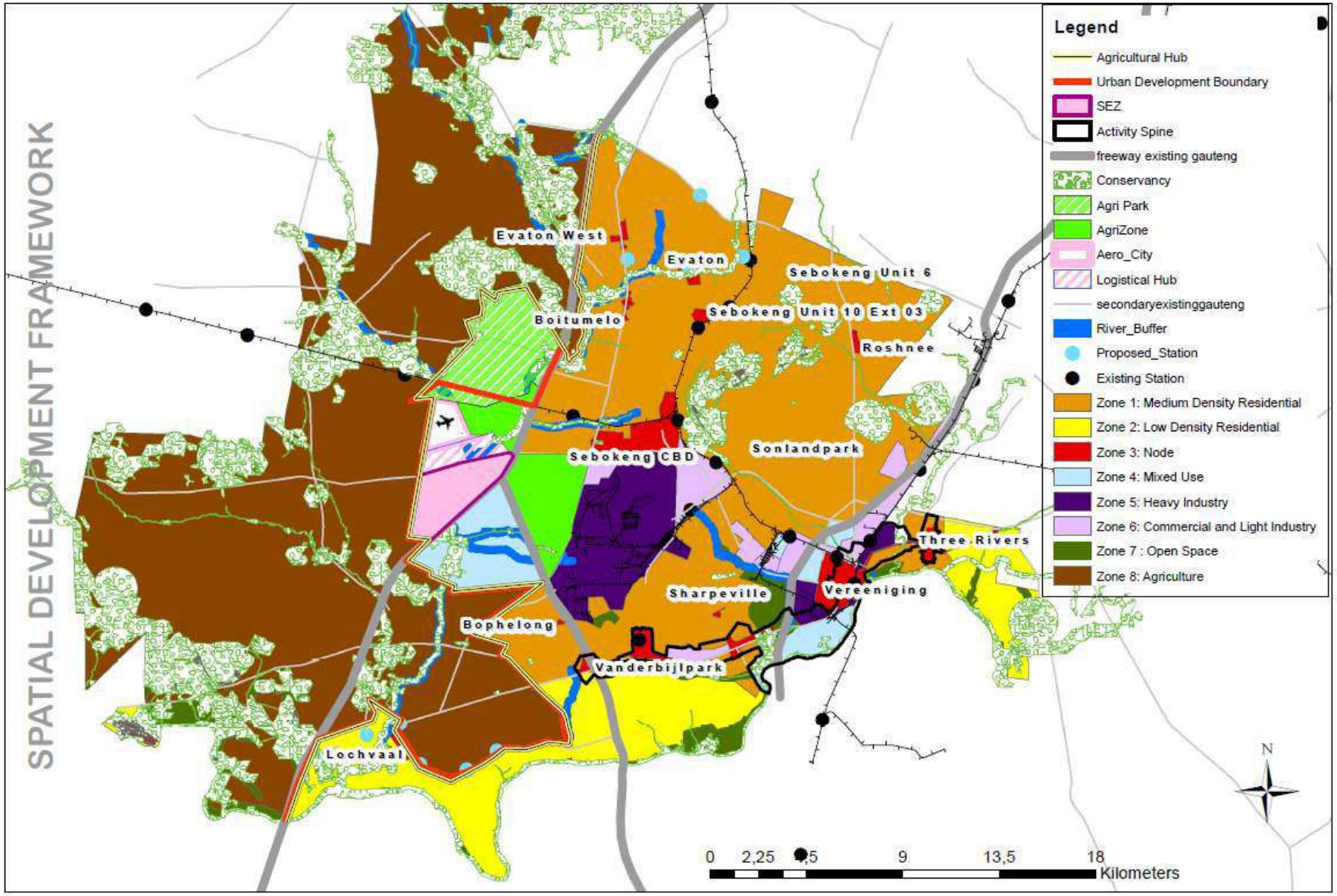
DRDLR elaborates that "Agri- hubs (AH) are located in central places in a district, preferably places with sufficient physical and social infrastructure to accommodate storage/warehousing facilities; Agri-processing facilities; packaging facilities; logistics hubs); agricultural technology demonstration parks; accommodation for extension support training; housing and recreational facilities for labourers. AH receive primary inputs from FPSUs for processing, value adding and packaging, which is through-put into the Rural Urban Market Centres or exported directly to markets".

Concepts on Agri-park, Agri- hubs and FPSUs will be comprehensively detailed in the relevant precinct plan being formulated and to be approved by the end of the year.

Potential Benefits of the Aerotropolis

- It will attract new investment and have a positive impact on the socio-economic development of the Vaal region.
- It will diversify and grow the Vaal economy.
- It will create job opportunities that will address unemployment in the Vaal region.
- It will afford local people the opportunity to participate in the economy through business partnering, business establishment, training, and skills development.
- It will create a greater demand for Arcelor Mittal's manufacturing output.
- The location of the Logistics Hub at Arcelor Mittal will help minimize transport cost of materials.
- It will create various opportunities for BBBEEE and SMME's within the Vaal region; and
- Kick-start downstream manufacturing in Emfuleni.
- Reduce transport costs of goods from areas surrounding the airport and enhance tourism opportunities within the Vaal region.

Map 2.6: Emfuleni Local Municipality Spatial Development Framework



Map 2.7: Emfuleni Local Municipality SDF Proposed Nodal Structure

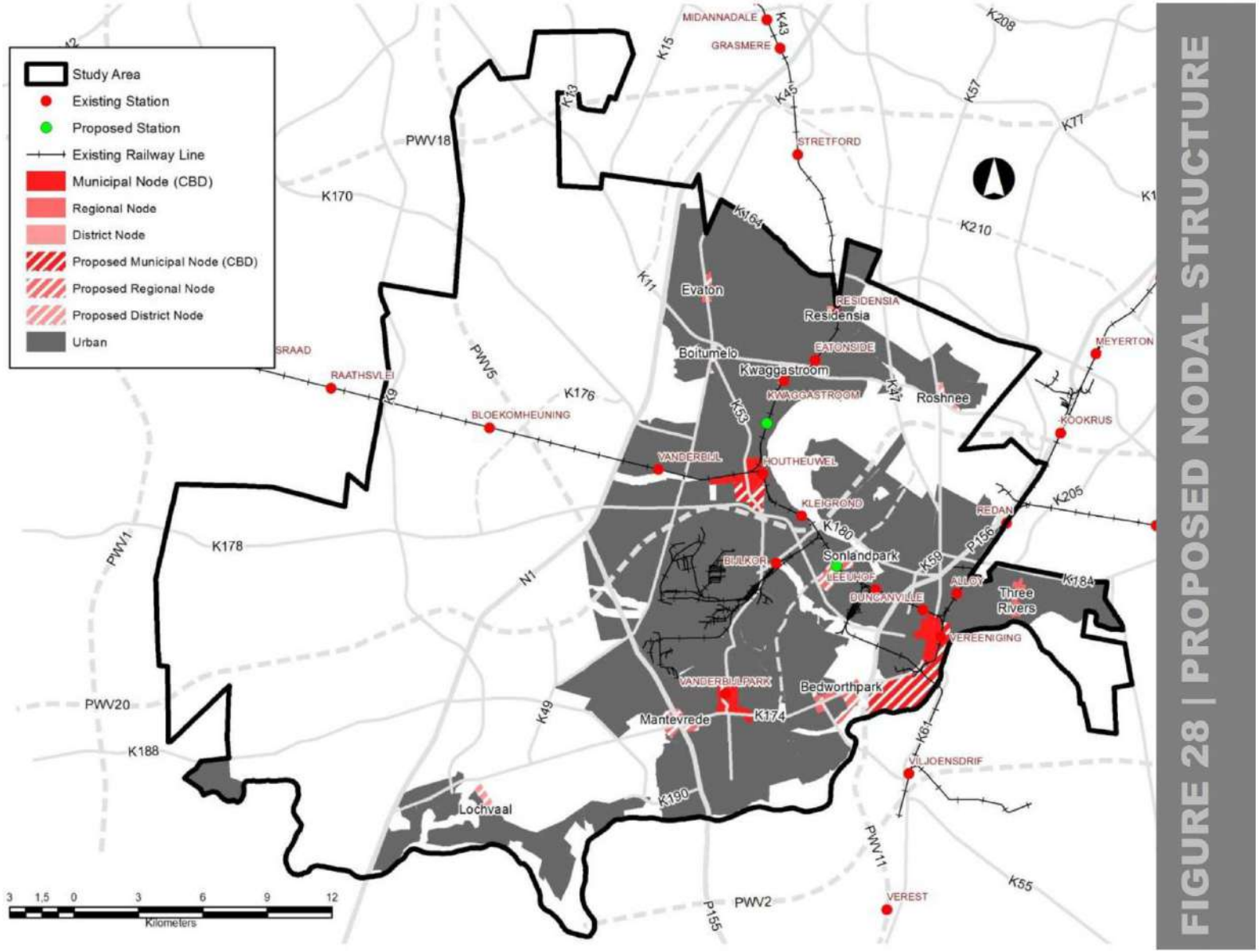


FIGURE 28 | PROPOSED NODAL STRUCTURE

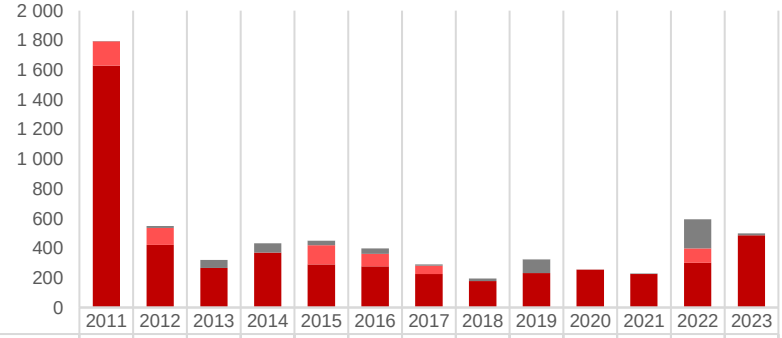
2.3 BUILDING STATISTICS[2]

EMFULENI LOCAL MUNICIPALITY: TOTAL BUILDINGS COMPLETED BETWEEN 2011 AND 2023 (PRIVATE SECTOR)

The historical trends of the Emfuleni Local Municipality show that the following has been completed between 2011 and 2023.

		Total	Average per annum
Residential Buildings	Dwelling-Houses	5 159 units	397 units
	Flats	1644 units	50 units
	Townhouses	534 units	41 units
	Other Residential (incl. Tourism Accommodation)	6 units	0.5 unit
	TOTAL residential	**6 343 units**	**488 units**
Non-Residential Buildings	Shopping Space	33 758m²	2 597m²
	Office and Banking Space	24 015m²	1 847m²
	Industrial and Warehouse Space	47 742m²	3 672m²

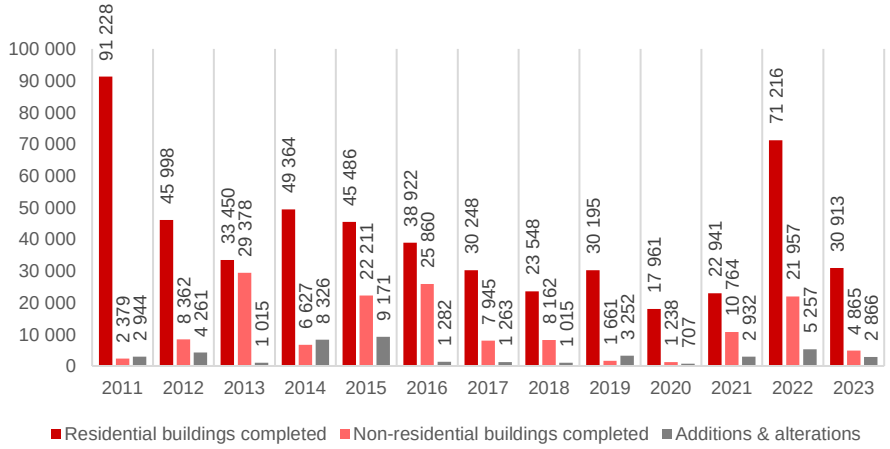
Dwelling Houses, Flats & Townhouses Completed (no of units)



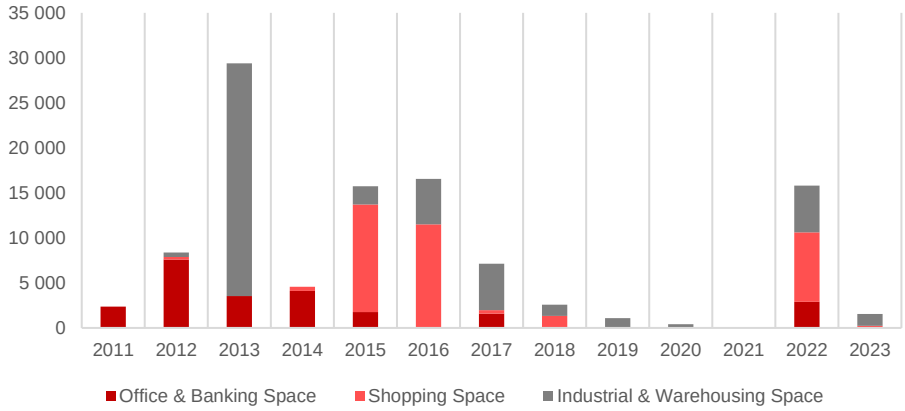
	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Other	0	0	0	0	1	0	0	0	2	1	2	0	0
Townhouses	1	14	54	63	31	36	9	17	94	0	6	196	13
Flats	165	115	0	0	129	84	55	0	0	0	0	96	0
Dwelling Houses	1 629	421	266	370	290	278	226	178	232	255	225	302	487

Dwelling Houses Flats Townhouses Other

Buildings Reported as Completed (sqm)



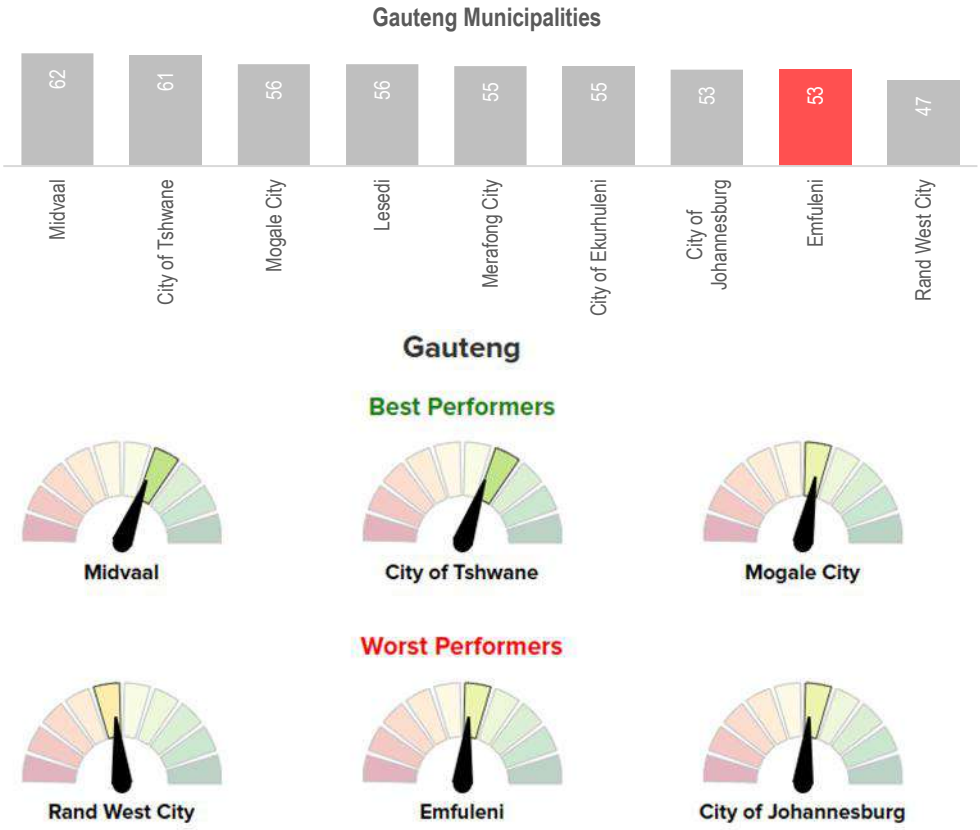
Non-residential Space as Completed (sqm)



[2] *Building Plans Stats SA, 2022*

2.4 State Of The Municipality

The Out of Order Index is an index that allocates each of the more than 200 local municipalities and eight Metros a score on a scale from 0-100, where 0 is a failure and 100 is perfectly performing. The data used are sourced from authoritative sources, such as National Treasury's budget data which is used for calculating budget allocations to municipalities, the Auditor-General's reports, and Statistics South Africa. Unlike other approaches, the Index does not only include pure financial metrics, but also measures of unemployment, poverty, and basic service delivery to households. Some factors are within the direct control of the municipality and others are not, but all affect their trajectory as sustainable entities.



FACTORS that contribute towards the Emfuleni Local Municipality's Out of Order Index Score:

Indicators

Some key factors contributing to the index

Money not spent properly
R0

Operating budget
No Data

Maintenance spending
No Data

Number of households
259,468

% of households that are poor
58%

% of households receiving water
99%

% of households receiving electricity
86%

% of households receiving sewerage services
95%

% of household receiving rubbish removal
88%

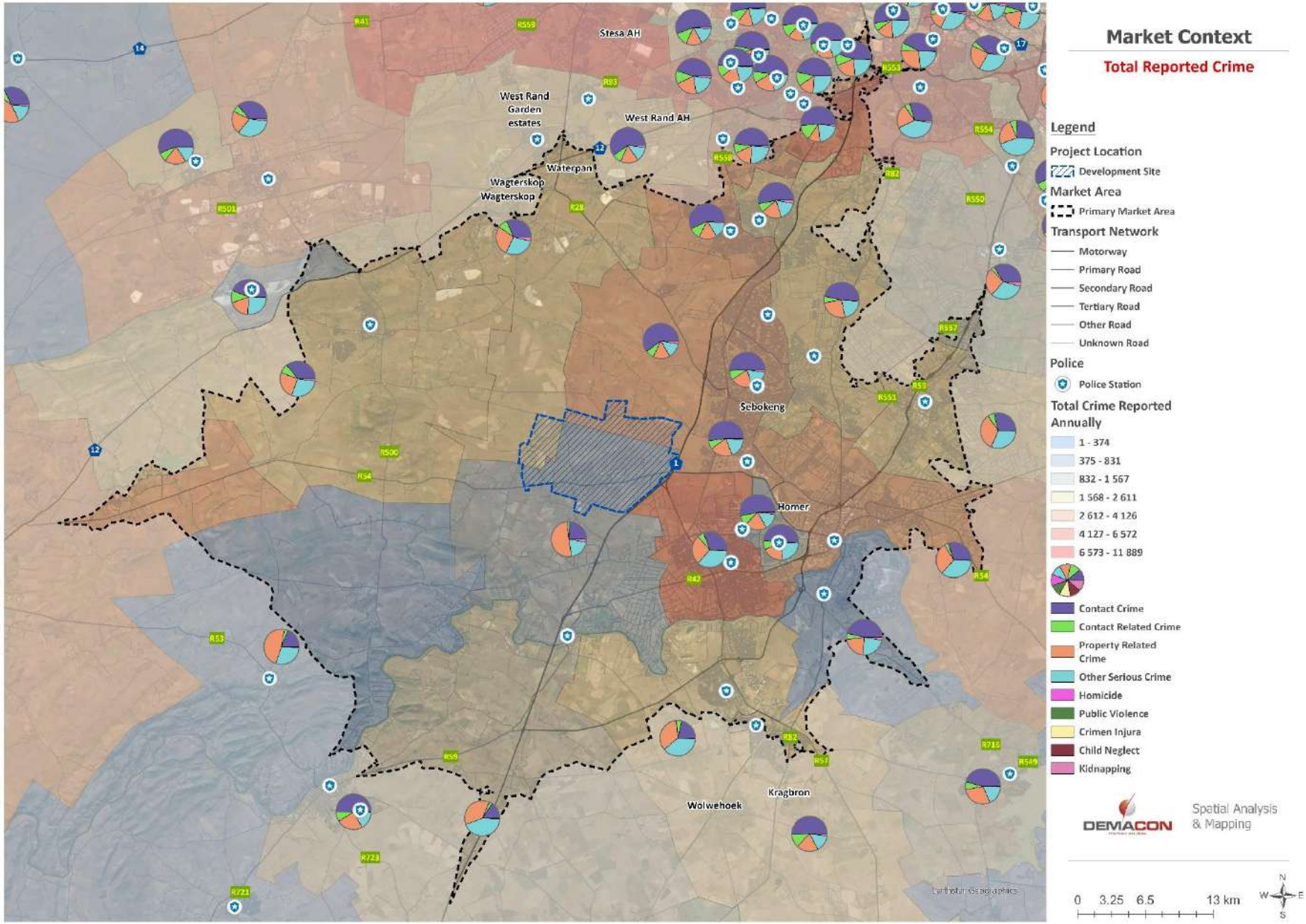
% of operating budget spent on staff wages
16%

Latest Auditor General Report:

Overall, audit outcomes regressed over the term of the previous administration due to a lack of institutionalised preventative controls. Municipal managers and senior management did not fulfil their responsibility to develop and effectively implement the basic controls that form the foundation of a sound control environment. Although we commend the province for the improvement in the 2020-21 audit outcomes, the improvements are not sustainable because weak control environments and a lack of decisive action to address transgressions persist.

Source: DEMACON ex SAPOA, Auditor General SA & News 24, May 2023

Map 2.8: Primary Market Area Crime Statistics



2.5 PROJECT LOCATION ASSESSMENT

Market potential is influenced not only by consumer income and expenditure, but in particular also by the characteristics of the site/location where future development activities are to take place. To this effect, DEMACON Site Evaluation Models © are utilised.

These DEMACON models are pragmatic and are based on the assignment of values to various location factors. Firstly, the site is evaluated on a ten-point scale, with ten being the highest. Secondly, weights are attached to these factors, in order of importance (1 to 5, with 5 being the most important).

* Note: 80%+ indicates an exceptional site rating; a site rating of 70 – 80% is high and indicates that most important fundamentals for a successful development is in place; a rating of 60 – 70% indicates some critical factors may be lacking but could possibly be addressed; projects with a sub 60% rating are not recommended for consideration.

Table 2.2: Residential Location Assessment

Locational Factors	Grade 1-10	Weight 1-5	Score
Perceived Level of Safety and Security	7	5	35
Area Price Profile Compatibility	7	4	28
Address Value	7	4	28
LSM / SEM Profile	7	5	35
Perceived Quality of Residential Environment	7	4	28
Tempo of Residential Growth / Influx / Demand	8	5	40
Within direction of Current & Future Growth	8	5	40
Perceived investment value & Impact	8	4	32
Access to main roads	8	3	24
Proximity to workplace	7	3	21
Proximity to schools	6	4	24
Proximity to retail facilities	6	4	24
Proximity to social amenities	6	3	18
Proximity to public transport	7	3	21
Availability of Land / Developable / Redevelopable Real Estate	8	3	24
Total			**422**
Score			**71.5%**

Source: DEMACON, 2024

Table 2.3: Retail and Automotive Location Assessment

Locational Factors	Grade 1-10	Weight 1-5	Score
Consumer Volumes	6	5	30
Income / SEM profile	7	5	35
Population Growth	8	4	32
Visibility	8	4	32
Accessibility	8	4	32
Functional & Complimentary Uses	6	3	18
Effective Market Gap	7	4	28
Proximity to Public Transport & Intermodal Facilities, e.g. Rail/Taxi/Bus terminus	7	3	21
Address Value	7	4	28
Availability of Land	8	4	32
Future Expansion Potential	8	4	32
Directional Growth of Area	8	4	32
Proximity to Labour	8	3	24
Proximity to Suppliers	7	3	21
Perceived Level of Security	7	4	28
Total			**425**
Score			**73.3%**

Source: DEMACON, 2024

Table 2.4: Industrial Location Assessment

Locational Factors	Grade 1-10	Weight 1-5	Points
Address Value	7	3	21
Accessibility	8	5	40
Visibility	8	4	32
Proximity to Key Transport Infrastructure - Airport, Port, Railway	8	5	40
Proximity to freeways	8	5	40
Centrality to Market Area	7	5	35
New / Emerging Industrial Node / Corridor	7	4	28
Functional and Complimentary Uses	6	4	24
Absence of Competitive Products - Market Gap	7	4	28
Proximity to Labour Force - unskilled, semi-skilled and skilled	7	4	28
Available Infrastructure	7	4	28
Availability of Land	8	3	24

Locational Factors	Grade 1-10	Weight 1-5	Points
Future Expansion Potential	8	4	32
Perceived Level of Security	7	4	28
Located in Direct Line of Growth	8	4	32
Total			**460**
Score			**74.2%**

Source: DEMACON, 2024

Table 2.5: Office Location Assessment

Locational Factors	Grade 1-10	Weight 1-5	Points
Accessibility	8	3	24
Visibility	8	5	40
Address Value - Popular Office Address	5	5	25
Moderate to Higher LSM / SEM Profile	6	4	24
Proximity to Educated / Highly Skilled Labour Force	6	4	24
Established Office Address / Monitored Node	5	5	25
Functional and Complimentary Uses	5	4	20
Emerging Commercial Node	5	5	25
Proximity to Freeways / Major Provincial Routes	8	4	32
Proximity to Intermodal Facilities, e.g. BRT, Gautrain, Rail/Taxi/Bus terminus	7	3	21
Availability of Land	8	3	24
Future Expansion Potential	8	3	24
Perceived Level of Security	7	4	28
Directional Growth of Aea	8	3	24
Total			**360**
Score			**65.5%**

Source: DEMACON, 2024

Table 2.6: Hotel Location Assessment

Locational Factors	Grade 1-10	Weight 1-5	Points
Accessibility	8	3	24
Visibility	8	5	40
Address Value	7	4	28
Effective Market Gap	6	5	30
Star Rating Market Gap	6	5	30
Proximity to Key Transport Infrastructure - Airport, etc	8	5	40
Proximity to Established Commercial Nodes / Mining areas & other key econic drivers	6	4	24
Proximity to Retail / Entertainment Facilities	6	4	24
Proximity to Convention Centres / Conference Facilities	6	4	24
Established Tourism Destination / Region (leisure or business)	6	4	24
Proximity to Tourism Facilities / Services - Clustering	6	4	24
Perceived Level of Security	7	3	21
Total			**333**
Score			**66.6%**

Source: DEMACON, 2024

The development site scored a rating of 74.2% for industrial, 73.3% for retail / trade / automotive, 71.5% for residential, 66.6% for hotel and 65.5% for office development. A site rating of above 70% indicates that all of the critical success factors for development are in place, whilst a rating of between 60% and 70% indicate that certain factors might be lacking and will have to be addressed to ensure successful development.

2.6 SYNTHESIS

The development site is situated within the Emfuleni Local Municipality. Due to the size and nature of the proposed development, national, district and local policies were evaluated.

The NDP, in terms of the rural economy identifies that rural economic growth should ideally target three aspects:

- Agricultural development based on successful land reform, employment creation and strong environmental safeguards. To achieve this, irrigated agriculture and dry-land production should be expanded, with emphasis on smallholder farmers where possible. To this end, established agricultural industries must be enabling partners.
- Quality basic services, particularly education, health care and public transport. Well-functioning and supported communities enable people to

seek economic opportunities. This allows them to develop their communities further through remittances and the transfer of skills, which will contribute to the local economy.

- In areas with greater economic potential, industries such as agro-processing, tourism, fisheries (in coastal areas) and small enterprise development should be developed with market support. Special focus to enhance skills and capabilities of rural women entrepreneurs with access to land and finance.

The NDP furthermore highlights the need to "provide innovative market linkages". Make provisions to link small-scale farmers in the communal and land-reform areas to markets in South Africa and further afield on the subcontinent. This will require improved road and rail infrastructure to usher farm products to and through the value chain and to markets, and improved communications infrastructure to inform agricultural role-players about buying and selling prices and supply-and-demand trends. Linking farmers to markets will also require infrastructure for processing and value addition and new forms of intermediaries, such as cooperatives, to help small producers achieve economies of scale in processing. Farmers also need cold-chain infrastructure if they are to access markets for high-value produce and rural consumers.

Aggressively expand trade and investment in the region, on the continent and globally. This will require developing hard infrastructure (like road and rail networks) and soft infrastructure (trade facilitation systems, supply-chain management, and customs controls and administration). South Africa should identify specific trade, manufacturing and industrial niches, where the country enjoys competitive advantages to make full use of the strong growth in East Asian economies and their interests on the African continent.

The development site forms part of the Central Innovation Belt, as identified by the NSDF. The area surrounding the core of the Gauteng Urban Region is spatially positioned to be an economically strong, diverse production area that forms an integral part of the core economic driver of the country and the sub-continent. The Central Innovation Belt (CIB) is (1) a key contributor to national economic growth and employment, and (2) a crucial surface water production area, i.e. the Vaal Catchment. The NSDF state that the CIB should support large-scale regional economic and employment change in the region through innovation, diversification, adaptation and the repurposing of existing industrial land and associated infrastructure. Expedite urban and rural land reform, consolidate existing small and- medium-scale agriculture support programmes, protect and optimise high-value agricultural land, and strengthen the focus on job-intensive agro-processing in the area.

The GSDF has identified Vereeniging, Vanderbijlpark and Sebokeng in the Emfuleni LM as key urban development nodes of provincial significance.

These nodes are to be linked via movement networks such as rail and road. Emfuleni major road and rail infrastructure are well developed; these traverse the area and are as follows:

- The N1 linking Pretoria with the Free State continuing to Cape Town to the south
- The K178 linking Vereeniging with the N1 and the North West Province
- to the west
- The K53 linking Vereeniging in the south with Johannesburg in the north
- The K59 linking Vereeniging with De Deur, Walkerville and Johannesburg to the north
- The rail line that links Vereeniging and Johannesburg to the north.

The Gauteng Spatial Development Framework has identified the importance of the R59 corridor to link Johannesburg, Ekurhuleni, Meyerton and Vereeniging. The close proximity of Johannesburg to Midvaal, linked by the R59, R82, M61 and N1, has contributed to the development of residential areas in the north of Midvaal as dormitory areas for people working in Johannesburg. Recently industrial/commercial areas have also developed in the northern part of the Midvaal Municipality adjacent to the R59 route, which takes advantage of the accessibility, low land costs and proximity to the Johannesburg, Tshwane and Ekurhuleni Metropolitan areas. Areas of strategic development are mainly focusing on future development along the R59 corridor, Henley-on- Klip, Vaal Marina/Mamello, De Deur, Walkerville and Savannah City. In addition, the densification of existing urban areas and emerging areas such as Riversdale is a key priority for the Municipality

The development site is situated within the Gauteng City Region. The GSDF 2030 is to contextualize and prioritise the existing and proposed SEZs in the broader Gauteng context including OR Tambo SEZ, TA SEZ and proposed Vaal

SEZ. The Gauteng SDF further mentions the Vaal Agrotropolis to be spatially referenced and bolstered for joint spatial prioritisation.

The site indicated for the Sebokeng Agri-Park (AP) as identified in the Sedibeng District SDF is located near Sebokeng. The proposed AP in Sebokeng was chosen for the following locational characteristics by DRDLR:

- Good road and rail connectivity,
- Many PLAS projects to the west of the location,
- CASP projects and Ilima Letsema projects in the area,
- Land Reform acquisition projects to the west of Sebokeng,
- Moderate land capability,
- Fresh produce market,
- At least 11 SPAR food stores in the area,
- Good water supply in terms of rivers in the area,
- Potential vacant state land to the south and north west of the location,
- Proximity to the CRDP site to the east of Sebokeng,
- Location lies within the poorest wards (PIMD),
- Proposed location is surrounded by CASP 15 – 16 projects,
- Close proximity to N1 national road between Gauteng and the Western Cape,
- 2 RID projects to the south east of the proposed location, and
- Close proximity to the Emfuleni Regional Gateway.

The Emfuleni Local Municipality SDF also focuses on the potential aerotropolis development and provides potential benefits of the Aerotropolis

- It will attract new investment and have a positive impact on the socio-economic development of the Vaal region.
- It will diversify and grow the Vaal economy.
- It will create job opportunities that will address unemployment in the Vaal region.
- It will afford local people the opportunity to participate in the economy through business partnering, business establishment, training, and skills development.
- It will create a greater demand for Arcelor Mittal's manufacturing output.
- The location of the Logistics Hub at Arcelor Mittal will help minimize transport cost of materials.
- It will create various opportunities for BBBEEE and SMME's within the Vaal region; and
- Kick-start downstream manufacturing in Emfuleni.
- Reduce transport costs of goods from areas surrounding the airport and enhance tourism opportunities within the Vaal region.

The table below provides a summary of the site ratings for the different land uses.

Table 2.7: Location Assessments

Land Use	Rating
Industrial	74.2%
Retail / Trade / Automotive	73.3%
Residential	71.5%
Hotel	66.6%
Office	65.5%

The development site scored a rating of 74.2% for industrial, 73.3% for retail / trade / automotive, 71.5% for residential, 66.6% for hotel and 65.5% for office development. A site rating of above 70% indicates that all of the critical success factors for development are in place, whilst a rating of between 60% and 70% indicate that certain factors might be lacking and will have to be addressed to ensure successful development.

ECONOMIC ANALYSIS

3

3 ECONOMIC ANALYSIS

3.1 INTRODUCTION

Chapter 4 of the report provides an analysis and overview of the sub-regional economy within which the Vaal Aerotropolis will operate. The purpose of the economic analysis is to establish salient features, current trends, and functions of the sub-regional economy of the Vaal Aerotropolis (referring to the Emfuleni Sub-Regional Economy), most notably the economic profile and growth trends within the sub-regional economy. In addition to profiling the sub-regional economy, the chapter aims to identify the economic sectors/industries that should/could be targeted for investment and/or development. Therefore, this chapter provides insight into the composition and stability of the sub-regional economy and hence, offers a more comprehensive assessment of medium- to long-term investment prospects than the conventional demographic analysis.

Given the preceding, a complex but predictable relationship exists between the economy and urban real estate markets. The performance of specific economic sectors serves as a proxy for the performance of these real estate markets. By considering the performance of the sub-regional economy and highlighting the sectors and/or industries in the economy that can provide investment and/or developmental potential, land use opportunities can be identified for the local real estate market of Emfuleni as well as the Vaal Aerotropolis. In addition, the performance of the economy can determine the demand for land uses and also provide a perspective on their long-term development potential

The remainder of the chapter is discussed under the following main topics:

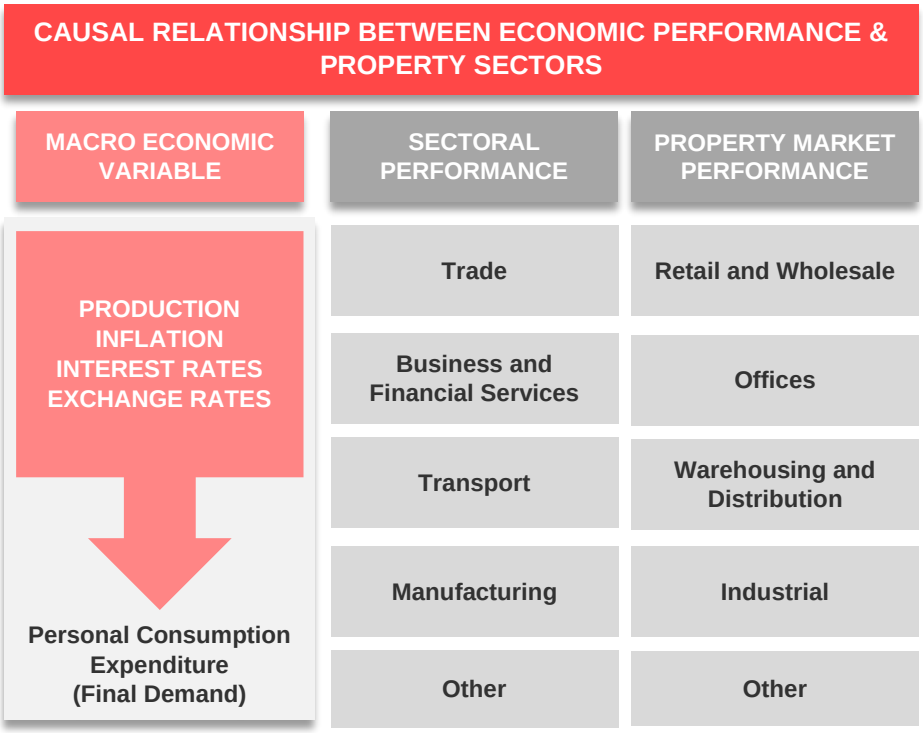
- Establishing the reference framework for the relationship between economic sector performance and property market demand
- Providing a perspective of macro-economic trends that influence different real estate markets
- Providing an overview of the local economy and its trends and performance
- Undertaking a competitive advantage analysis to establish industries/economic sectors that could/should be targeted for investment and/or development

3.2 REFERENCE FRAMEWORK

The causal relationship between economic sector performance and property market performance is illustrated in Diagram 4.1.

The economic indicators of an area form the basis for current demand for commercial product offerings and serve as drivers for future growth in demand. Subsequent paragraphs highlight the main indicators for the market area under investigation.

Diagram 3.1: Causal Relationship between Economic Performance and Property Sectors



©2024 H du Toit, Msc, PhD

3.3 Macro-Economic Trends and Performance

The following provides an overview of the current macro-economic trends and factors influencing national and local economic growth prospects, consumer demand growth and property market demand.

3.3.1 Economic Outlook for South Africa (August 2024)

Economic Growth	• South Africa's economic growth outlook for 2024, revised to **1.1% y/y.**		• Expectations for 2025: ○ BER: 2.2% y/y ○ SA Reserve Bank: 1.5% y/y ○ IMF: 1.2% y/y	
Inflation Rate	• SA Consumer Price Inflation on a Declining Trend since March 2023, falling from 7.1% to 5.1% (June 2024).	• Declining trend due to stronger currency value of the Rand and declining international food commodity prices.	• SA Reserve Bank lowered inflationary forecast to 4.8% for Q3 of 2024.	• Interest Rates not to be cut until CPIX reach 4.5% y/y.
Interest Rate	• First cut expected in September 2024 (25 basis points), with another cut in November 2024 (25 basis points).			

Post Election Trends

- The 2024 election has lined the way for a more effective and inclusive government, ready to implement the necessary reforms to drive economic growth.
- One key driver of this optimism is the ongoing "radical economic transformation", through the increased involvement of the private sector (emphasis on energy generation and logistical support).
- The coalition's commitment to constitutional principles, judicial independence and institutional integrity bodes well for future governance and policy implementation.
- This new government structure is likely to accelerate fiscal consolidation and enhance economic growth, making it easier to manage the budget deficit and debt ratio.
- The new government, welcomed by the markets, has already spurred a rally in the stock market and a strengthening of the rand.
- A stronger rand, coupled with reduced load-shedding, lower inflation and lower interest rates, will bolster confidence among consumers, businesses, and investors, underpinning economic growth.
- The enhanced role of the private sector in the economy, coupled with ongoing private sector initiatives in other areas, will enhance efficiency and productivity across the economy.
- The increased involvement of the private sector, coupled with strengthened institutions and improved confidence, sets the stage for a period of sustained growth and stability.
- While challenges remain the progress made thus far gives us reason to be optimistic about the future.

Indicators

Inflation and Lending Rates			Exchange Rates		
CPI	5.1%	Jun 2024	ZAR/ USD	18.49	Aug2024
PPI	4.6%	Jun 2024	ZAR/ GBP	23.66	Aug 2024
Repo Rate	8.25%	Aug 2024	ZAR/ EUR	20.28	Aug 2024
Prime Rate	11.75%	Aug2024	ZAR/ JPY	0.12	Aug 2024

Key Challenges

- Structural constraints, such as an underperforming education system, a regulated labour market and logistical issues will continue to impede growth.
- These issues need to be addressed comprehensively to unlock the full potential of the SA economy.
- However, the progress being made in addressing some constraints provides a solid foundation for sustained improvement. This momentum should be maintained through continued collaboration between government, the private sector and other stakeholders.

3.3.2 Macro-Economic Forecasts and Related Indicators

Macro-Economic Forecasts (July 2024)

Baseline scenario	2022	2023	2024f	2025f
ZAR/USD	16.36	18.45	18.60	19.10
Consumer price inflation (%)	6.9	6.0	5.1	4.7
Repo rate (end-of-period)	7.00	8.25	7.75	7.25
Real GDP growth (%)	1.9	0.6	0.9	1.3
Unemployment rate (%)	32.7	32.1	32.5	32.7
Probability weighted average	**2022**	**2023**	**2024f**	**2025f**
ZAR/USD	16.36	18.45	18.64	19.14
Consumer price inflation (%)	6.9	6.0	5.1	4.8
Repo rate (end-of-period)	7.00	8.25	7.85	7.30
Real GDP growth (%)	1.9	0.6	0.9	1.2
Unemployment rate (%)	32.7	32.1	32.5	32.8

South Africa Credit Ratings

	Rating	Outlook	Dates
S & P	BB-	Stable	Nov 2023
Moody's	Ba2	Stable	Nov 2023
Fitch	BB-	Stable	Jan 2024

Credit Fundamentals

South Africa's 'BB-' IDR is constrained by:	low real GDP growth, a high level of inequality, a high and rising government debt-to-GDP ratio, and a modest path of fiscal consolidation
Growth is hampered by:	power shortages that are expected to continue in the near to medium term, although at a lower magnitude than in recent months, and by a struggling logistic sector.
The ratings are supported by:	a favourable debt structure with long maturities and mostly local-currency-denominated, strong institutions, as well as a credible monetary policy framework.

Consumer Market Perspectives

Consumers are the lifeblood of the South African economy. More than 60% of the country's GDP comes from household spending. As such, the health of the consumer wallet is integral to the country's economic prosperity and social stability. South Africa needs accelerated employment growth in order to support a large-scale improvement in household financial wellbeing. This is only possible if all social partners—government, the private sector, labour unions, and community organisations—work together for the betterment of the economy and its people. Lullu Krugel, PwC South Africa Chief Economist

Consumer Threats

- Pressure on the cost of living as salaries and wages continue to fall behind consumer price inflation.
- Seeking answers from the new government for economic and employment growth concerns.

Optimistic About

- South Africans are more optimistic about the outlook for household finances but not about buying durable goods right now.
- Trends supporting more optimistic household sentiment towards retail spending include: a decline in load-shedding, expectations of interest rate cuts, and hopes for improved buying power of salaries and wages.
- The majority of consumers expect to spend more on essentials like groceries, clothing, and healthcare products in the next six months, while fewer expect to spend more on comfort and/or luxury goods like electronics and sports equipment.

"*While we are seeing some positive trends in the consumer market, shoppers are cautious about the economic outlook for the remainder of 2024 and heading into 2025. They will continue to be very price sensitive in their shopping activities and frequently compare prices across apps and shops to get the best deal. And they will prioritise essential products over comfort and luxury goods. For consumer-facing companies, this signals the importance of having deep knowledge of their customers and responding to their needs in order to build trust and deliver on expectations." NqabaNdiweni, PwC Africa Leader for Consumer and Industrial Products and Services (CIPS).*

Source: DEMACON ex Investec, SARB, Stats SA, 2024

3.3.3 SOUTH AFRICA PROPERTY MARKET OUTLOOK

The MSCI South Africa Index is designed to measure the performance of the large and mid-cap segments of the South African market. With 32 constituents, the index covers approximately 85% of the free float-adjusted market capitalization in South Africa.

CUMULATIVE INDEX PERFORMANCE – NET RETURNS (USD) (JUL 2009 – JUL 2024)

ANNUAL PERFORMANCE (%)

Year	MSCI South Africa	MSCI Emerging Markets	MSCI ACWI IMI
2023	1.50	9.83	21.58
2022	-3.88	-20.09	-18.40
2021	3.58	-2.54	18.22
2020	-3.96	18.31	16.25
2019	10.04	18.42	26.35
2018	-24.76	-14.57	-10.08
2017	36.12	37.28	23.95
2016	17.91	11.19	8.36
2015	-25.45	-14.92	-2.19
2014	5.21	-2.19	3.84
2013	-6.21	-2.60	23.55
2012	18.69	18.22	16.38
2011	-14.36	-18.42	-7.89
2010	34.21	18.88	14.35

INDEX PERFORMANCE – NET RETURNS (%) (JUL 31, 2024)

	1 Mo	3 Mo	1 Yr	YTD	ANNUALIZED 3 Yr	5 Yr	10 Yr	Since Dec 29, 2000
MSCI South Africa	5.18	14.84	4.86	10.00	0.78	1.66	0.08	7.66
MSCI Emerging Markets	0.30	4.84	6.27	7.81	-2.74	3.41	2.63	7.70
MSCI ACWI IMI	2.06	8.16	16.38	12.55	5.24	10.74	8.56	6.74

FUNDAMENTALS (JUL 31, 2024)

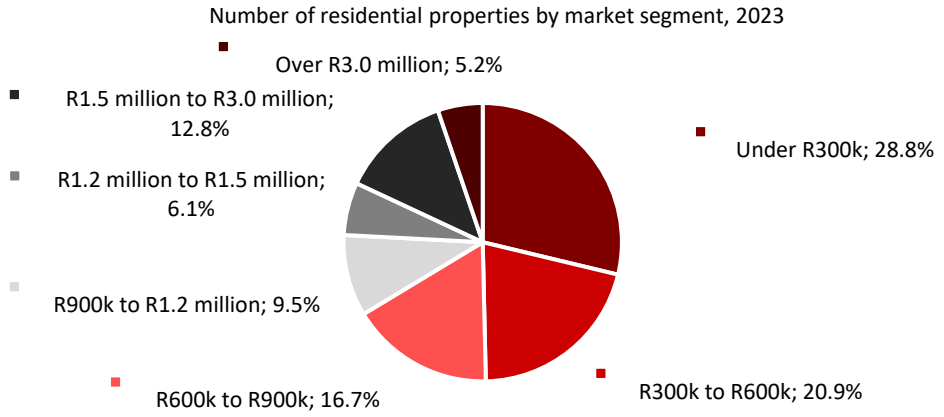
	Div Yld (%)	P/E	P/E Fwd	P/BV
MSCI South Africa	3.34	13.68	9.84	1.73
MSCI Emerging Markets	2.68	15.90	11.98	1.79
MSCI ACWI IMI	1.91	21.54	17.46	2.90

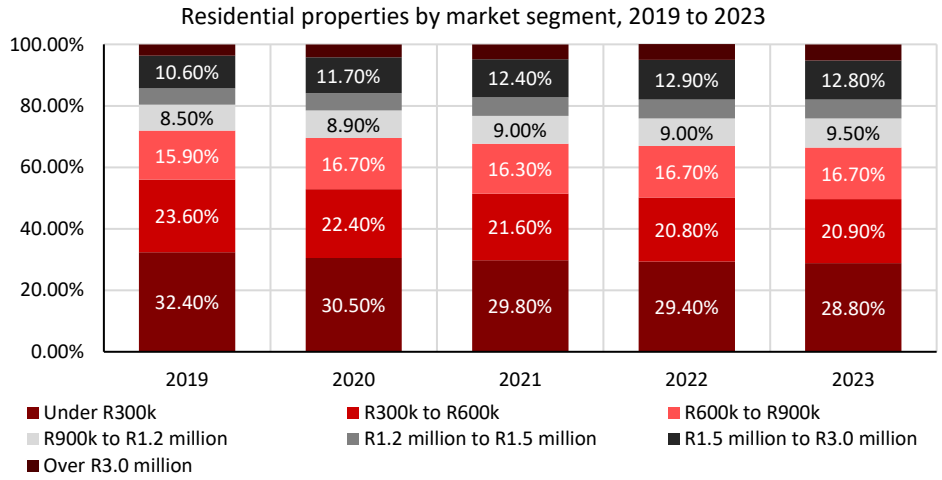
Source: DEMACON ex PWC, FITCH, S&P, Moody's

3.3.4 Residential Property Market Outlook

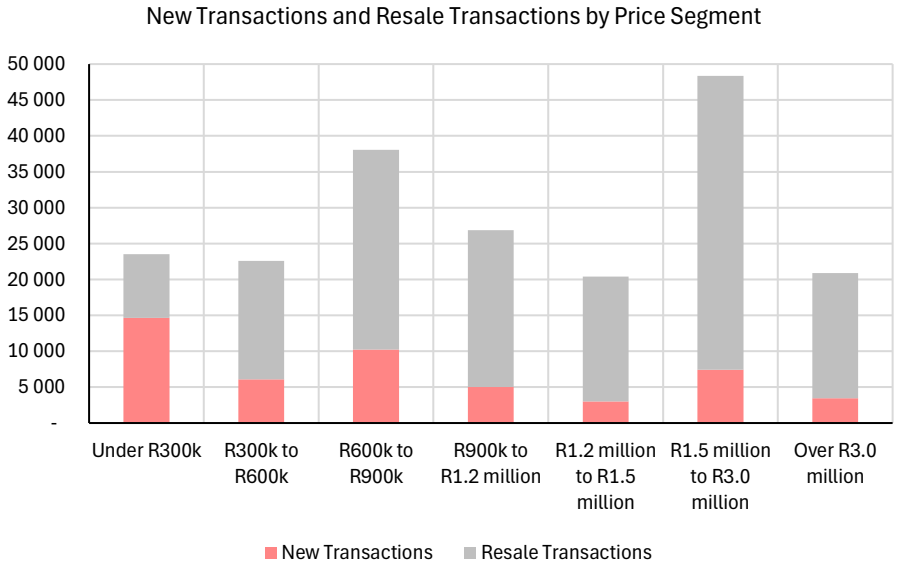
The South African residential property market size can be described as:

- 6.91 million properties
- These properties are valued at approximately R6.789 trillion





Source: DEMACON ex CAHF, 2024



Number of Transactions (2023)

- New Transactions: 49 893
- Resale Transactions: 150 738

Type of Property:

- Freehold Property: 86.0%
- Sectional Title Property: 14.0%

Entry market—Under R300k

Affordable market—R300k to R600k

Conventional market —R600k to R900k

High-end market—R900k to R1.2 million

Lower luxury market—R1.2 million to R1.5 million

Mid luxury market—R1.5 million to R3million

Top luxury market—R3 million+

House Price Inflation

- The average property price has increased by over 833% since 1994 when South Africa became a democracy, significantly outpacing inflation over the same period.
- This was revealed in Lightstone Property's latest report, which focused on house price inflation and data from the Deeds Office from 1994.
- National Level: current annual property inflation rate is 3.22%, and the monthly rate is 0.42%.
- Provincial level:
  - Compared with the national property inflation rate, the North West and Western Cape are the only provinces above the 3.2% benchmark.
  - Gauteng and KZN are below 1% (0.23% and 0.42%, respectively), while Limpopo is negative, at -1.14%.

	Low Value segment – **12.7%**
	Mid Value segment - **3.5%**
	High Value and Luxury segments - **2.1%** and **3.1%**

House Price Growth

- The FNB House Price Index edged up to 0.5% year-on-year (y/y) growth in June, a slight improvement from 0.3% in May.
- The low house price growth trajectory aligns with expectations given the persistent high living and borrowing costs.
- Notably, lower-priced segments and non-metro regions continue to perform better.
- Market strength indicators suggest a potential stabilisation in supply and demand dynamics, following a period of decline.
- We maintain a cautiously optimistic outlook for the remainder of the year.
- Slower price increases and the possibility of interest rate cuts support the bottoming out of buying activity.
- Additionally, if the new administration implements pro-growth policies, lower interest rates could further support potential buyers and lead to a revitalised housing market.

3.3.5 Retail Market Indicators

Overview

- Despite pre-election uncertainty impacting sales, the election of a Government of National Unity for South Africa has spurred consumer demand and led to increased sales for local retailers.
- High interest rates, increasing debt and elevated food inflation collectively continued to impact disposable income.
- The retail sector was impacted by several factors, such as
- The movement of Easter and school holidays into March 2024 impacting sales performance in April 2024
- Significantly higher average temperatures in April and May 2024, resulting in delayed consumer spend on winter merchandise
- The late onset of cold weather in June 2024, which was supported by pent-up consumer demand for winter merchandise
- The South African national elections, as consumers withheld spend in anticipation of the election results
- The formation of the Government of National Unity, positive consumer sentiment supported improved sales performance across the sector in June 2024.

Outlook

- Outlook prospects in South Africa are improving with a positive growth outlook based on a favourable election outcome, no load-shedding for over 100 days and the onset of a consumer confidence recovery.
- However, despite the positive outlook it is anticipated that the medium term will remain challenging for consumers until key relief factors come into effect.
- Lower inflation, interest rate cuts and the two-pot retirement system all support a better consumer spending environment.
- However, it is likely that the influence of these events on real wage growth and consumer expenditure will only take effect towards the end of 2024 and into 2025.

3.3.6 Office Market Indicators

Overview

- The modest recovery of the office market continued during Quarter 2 of 2024 (lower vacancy rates and slowly growing nominal market rentals).
- The sector has been boosted by the return of some workers to office since 2022 albeit mostly in a hybrid way.

Vacancy Levels

- Rode found that the average South African vacancy rate of grades A+, A and B office space, combined in decentralised nodes was 13.1% in Quarter 2 of 2024, down from 13.9% in Quarter 1. This was also lower than the 14.6% average of Quarter 2 of 2023.
- The vacancy rate is above the pre-Covid-19 level of 10.5% in 2019 and the historical long-term average of 9.4%.
- Decentralised vacancy rates of Cape Town and Durban improved during Quarter 2 of 2024.
- Vacancy rates were comparatively higher in Johannesburg but have also seen a strong improvement over the past few quarters.

Rental Rates

- During Quarter 2 of 2024, weighted gross market rentals for decentralised Grade A office space increased nationally by 2% in nominal terms compared to Quarter 2 of 2023, somewhat better than the 1% growth recorded in Quarter 1 of 2024.
- Overall, rentals have improved but are still approximately 1% below pre-pandemic levels.
- Durban had the fastest growth in decentralised nominal market rentals of approximately 6.2%.
- Cape Town continues to perform strongly with decentralised rental growth of approximately 5%.
- Johannesburg (0.8%) and Pretoria (1.5%) continues to experience weak nominal growth in decentralised office locations.

3.3.7 Industrial Market Indicators

Overview

- The industrial property sector continues to boast sharp nominal rental growth amid continued low vacancy rates, benefitting from less speculative development than office building and shopping centres.

Vacancy Levels

- The resilience of the industrial property market is particularly evident in its lower vacancy rate.
- However, there is a risk of higher vacancies and lower rental growth in the short-term, given the sustained level of low business confidence.

Rental Rates

- Nominal gross market rentals in South Africa for industrial space of 500 m² grew by 6.1% year-on-year during Quarter 2 of 2024, up from the 4.8% growth recorded in Quarter 1 of 2024.
- Rentals of industrial space of 1 000 m² grew by a similar rate (approximately 6.2%) in Quarter 2 of 2024. However, in real terms, rentals are still declining due to elevated building-construction inflation.
- Regionally, all major conurbations show with strong nominal market rental growth (approximately 4% to 9%) and low vacancies. Central Witwatersrand (approximately 9.2%) and the East Rand (approximately 6.8%) saw the fastest rental growth compared to Cape Town which experienced a cooling of rental growth (approximately 4.9%).
- National stand values in comparison did not perform at the same level as industrial rental markets.

3.4 Industrial Development Corporation – Sector Trends, 2024

First half of 2024: Snapshot

This section provides a sector-level snapshot of performance in agriculture, mining, manufacturing, electricity and construction sectors of the South African economy in H1 2024, compared to the same period in 2023.

❖ Value added

The seasonally adjusted value added by the primary and secondary sectors contracted by 4.5% in the first half of 2024 compared to the same period in 2023, proving to be a drag on overall South Africa GDP growth, which was 0.5% in the first half of 2024. The contraction in value added was driven by agriculture (-10.2% growth in H1 2024), construction (-7.6%), and manufacturing (-0.8%), while mining value added remained unchanged. The suspension of loadshedding from the end of March 2024 underpinned growth of 3.4% in the electricity sector, although from a very low base in 2023.

❖ International trade

In the first half of 2024, the value of South African exports declined by 0.8% to R983 billion compared to the same period in 2023, due to a significant reduction in international commodity prices. In the same period, the value of imports declined by 6.4% to R914.6 billion as lower oil prices and a still weak domestic environment constrained import demand. Consequently, the surplus on the balance of trade increased to R68.4 billion in H1 2024 compared to R14.4 billion in H1 2023.

❖ Employment

The primary and secondary sectors' employment declined by 18 237 (-0.5% y-o-y) in Q2 2024, compared to the same quarter in 2023, with a total of 3.3 million people employed in these sectors. The manufacturing (+4 431), agriculture (+1 480) and electricity (+1 290) sectors recorded slight increases, and in contrast construction (-20 017) and mining (- 5 421) recorded significant job losses. Average monthly remuneration per employee in the primary and secondary sectors increased 3.8% y-o-y in Q2 2024, with the electricity sector reporting an increase of 7.6% to R53 148 per month. In the mining sector average monthly remuneration increased 5.3% to R34 142, followed by agriculture with a 4.8% rise to R5 910, construction 3.3% rise to R24 324 and manufacturing 3.1% rise to R24 533.

❖ Youth employment

Youth employment as a share of overall employment in the primary and secondary sectors of the economy was 35.5% in Q2 2024 unchanged from Q2 2023. The agriculture sector has the highest proportion of youth employees at 41.2% while the electricity sector's proportion is only 17.4%. 1.5 million youth (under 35-year-olds) are employed by the primary and secondary sectors, a decline of 0.8% from a year earlier.

❖ Profitability

The profitability of the mining, manufacturing, electricity and construction sectors as a whole remained unchanged at 7% in H1 2024, compared to H1 2023. The mining sector's profitability declined from 20.5% to 12.2% over this period while the losses incurred by the electricity sector narrowed to -6.3% from -11.8% a year prior. The manufacturing sector reported a slight increase to 7% in H1 2024 compared to 6.2% in H1 2023.

❖ Investment

Investment activity in the mining, manufacturing, electricity and construction sectors slowed significantly in H1 2024, declining by 17.2%, compared to 2024 in nominal terms, mainly due to a 29.7% decline in mining and 5.7% in manufacturing investment spending. The electricity sector sustained its investment spending, increasing by 2.7%, while construction reported a 28% increase.

❖ Inventories

Overall inventory levels in the mining, manufacturing, electricity and construction sectors remain at very elevated

levels after having increased by 11.7% in H1 2024 compared to the same period in 2023. The manufacturing sector is responsible for the bulk of the inventory reported, with the sector's inventory increasing by 11% y-o-y in H1 2024.

❖ Business confidence

Overall business sentiment for the economy improved marginally in Q2 2024, to 35-points, compared to the opening quarter, remaining well below the 50-point neutral level. Conditions in the agricultural sector remain difficult as reflected in the Agbiz/IDC Agribusiness confidence index, which recorded a reading of 37.9 index points in Q2 2024, significantly lower than the 50-point reading of Q3 2023, as climatic conditions became significantly less favourable during 2024. The RMB/BER manufacturing business confidence index remains highly negative with a reading of 28 index points in Q2 2024, although this was a slight improvement from the 21-index point reading in Q1 2024 as uncertainty regarding the election increased. The construction sector's confidence levels recorded a reading of 35.3 index points, which is an improvement from the 26.8 level of Q1 2024.

3.4.1 Agricultural Imports And Exports

The value of agriculture exports fell slightly to R64.5 billion in the first half of this year, a 0.5% decline relative to the same period last year. The slight decrease in exports reflected the moderation in the prices of some agriculture products and a decline in the volumes following tough seasonal conditions. Weak global import demand amid a stagnant global commodity price environment also contributed to lower exports during this period. Exports declined despite efficiency improvements at the ports, while stakeholders in the sector continue to collaborate with Transnet to ensure efficient transit of agriculture produce to international markets.

The main agriculture export products in the first half of 2024 were edible fruits (mostly citrus whose export season gained momentum in the second quarter of 2024) and nuts, with a combined 67.9% share, followed by cereals (14.0%). Exports were spread across various key markets, with the Netherlands, as the gateway to the wider European Union (EU), remaining the largest destination with a share of 21.0% (in value terms) of domestic agriculture exports during this period. It was followed by the United Kingdom (UK) and Zimbabwe, which accounted for 10.5% and 7.5%, respectively.

Agriculture imports amounted to R18 billion in the first half of 2024, up 14.2% from the same period last year. The main imported products, in value terms, were cereals, mainly rice and wheat (considering limited domestic production capabilities), which accounted for 38.2% of total agricultural imports. The main source of imports in the first half of 2024 was Australia (mainly wheat) with about 9.0% share of total agriculture imports, followed closely by Russia (wheat) and Namibia (cattle, sheep and seafood), with shares of 8.1% and 8.0%, respectively, during the same period. Despite the strong increase in imports, the agriculture sector managed to record a sizeable trade surplus of R46.5 billion over the first half of 2024.

3.4.2 Manufacturing Imports And Exports

Manufacturing exports expanded by 0.8% y-o-y, reaching R518 billion in H1 2024, partly aided by the depreciation of the exchange rate against major currencies. Rail and port constraints that are affecting the flow of goods are being addressed and programmes implemented are beginning to bear fruit. Despite a notable drop in export volumes of motor vehicles, the export value of motor vehicles, parts and accessories increased by R8.1 billion (+7.3%) in H1 2024 compared to H1 2023, followed by food (+8.4 billion) and coke & refined petroleum products (+R4.2 billion). Catalytic converters, the dominant category in the parts and components industry exports continued to drop (-R5.5 billion) as new energy vehicles continue to gradually erode the market for the internal combustion engine in key markets especially Europe. The top export markets for South African manufactured goods include Germany (9.0% share), the US (8.8%), Botswana (6.6%), China (5.9%). Imports of manufactured goods decreased by 8.4% (year-on-year) in 2023 largely due to weak South African demand conditions. However, the import value of coke and refined petroleum products declined (y-oy) due to the return to full production of a Cape Town-based fuel refinery, but the impact of the loss of capacity due to closure of two large refineries remains evident. Machinery and equipment imports declined by 4.9%, or by R6.0 billion, reflecting subdued fixed investment spending in the country. Nonetheless, South Africa remains highly reliant on imported capital goods to augment domestic manufacturing capabilities to satisfy demand for fixed investment activity. The much-improved electricity availability factor, which manifested itself in significantly reduced incidence of loadshedding saw electrical machinery and electronic goods imports contract by the largest amount (-R38.6 billion), as household and businesses deferred spending on storage batteries, solar panels and inverters which are largely imported.

Diagram 4.2: Change in Output and Utilisation of Production Capacity in 2022

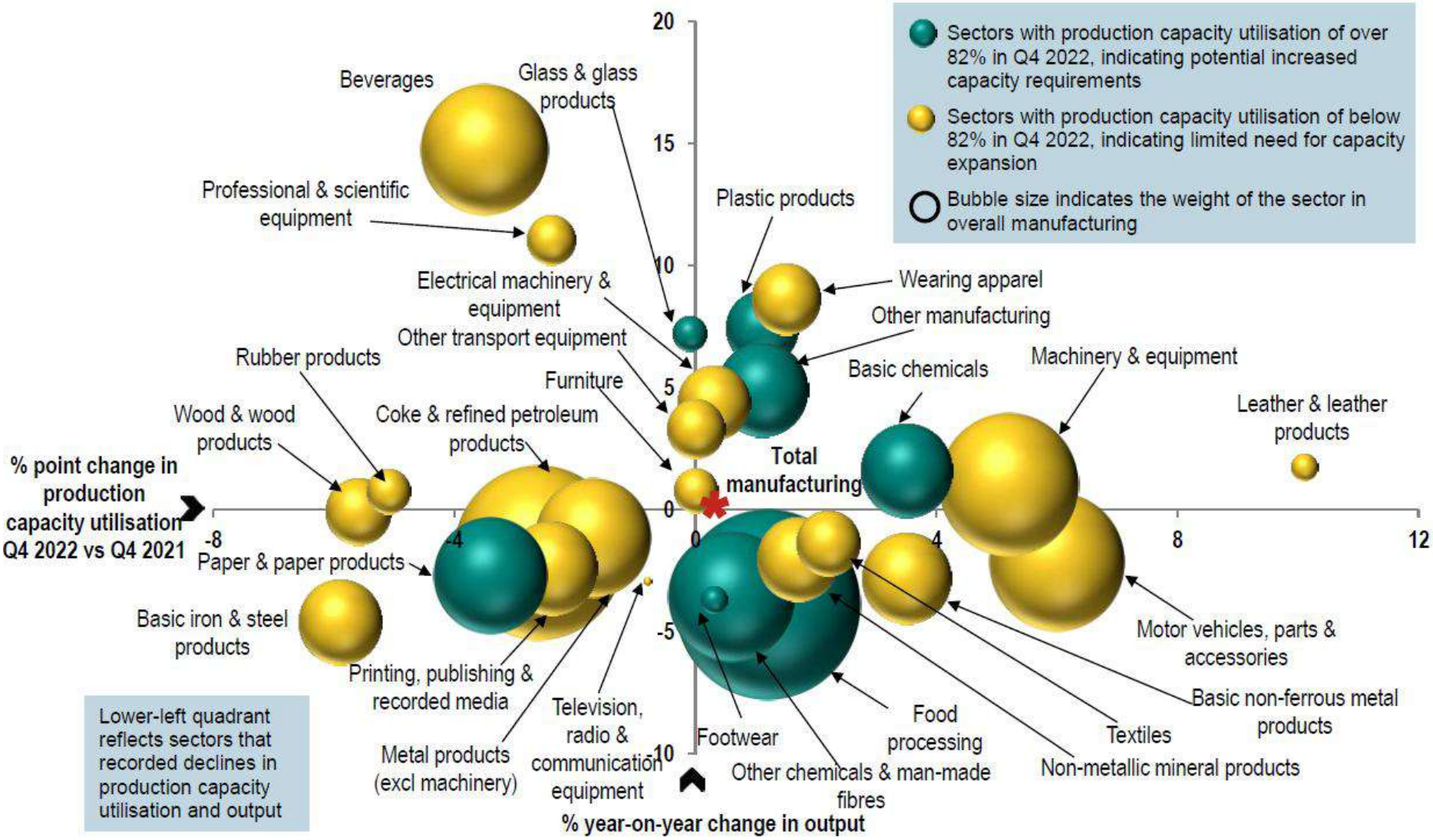


Figure 4.1: Growth in Physical Volume of Production in the Primary and Secondary Sectors

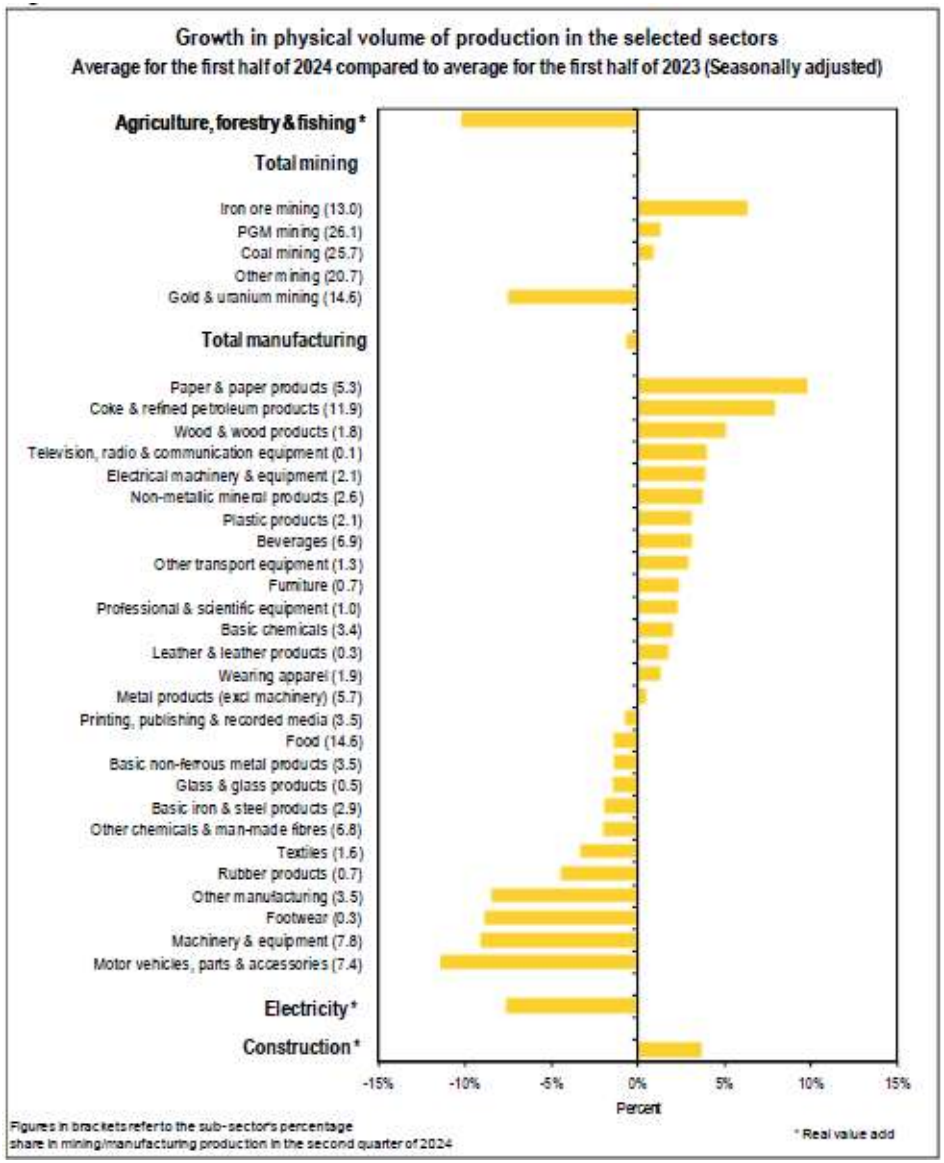


Figure 4.2: Manufacturing: Change in the Utilisation of Production Capacity

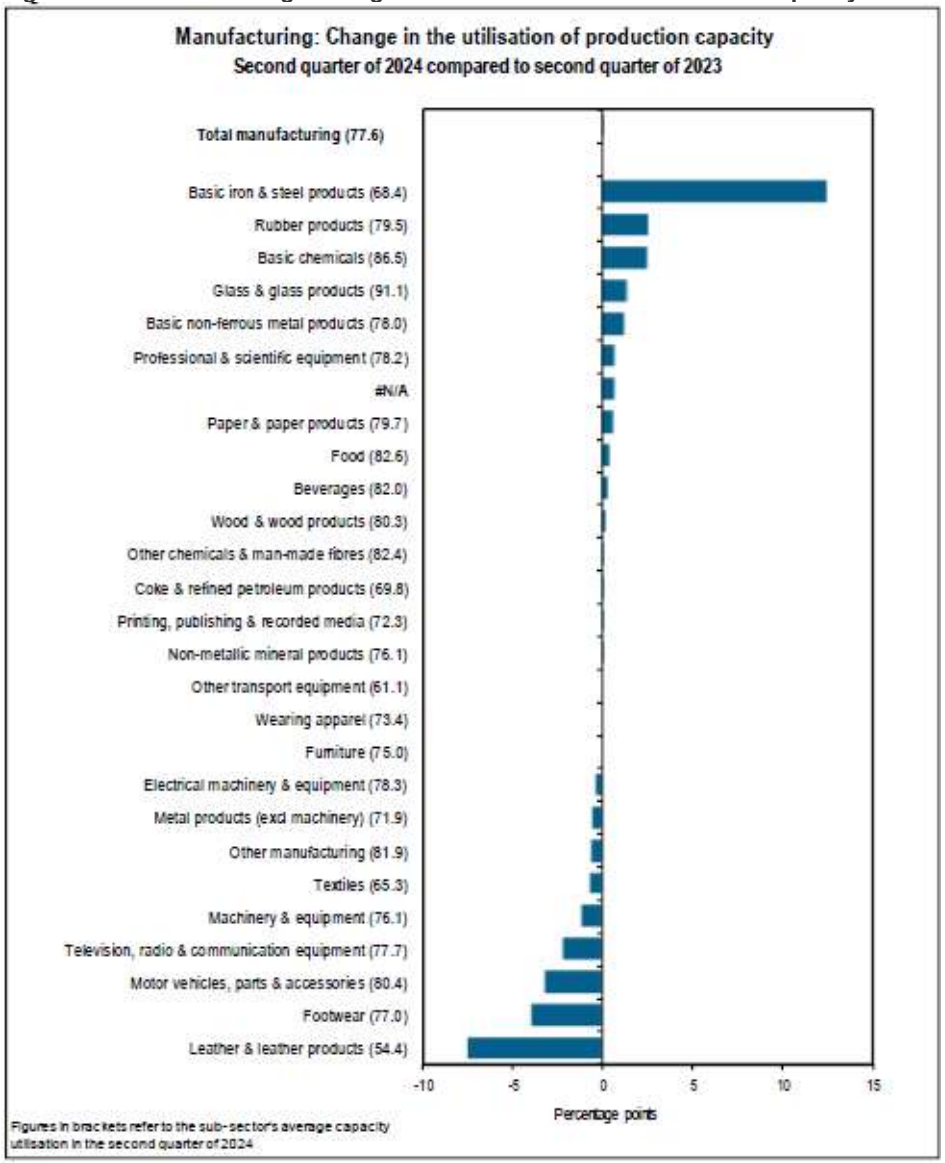


Figure 4.3: Growth in Formal Employment in the Primary and Secondary Sectors

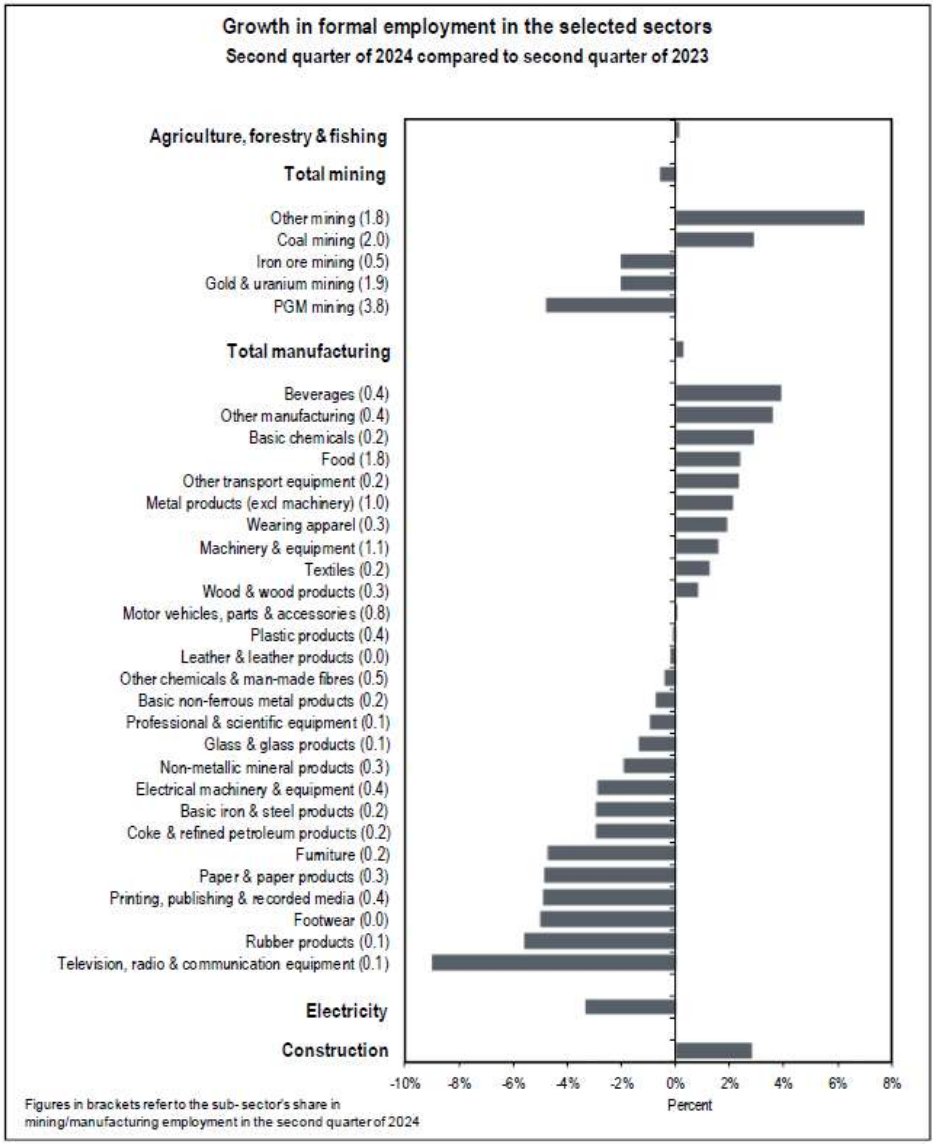


Figure 4.4: Growth in the Value of Exports in the Primary and Secondary Sectors

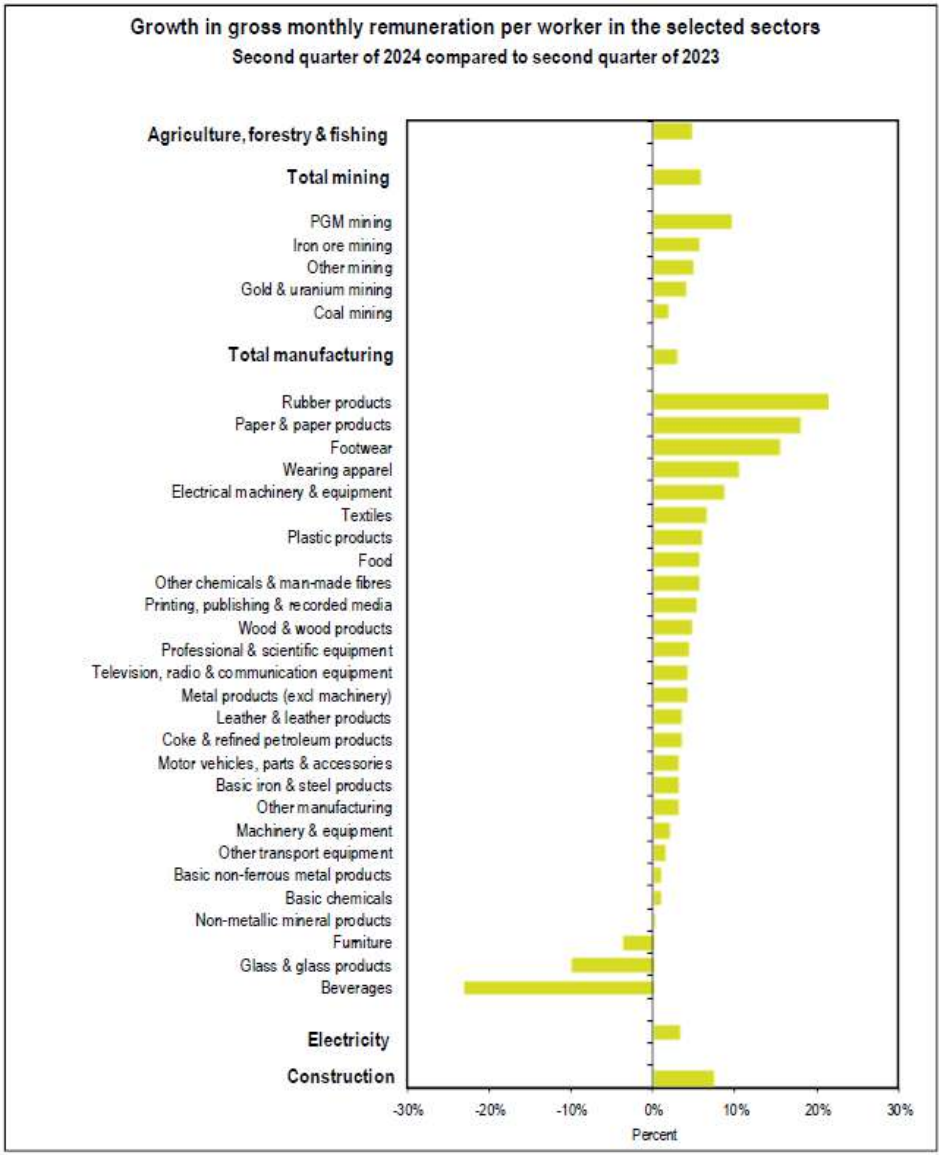
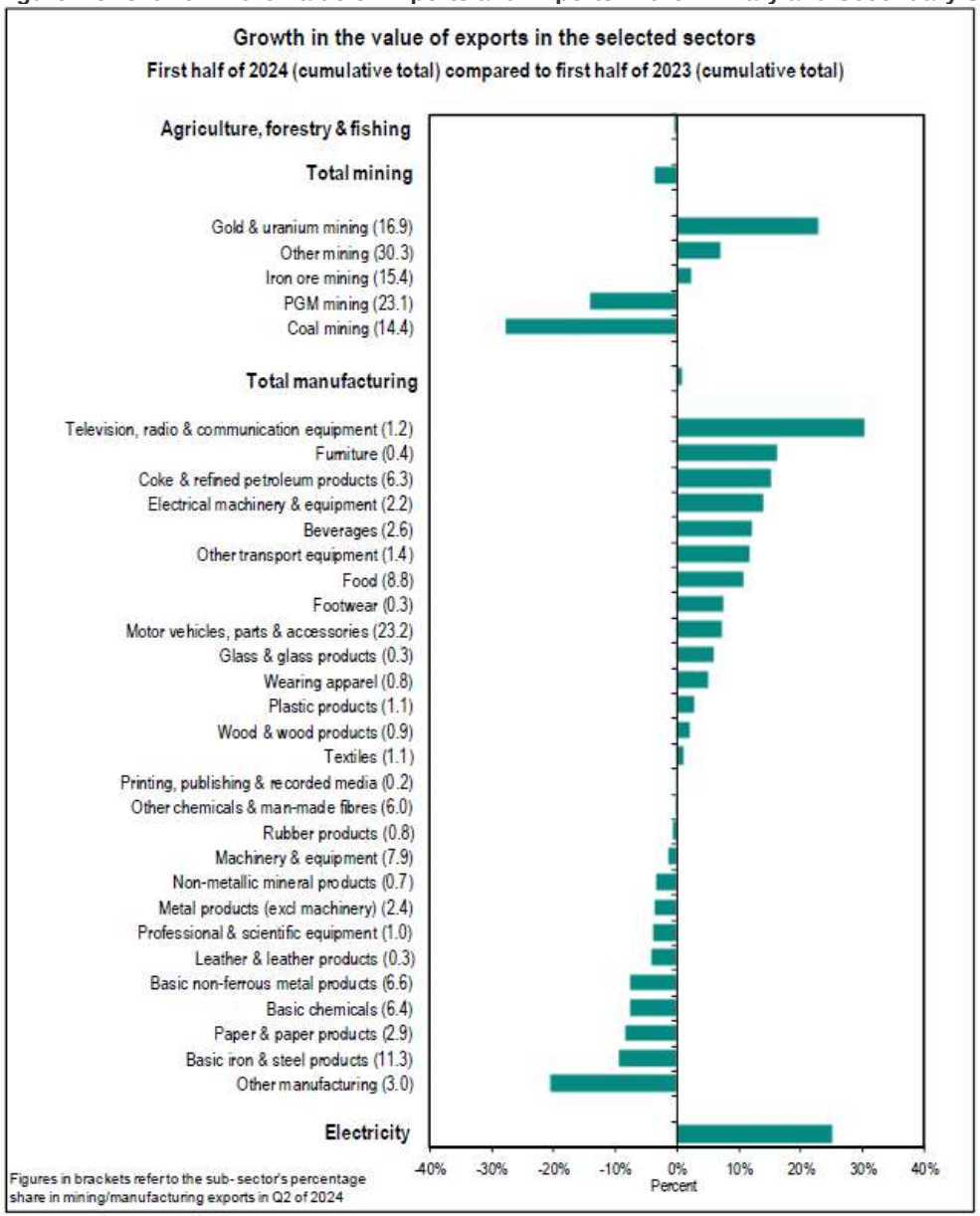
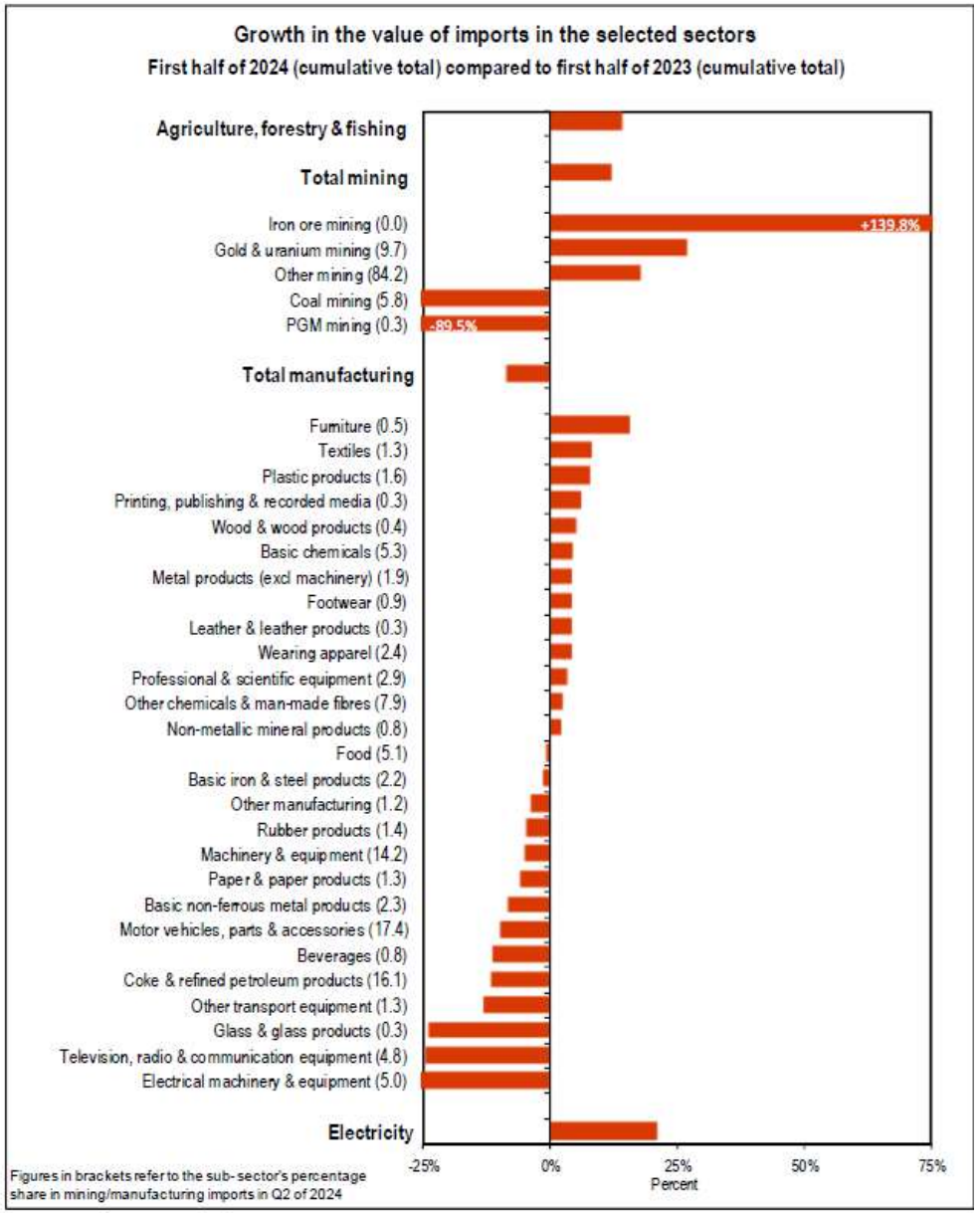
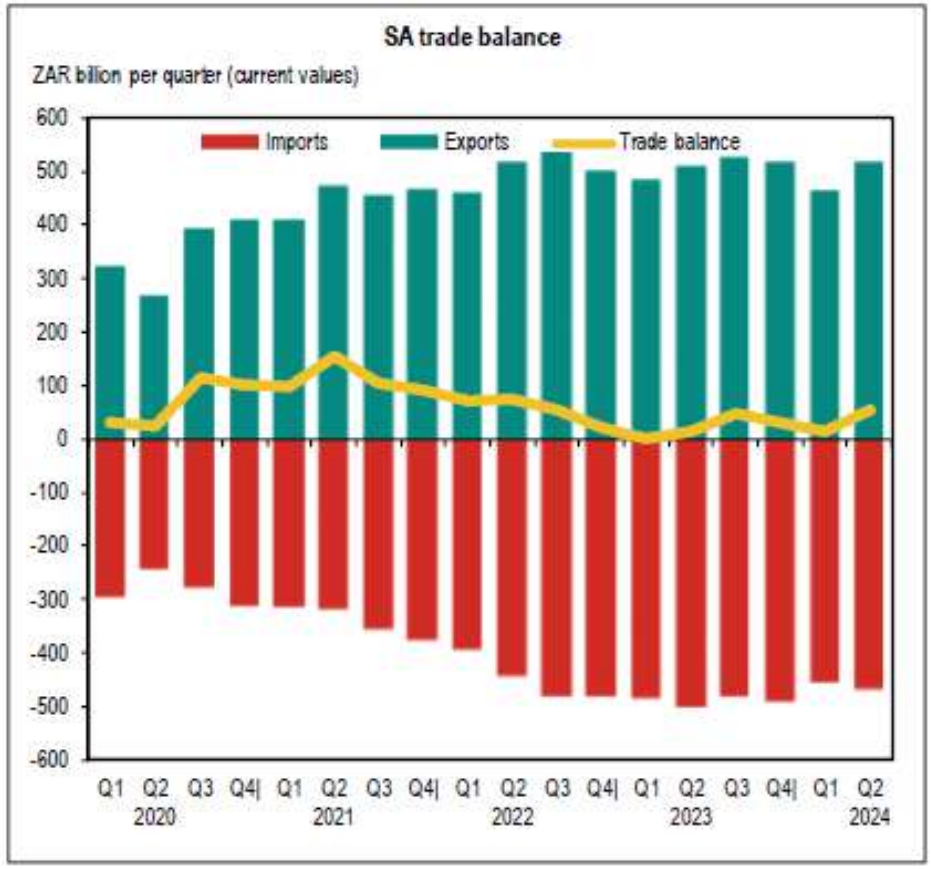


Figure 4.5: Growth in the Value of Imports and Exports in the Primary and Secondary Sectors



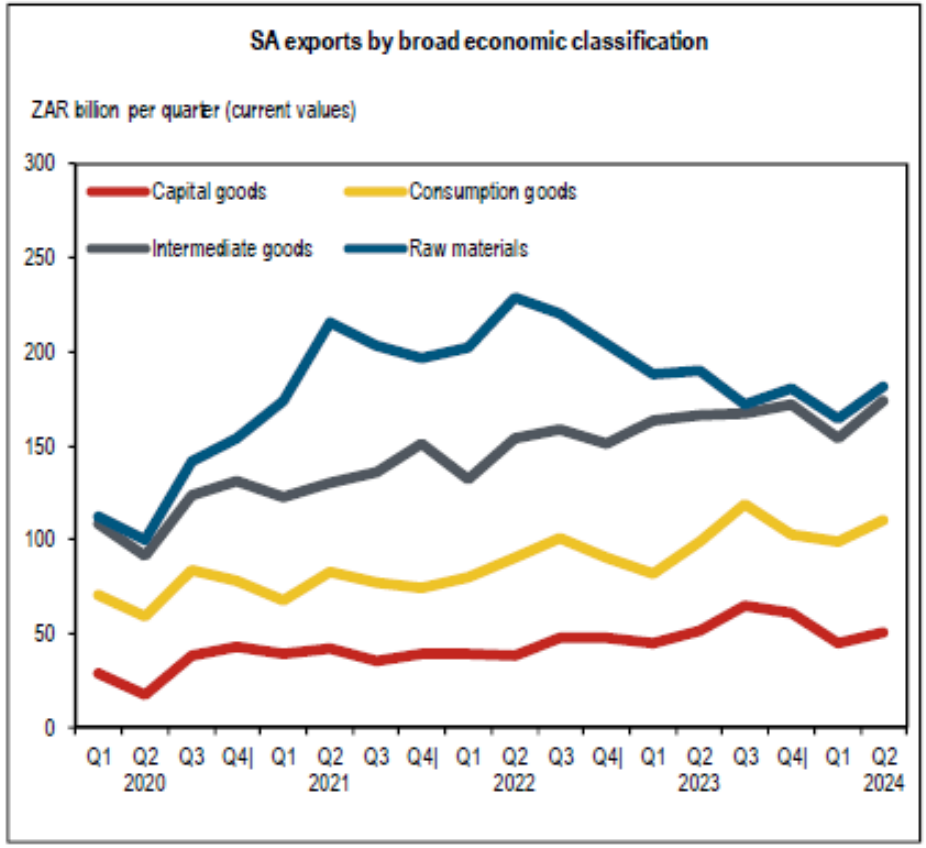


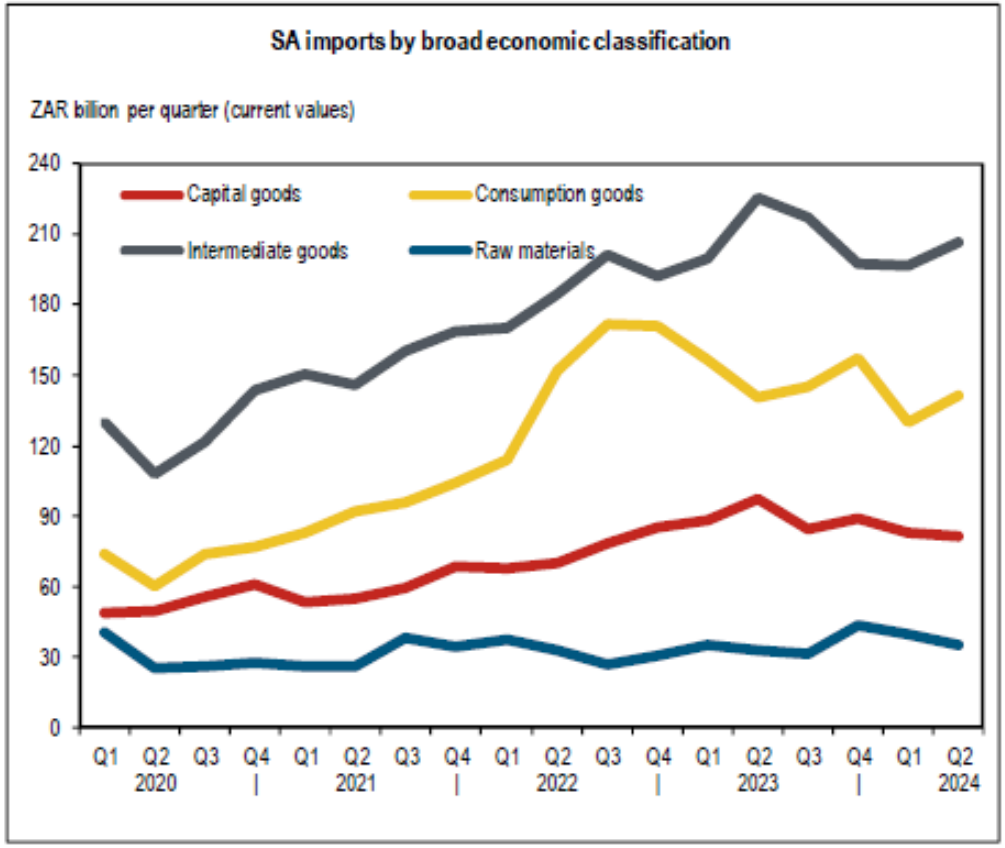


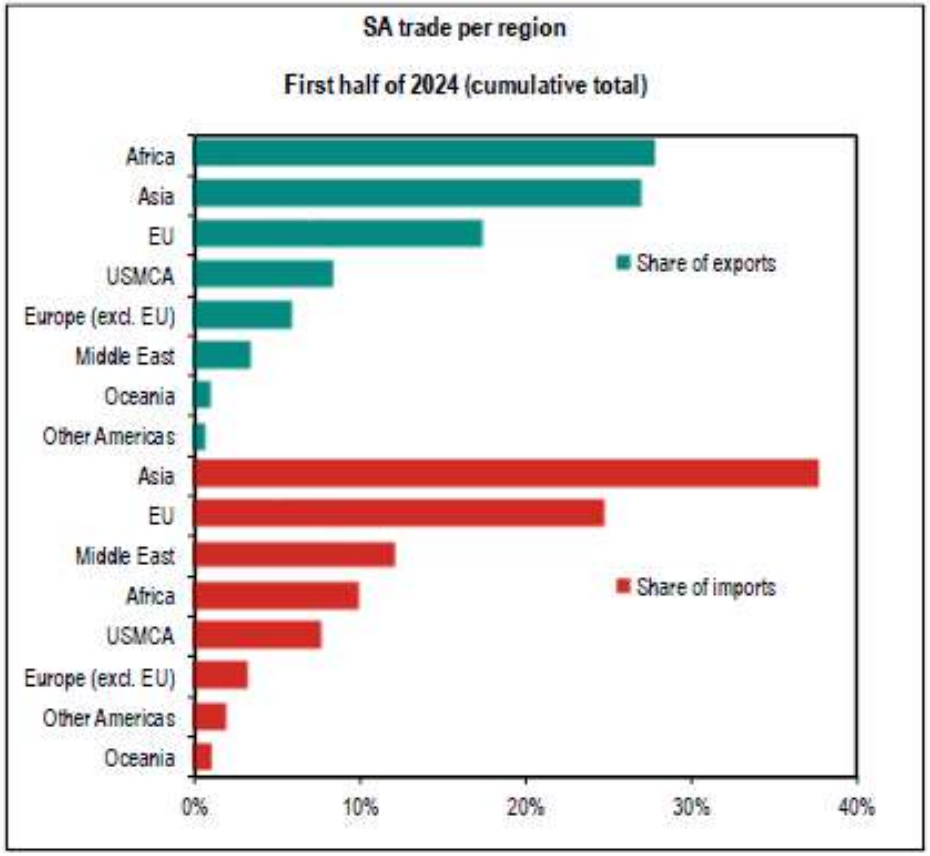
Major traded products

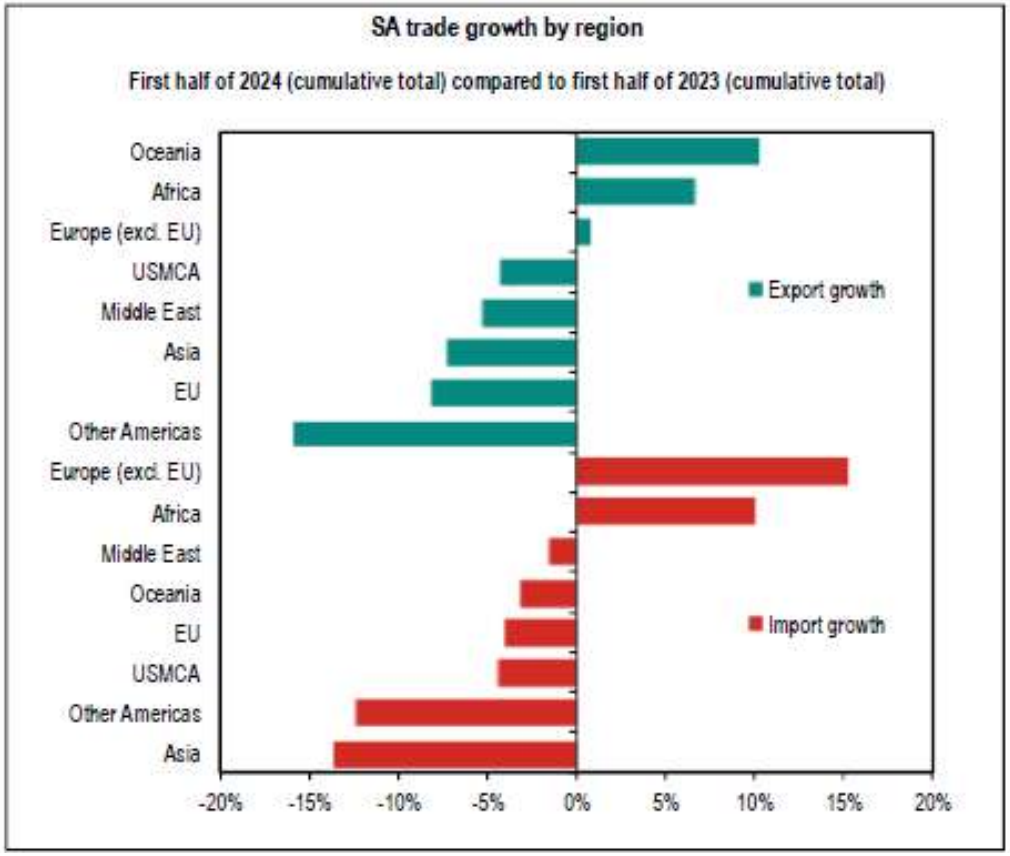
First half of 2024 (cumulative total)

	HS2 code	ZAR m
Exports	H71: Natural or cultured pearls, precious stones and metals	177 536.80
	H26: Ores, slag and ash	159 967.71
	H87: Vehicles, parts and accessories	110 170.66
	H27: Coal, petroleum and petroleum products	94 097.05
	H72: Iron and steel	57 170.75
	Exports Total (including others)	**982 623.91**
Imports	H27: Coal, petroleum and petroleum products	190 689.67
	H84: Machinery and equipment, mechanical appliances	114 741.07
	H85: Electrical machinery and electronic equipment	87 626.76
	H98: Original equipment components for the motor vehicle industry	83 235.40
	H87: Vehicles, parts and accessories	62 216.03
	Imports Total (including others)	**913 217.06**


SA exports by broad economic classification
ZAR billion per quarter (current values)
Capital goods
Consumption goods
Intermediate goods
Raw materials
300
250
200
150
100
50
0
Q1 Q2 Q3 Q4 Q1 Q2 Q3 Q4 Q1 Q2 Q3 Q4 Q1 Q2 Q3 Q4 Q1 Q2
2020 2021 2022 2023 2024


SA imports by broad economic classification
ZAR billion per quarter (current values)
Capital goods
Consumption goods
Intermediate goods
Raw materials
240
210
180
150
120
90
60
30
0
Q1 Q2 Q3 Q4 Q1 Q2 Q3 Q4 Q1 Q2 Q3 Q4 Q1 Q2 Q3 Q4 Q1 Q2
2020 2021 2022 2023 2024





3.5 Local Economy Trends and Performance

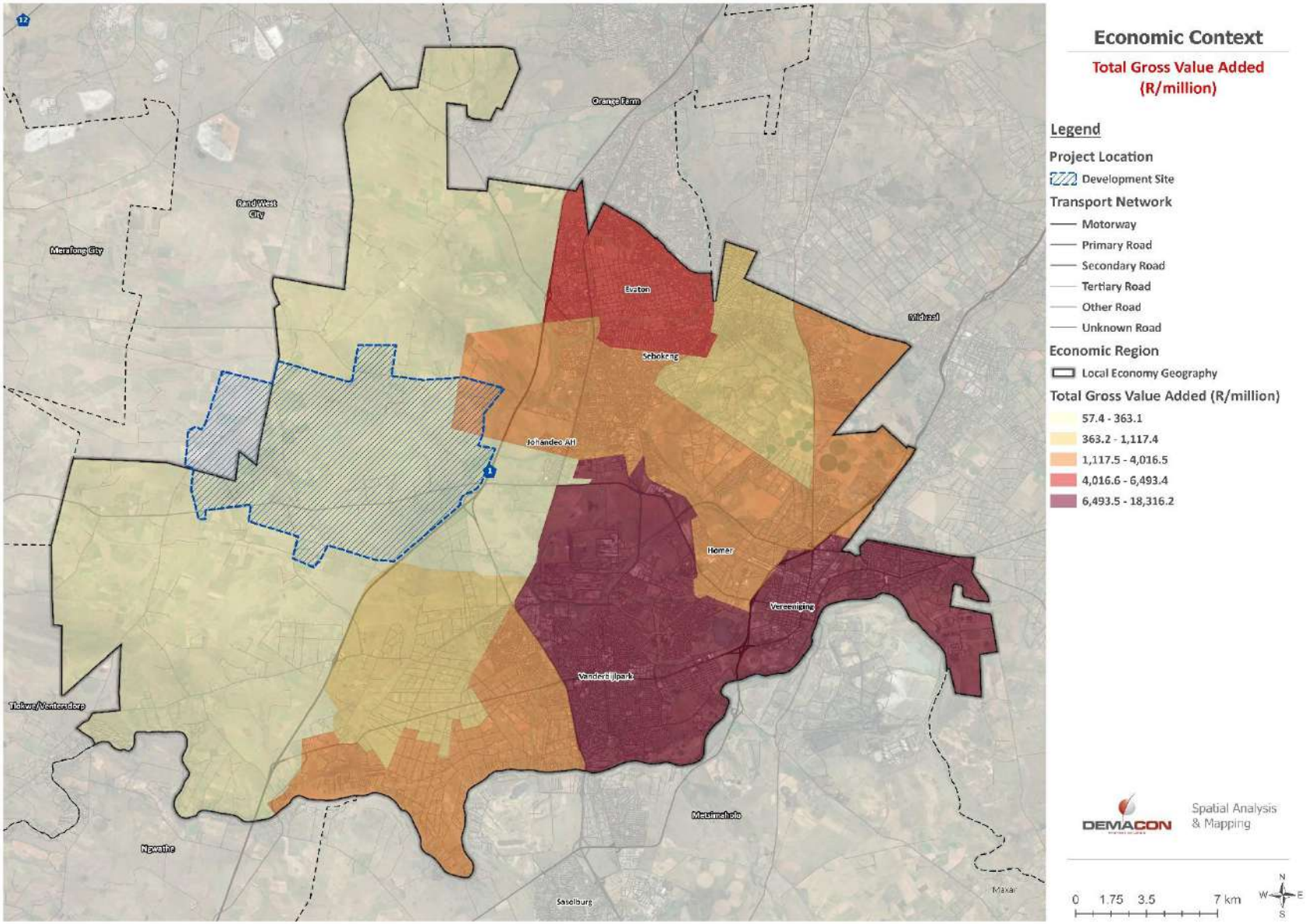
The following section is focused on the salient features that define and characterise the sub-regional and regional economies within which the Vaal Aerotropolis is situated. The section seeks to geographically define sub-regional and regional economies, analyse the size and composition of the sub-regional economy compared to regional economies, outline growth trends and changes, the size and participation of the labour force, and the composition of the labour force as an indicator to current and future skills demand.

3.5.1 Geographically Defining the Local and Regional Economy

The geographic context of a sub-regional or regional economy is an important characteristic that should be defined. The importance of defining the geographic extent of sub-regional or regional economies relate to:

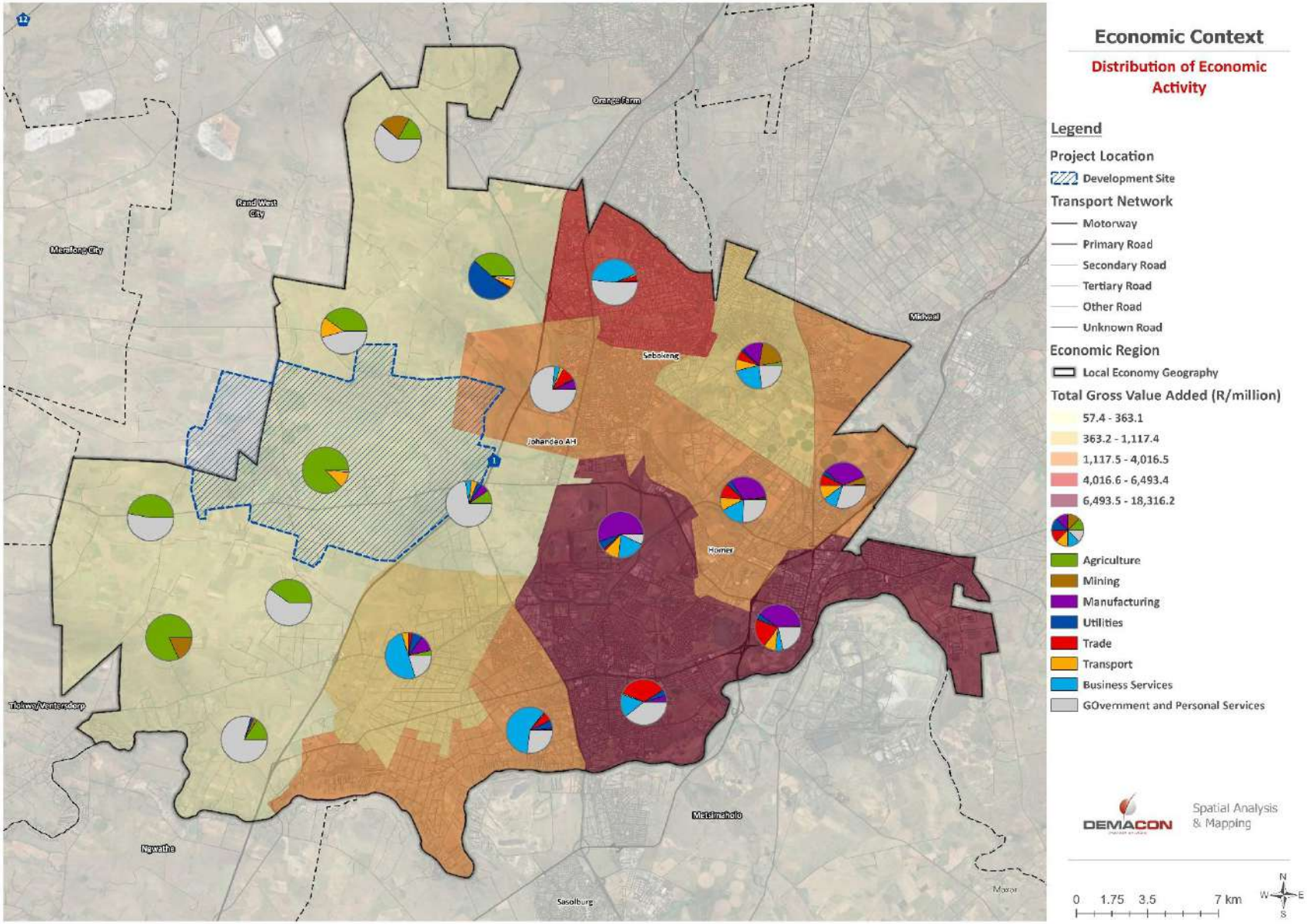
- Clearly defining the geographic area which is incorporated as part of a local/regional economy
- Understanding the extent of economic functions that contribute to a local/regional economy's and
- Clearly understanding the spatial context and inter-relations between a local/regional economy and its surrounding areas

Map 3.1: Sub-Regional Economy Total GVA



Source: DEMACON GIS, 2024

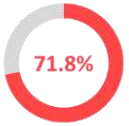
Map 3.2: Emfuleni Local Municipality GVA Distribution



3.5.2 ECONOMY SIZE AND STRUCTURE

ECONOMY SIZE AND CONTRIBUTION

Emfuleni
Sub-Regional Economy GVA
(current prices 2023)



contribution to the Sedibeng Regional Economy

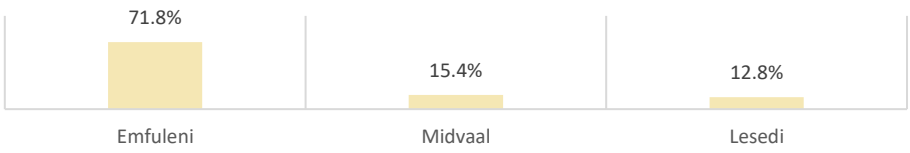
contribution to the Gauteng Provincial Economy

The Emfuleni sub-regional economy is the **largest** contributor to the total economy of the Sedibeng regional economy.

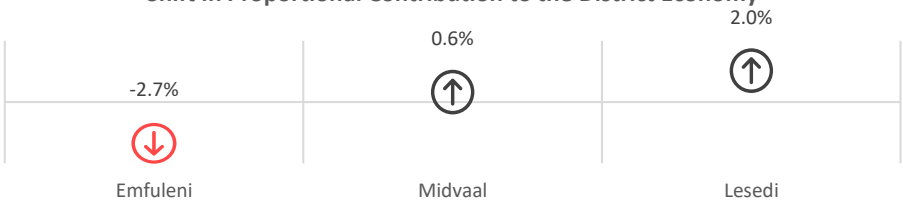
Compared to other economies in the Sedibeng regional economy, the Emfuleni sub-regional economy **lost** proportional contribution to the regional economy since 2013. Therefore, although the sub-regional economy has **continually expanded** economic output, other sub-regional economies in the Sediebng regional economy has expanded their economic output at a rate faster than the Emfuleni sub-regional economy.

COMPARATIVE ECONOMY SIZE AND CONTRIBUTION ANALYSIS

Proportional Contribution per Regional Economy to the District Economy

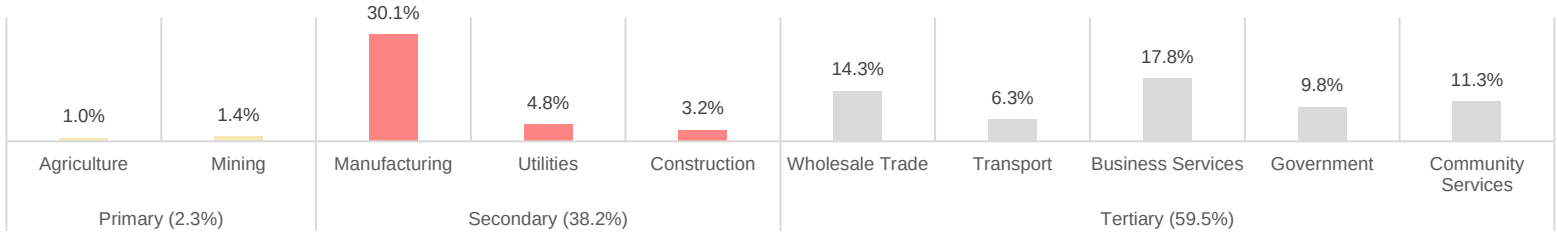


Shift in Proportional Contribution to the District Economy



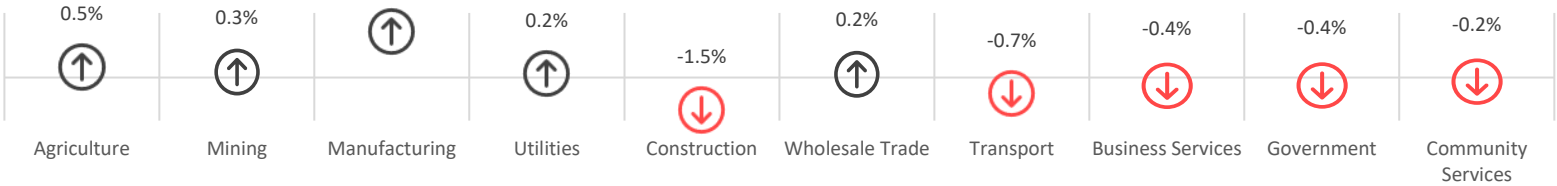
ECONOMY STRUCTURE AND PROPORTIONAL SHIFTS

Proportional Contribution per Economic Sector to the Total GVA of the Regional Economy



The sub-regional economy is characterised by the **tertiary sector**, with a sizeable **manufacturing industry** in support

Shift in Proportional Contribution per Economic Sector (2013 to 2023)



Drivers in the sub-regional economy are the **manufacturing trade sectors.**

These sectors have maintained **positive** growth and are **sizeable contributors** to sub-regional economic output

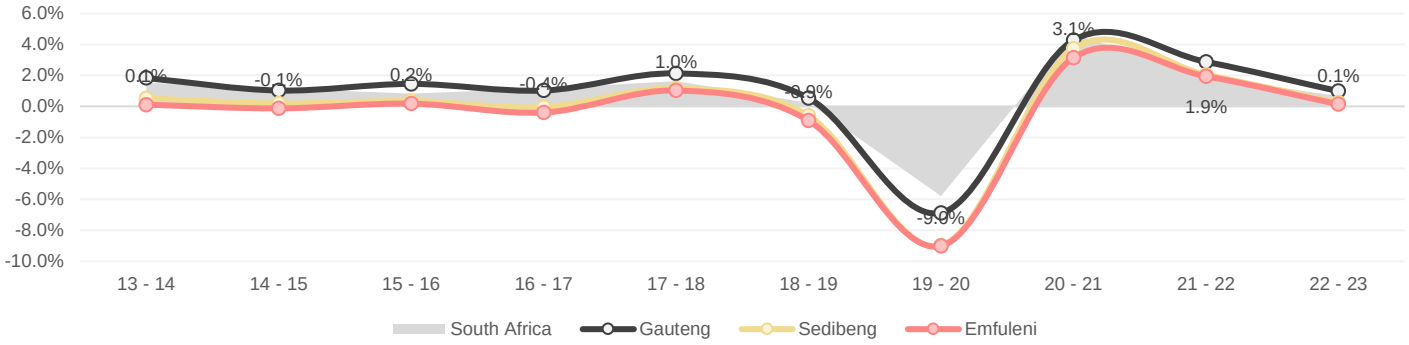
3.5.3 ECONOMY GROWTH AND HOUSEHOLD CONSUMPTION EXPENDITURE

ECONOMY GROWTH

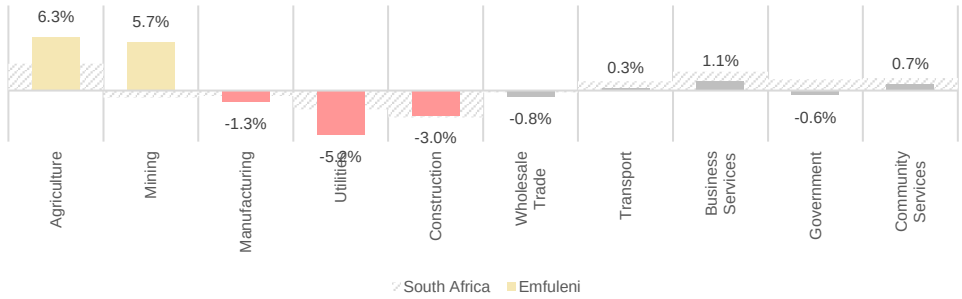
-0.4% (2013 - 2023) average annual growth of the sub-regional economy over the previous 10 years

-1.0% (2018 - 2023) average annual growth of the sub-regional economy over the previous 5 years

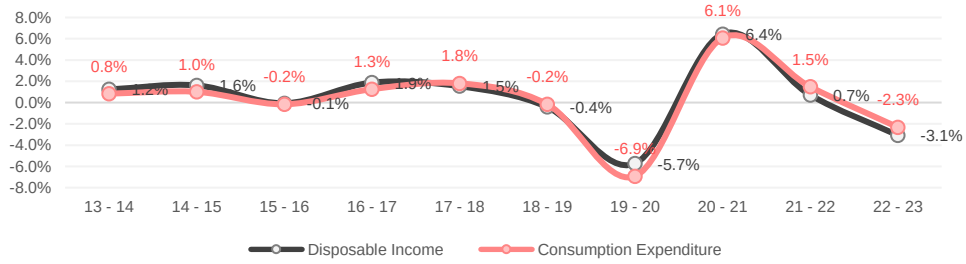
The sub-regional economy has recovered economic capacity lost during 2020. In 2023 the sub-regional economy was **4.2%** below pre-pandemic economic GVA output



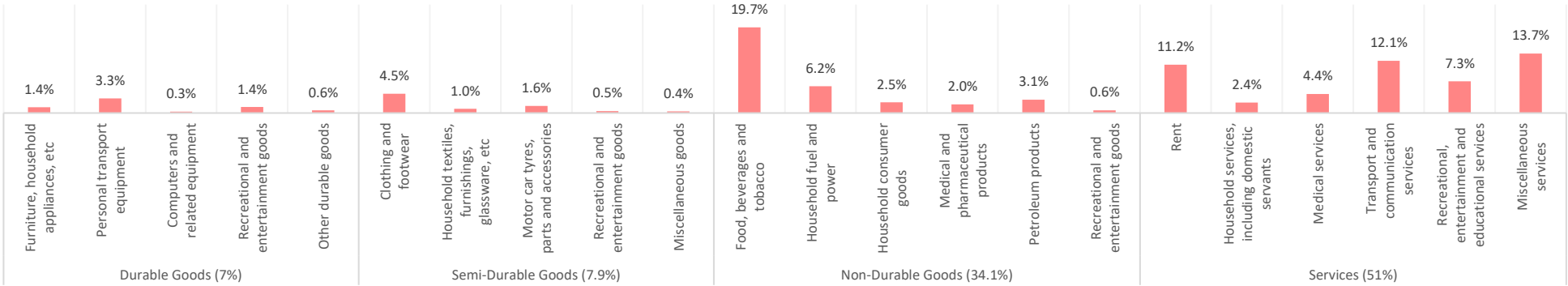
AVERAGE ANNUAL GROWTH PER ECONOMIC SECTOR



DISPOSABLE INCOME & CONSUMPTION EXPENDITURE



CONSUMPTION EXPENDITURE PER EXPENDITURE TYPE



3.5.4 LABOUR FORCE PARTICIPATION

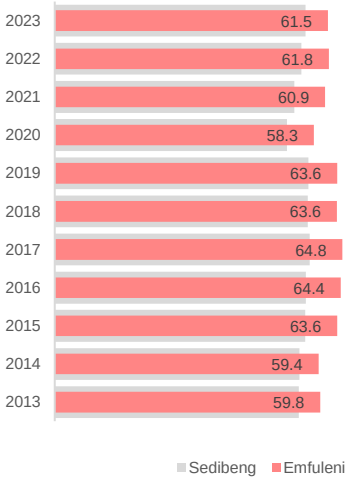
LABOUR FORCE PARTICIPATION RATE (%)

61.5% of the potential labour force participate in the **sub-regional economy**

56.5% of the potential labour force participate in the **regional economy**

71.5% of the potential labour force participate in the **provincial economy**

Compared to the regional average, the sub-regional economy maintains, on average, a lower labour force participation rate



STRUCTURE OF EMPLOYMENT

Formal employment accounts for **80.9%** of all jobs

Informal employment accounts for **19.1%** of all jobs

42 261 informal jobs exist in the sub-regional economy

The **informal economy** lost 12 082 jobs since 2013 at an average rate of -1 208 jobs per year

178 567 formal jobs exist in the sub-regional economy

The **formal economy** gained 10 752 jobs since 2013 at an average rate of 1 075 jobs per year

Skilled Jobs

16 509 jobs

3 780 jobs added since 2013

378 jobs gained per annum

Semi-Skilled Jobs

23 625 jobs

3 272 jobs added since 2013

327 jobs gained per annum

Low-Skilled Jobs

19 388 jobs

1 800 jobs lost since 2013

180 jobs lost per annum

The unemployment rate of the local economy is **28.6%**

The unemployment rate has started to decrease from a low of 29.1**%** in 2021.

The data shows that the sub-regional economy is experiencing a slowdown in the rate at which the local economy can produce jobs.

31 090 EA population Unemployed

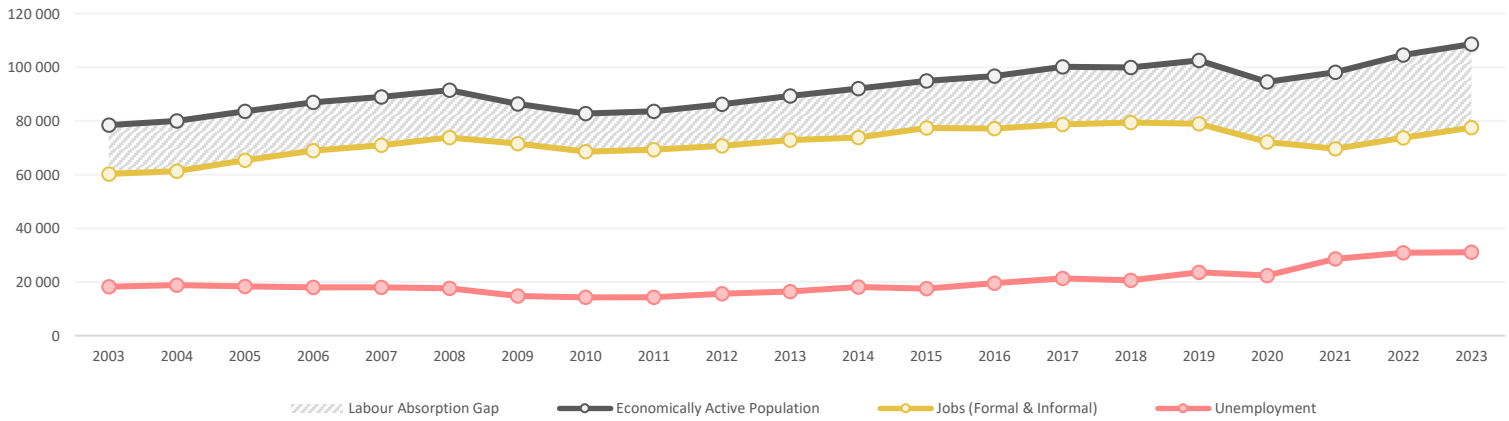
77 558 EA population Employed

LABOUR DEMAND

61 911 people became economically active since 2013

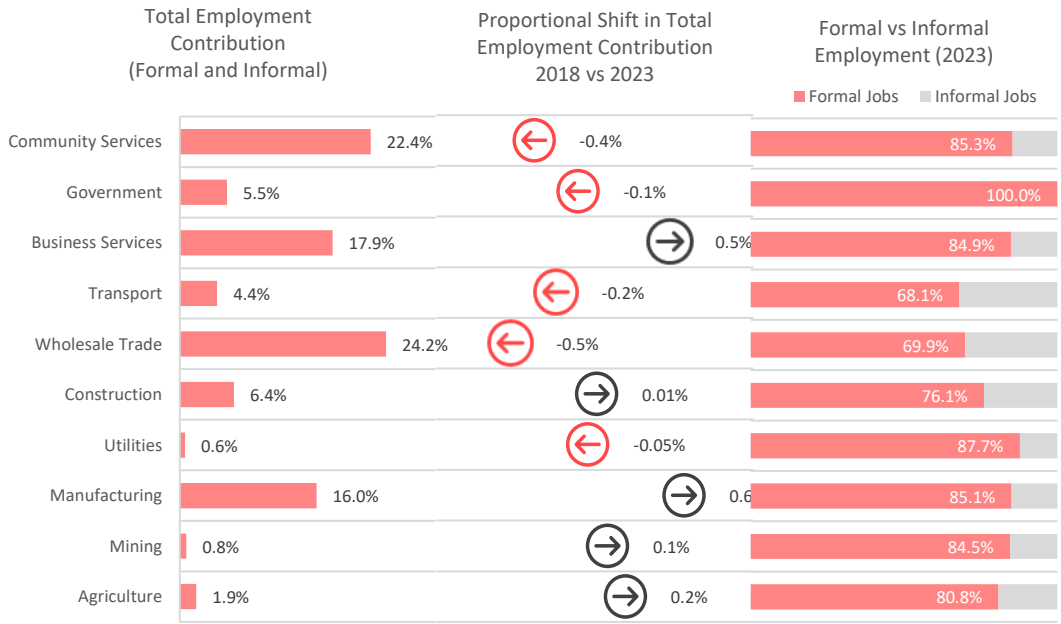
-1 330 people found employment since 2013

63 241 people became unemployed since 2013

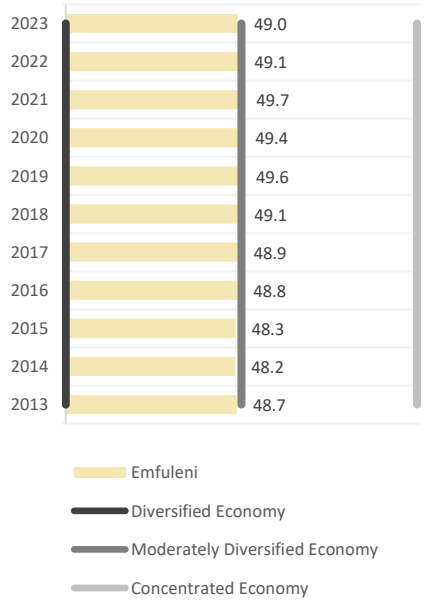


3.5.5 LABOUR FORCE BREAKDOWN

EMPLOYMENT CONTRIBUTION PER ECONOMIC SECTOR



TRESS INDEX (10 INDUSTRIES)

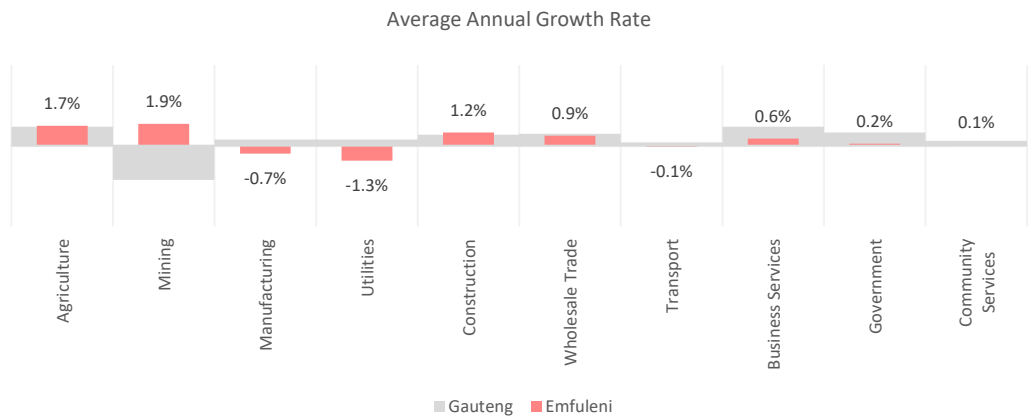


A tress index measures the degree of concentration or diversification of an economy on a sectoral basis. The value of zero represents a completely diversified economy, while higher values show more concentration of economic activities

The tress index of the sub-regional economy is measured across 10 sectors that include:

- Agriculture, forestry and fishing
- Mining
- Manufacturing
- Utilities
- Construction
- Retail and Wholesale Trade, Catering and Accommodation
- Transport, Storage and Communication
- Business and Financial Services
- General Government
- Community and Personal Services

EMPLOYMENT GROWTH PER SECTOR, 2013 – 2023



3.5.6 Local Economy Synthesis and Key Considerations

The following provides a summary of the preceding analysis:

Location

- The proposed project is situated in the Emfuleni sub-regional economy. The sub-regional economy forms part of the Sedibeng regional and Gauteng provincial economies.
- The Sedibeng regional economy is the smallest economy of the Gauteng Province with a contribution of 4.9% and is not a prominent national economic contributor.

Economy Size and Distribution

- The size of the sub-regional economy in relation to other sub-regional economic geographies provides an indication of the relative importance of a sub-regional economy in the context of the broader economic environment within which it operates.
- The Emfuleni sub-regional economy proportionally contributes 71.8% to the regional economy and approximately 3.5% to the provincial economy.
- The sub-regional economy is, therefore, the largest contributor to economic output in the Sedibeng regional economy but does not contribute significantly to the provincial economy.

Economic Profile

- To highlight the economic growth trends of the Emfuleni sub-regional economy, reference is made to the growth and associated trends of sub-sectors that make up the economy. The reference focuses on the proportional contribution made by each economic sub-sector to the total Emfuleni sub-regional economy.
- Historic trends for the sub-regional economy as well as contributions made by each economic sub-sector to the sub-regional economy show that in 2023, the tertiary economic sector proportionally contributed nearly 60% (59.5%) to the total economy of the Emfuleni sub-regional economy, while the secondary sector proportionally contributes 38.2% and the primary sector 2.3%.
- Proportionally, the manufacturing sector (30.1%) is the largest contributor to the sub-regional economy. Economic sub-sectors business services (17.8%) and trade (14.3%) contribute the second and third largest proportions of economic output.
- Economic sub-sectors mining (1.4%) and agriculture (1.0%) proportionally contribute the least to economic output.

Economic Growth

- Between 2013 and 2023, the sub-regional economy had an average annual growth rate of -0.4%. Similarly, between 2018 and 2023, the sub-regional economy contracted by -1.0%.
- It should be noted that the level 5 and level 4 lock down regulations in the early stages of 2020 (March to June) impeded the normal operation of the majority of the economy. As a result, the economy of the country contracted and, therefore, the sub-regional economy was also impacted. The Covid-19 pandemic impeded economic growth in 2020 and 2021, and the sub-regional economy has struggled to rebound mainly as a consequence of negative growth in the Utilities, Construction, Manufacturing Trade ang Government sectors.
- The sub-regional economy follows a similar growth trajectory to the regional, provincial, and national economies, but not exceeding the rate with which aggregate economies grow.

Growth In Consumption Expenditure and Disposable Income

- A positive correlation exists between final consumption expenditure and disposable income, which in turn reveals similar up-and downturns to the business cycle as a whole.
- The average annual growth rate of final consumption expenditure in the sub-regional economy for the period 2013 to 2023 is 0.2%, while over the short to medium term (2018 to 2023) -0.5% growth was experienced.
- The average annual growth rate for disposable income for the period 2013 to 2023 is 0.4%, while over the short to medium term (2018 to 2023) a lower growth of -0.5% was experienced in terms of consumption expenditure.

Household Expenditure Per Category

- The trade sector is largely driven by expenditure on goods and services (retail sales) by a wide variety of consumer elements such as households, businesses, government departments and exports. Retail sales can be classified per different types of goods and services.
- Goods, in this instance, can be considered in terms of durable, semi-durable and non-durable goods. Durable goods refer to items such as furniture,

personal transport equipment and entertainment goods, while semi-durable goods refer to clothing, footwear, and household textiles.

- Non-durable goods refer to food, medicine, and petroleum products. These goods are consumed and used daily.
- A general urban South African trend indicates that the decrease in expenditure directed towards non-durable groceries is declining year-on-year with a rise in consumption expenditure on semi durables including clothes and footwear.
- These trends can be ascribed to the high rate of inflation on non-durables (especially meat) and unabated clothing and footwear deflation.
- Food, beverages, and tobacco products are the largest expenditure items of household, with a proportional contribution of 19.7% in 2023, which is less than the national (20.4%) average.
- The second largest expenditure item is miscellaneous services (e.g., education), representing approximately 13.7% of household expenses.
- The third largest expenditure item for household in the sub-regional economy is transport and communication services (12.1%).

Employment and Labour Participation

- The average labour force participation rate for the Emfuleni sub-regional economy amounts to 61.5%. The sub-regional economy under-performs in terms of the provincial labour force participation trends.
- It should be noted that the impact of lockdown regulations can be observed when comparing labour force participation in 2020 to 2021. The labour force participation rate was highest in 2019 at 63.6%, since a low in 2020, an upward trend can be observed. The rate with which population is reaching the working age is greater than the rate with which the sub-regional economy can produce jobs, leading to a continuous reduction in the labour force participation rate.
- A total of 10 752 formal jobs have been created between 2013 and 2023 in the sub-regional economy – approximately 1 075 formal employment opportunities gained per year.
- The number of skilled employees increased at an average of 431 jobs per year, while semi-skilled employment gained 102 jobs per year. Low skilled employment gained 5 416 jobs at an average rate of 542 jobs per year.
- The informal sector decreased by 12 082 jobs between 2013 and 2023 – approximately -1 208 informal jobs per year.
- The economically active segment of the labour force increased by 61 911 people between 2013 and 2023. Approximately 63 241 people became unemployed in the sub-regional economy between 2013 and 2023.
- It is evident that the economically active segment of the population is growing faster than the absorption capacity of the sub-regional economy, meaning that potential jobs seekers are growing faster than the rate at which the sub-regional economy is creating employment. This could force job seekers to look for employment outside the sub-regional economy.
- The main employment creating sectors within the sub-regional economy are the community services, wholesale and trade, business services and manufacturing, contributing more than 80.4% to the jobs created within the sub-regional economy.

3.6 EMFULENI LOCAL ECONOMY COMPETITIVE ADVANTAGE ANALYSIS

The following analysis focuses on identifying and reviewing the competitive advantage that the Emfuleni Sub-Regional Economy has, considering the broader National Economy (i.e., aggregate economy). The purpose is to identify whether the Emfuleni Sub-Regional Economy has a competitive advantage over other sub-reginal economies/regions in the country because of its structure and historic performance. The outcome of the analysis also assists with identifying industries and economic sectors that could directly contribute to, or support, the existing drivers of the VAAL Aerotropolis or create additional land use opportunities that could be incorporated as part of a diverse economically driven offering and community support structure.

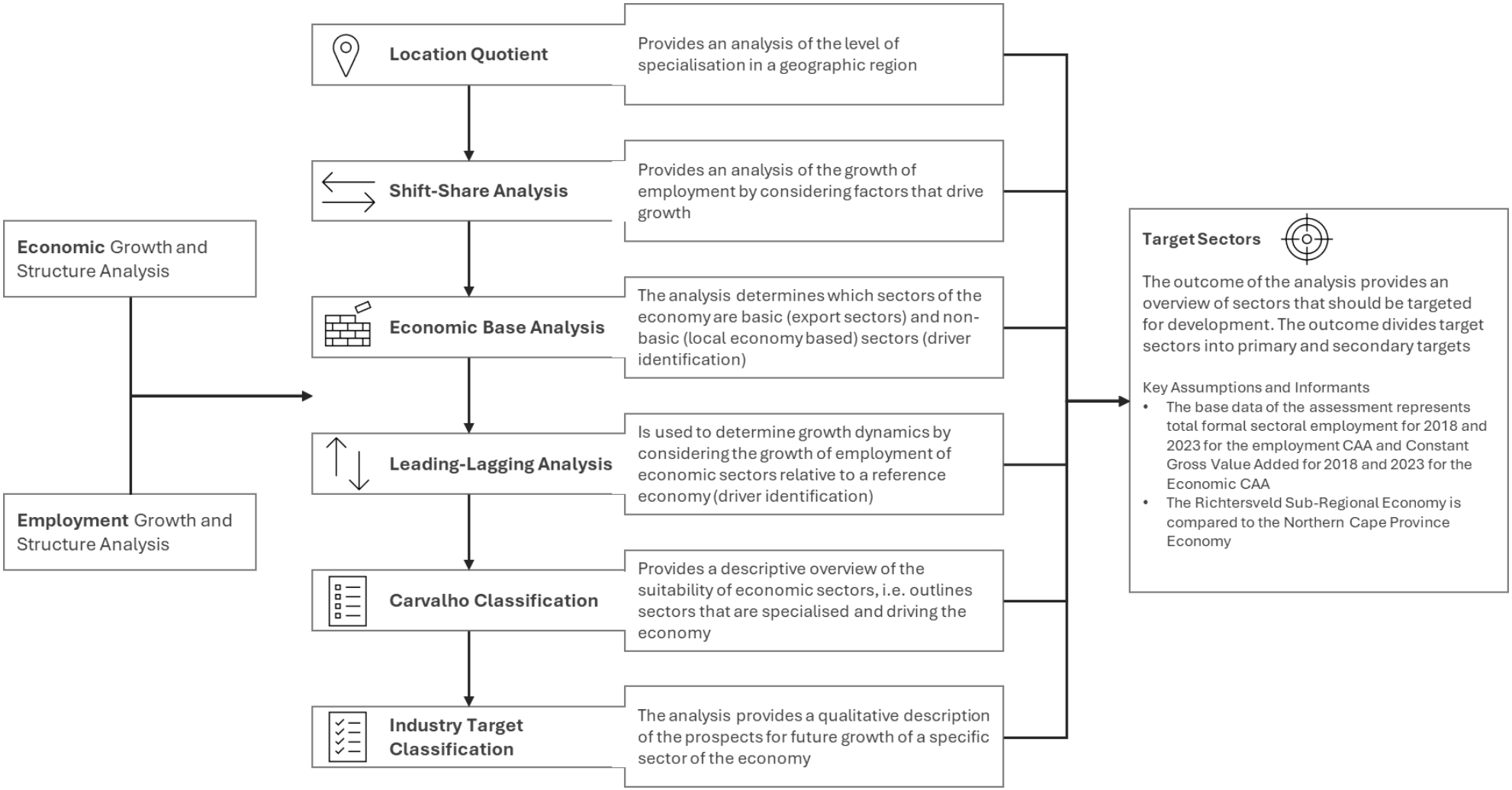
Competitive Advantage Analysis (CAA) is an assessment of the structure and performance of the economy of a geographic region to identify local strengths ("competitive advantages") and potential for economic development. The following approach used for CAA is focused on examining local industries/sectors to identify leading and lagging economic sectors and the potential prospects of these sectors for economic and employment growth. The outcome of the analysis reveals which economic sectors should be targeted for development based on growth trends, specialisation, and development potential.

In order to assess and identify economic sectors with the potential for economic and employment growth, the CAA is conducted for both the employment and economic growth drivers of the Emfuleni Sub-Regional Economy. The aim is to identify the competitive advantage the sub-regional economy provides in terms

of its capacity to support economic growth and employment creation within the sub-regional economy and in support of the proposed harbour development.

The following diagram depicts a concise overview of the analysis process and methodology:

Diagram 3.2: Competitive Advantage Analysis and Target Sector Identification Methodology



3.6.1 COMPETITIVE ADVANTAGE ANALYSIS – ECONOMIC GROWTH BASED

3.6.1.1 LOCATION QUOTIENT ANALYSIS

A location quotient identifies the level of specialisation in a geographic region. In simple terms, it measures the concentration of certain industry sectors in the region relative to the aggregate/reference economy.

Location Quotient (LQ) is a means of comparing the performance of regions against a benchmark region, usually the Province or the Nation. It compares how a sector is performing in a region, compared to the performance of the same sector in the benchmark region. A LQ of between 1 and 1.25 means that the regions are performing equally, whereas a LQ of less than 1 means that the regions are not performing well. A LQ of >1.25 shows that the region is outperforming the other regions.

Table 3.1: Location Quotients of the Emfuleni Local Economy

Primary Economic Sectors and Sub-sectors	LQ	Classification
Agriculture	**0.34**	**Low**
Agriculture	0.36	Low
Forestry	0.25	Low
Fishing	0.12	Low
Mining	**0.30**	**Low**
Manufacturing	**2.08**	**High**
Food, beverages, and tobacco	1.88	High
Textiles, clothing, and leather products	1.05	High
Wood and paper, publishing and printing	1.14	Medium
Petroleum products, chemicals, rubber, and plastic	1.77	High
Other non-metal mineral products	2.48	High
Metals, metal products, machinery, and equipment	3.66	High
Electrical machinery and apparatus	2.75	High
Radio, TV, instruments, watches, and clocks	1.03	Medium
Transport equipment	1.12	Medium
Furniture, other manufacturing	2.01	High
Utilities	**1.40**	**High**
Electricity and gas	1.15	Medium
Water	2.19	High
Construction	**1.34**	**High**
Trade	**1.06**	**Medium**
Wholesale and retail trade	1.08	Medium
Catering and accommodation services	0.92	Medium
Transport and storage	**0.83**	**Medium**
Transport and storage	0.94	Medium
Communication	0.62	Low
Business and Financial Services	**0.78**	**Medium**
Finance and insurance	0.67	Low
Business Services	0.81	Medium
Professional business services	0.75	Medium
Business activities n.e.c.	1.08	Medium
Government	**1.16**	**Medium**
National and Provincial government	1.09	Medium
Local government	1.33	High
Community and Personal Services	**0.73**	**Low**
Education (Private)	0.57	Low
Health and social work (Private)	0.74	Low
Other community, social and personal services	1.08	Medium

Source: DEMACON Calculations, 2024

The preceding data shows that the main economic sectors Manufacturing and Construction are all outperforming the region. Sub-sectors outperforming the region include the sub-sectors:

- Food, beverages, and tobacco
- Textiles, clothing and leather products
- Petroleum products, chemicals, rubber and plastic
- Other non-metal mineral products
- Metals, metal products, machinery and equipment
- Electrical machinery and apparatus
- Furniture, other manufacturing
- Water.

The data shows that the following main economic sectors of the local economy have a medium level of specialisation: Trade, Transport and Storage, Business and Financial Services, and Government Services.

The main economic sectors with a low location quotient is the Agriculture, Mining and Community & Personal Services sectors.

3.6.1.2 ECONOMIC BASE ANALYSIS

An economic base analysis is designed to analyse the broad economic structure of the Emfuleni local economy. It does this by dividing the economy into two sectors:

- **Basic sectors** (which includes all output (goods and services) sold outside the borders of the local economy – brings money in for the local economy
- **Non-basic sectors** (which includes all output that is sold within the local economy) – caters to the local economy

A local region's export industries are its economic foundation, and all other industries thrive by servicing the export industries and one another. A change in the basic sector will automatically lead to a similar change in the non-basic sector. The ratio of non-basic to basic activity is reasonably stable over the long term. Overall, if a region can increase the level of basic employment, it can concomitantly increase total employment. For this study, the location quotient method is applied. It is important to understand that not all of a basic industry is 'basic'. Only that part of the industry that serves the export market is considered basic. It is the part of the industry that raises the location quotient above 1.0. Any employment below an LQ of 1.0 is Non-Basic – those jobs typically serve local demand.

Table 3.2: Emfuleni Local Economy Base Analysis

Economic Sectors and Sub-sectors	Sector Classification	BM Multiplier
Agriculture	**Non-basic sector**	
Agriculture	Non-basic sector	
Forestry	Non-basic sector	
Fishing	Non-basic sector	
Mining	**Non-basic sector**	
Manufacturing	**Basic sector**	**1.92**
Food, beverages and tobacco	Basic sector	2.14
Textiles, clothing and leather products	Basic sector	21.61
Wood and paper, publishing and printing	Basic sector	8.37
Petroleum products, chemicals, rubber and plastic	Basic sector	2.30
Other non-metal mineral products	Basic sector	1.67
Metals, metal products, machinery and equipment	Basic sector	1.38
Electrical machinery and apparatus	Basic sector	1.57
Radio, TV, instruments, watches and clocks	Basic sector	39.68
Transport equipment	Basic sector	9.22
Furniture, other manufacturing	Basic sector	1.99
Utilities	**Basic sector**	**3.49**
Electricity and gas	Basic sector	7.52
Water	Basic sector	1.84
Construction	**Basic sector**	**3.97**
Trade	**Basic sector**	**17.91**
Wholesale and retail trade	Basic sector	14.16
Catering and accommodation services	Non-basic sector	
Transport and Storage	**Non-basic sector**	
Transport and storage	Non-basic sector	
Communication	Non-basic sector	
Business and Financial Services	Non-basic sector	
Finance and insurance	Non-basic sector	
Business Services	Non-basic sector	
Government	**Basic sector**	**7.23**
National and Provincial government	Basic sector	12.36
Local government	Basic sector	4.01
Community and Personal Services	**Non-basic sector**	
Education (Private)	Non-basic sector	
Health and social work (Private)	Non-basic sector	
Other community, social and personal services	Basic sector	13.68
Emfuleni Local Economy Basic Sector Multiplier		**1.98**

Source: DEMACON Calculations, 2024

The Manufacturing, Utilities, Construction, Trade, and Government Services are all basic sectors, indicating that they are exporting goods and services and ensuring that money comes into the local economy. These sectors drive the local economy and investment in these sectors will lead to investment in the supporting non-basic sectors. Non-basic sectors include Agriculture, Mining Transport and Storage, Business and Financial Services and Community and Personal Services. The data also shows that the basic multiplier for the local economy is 1.98. The economic base analysis shows that for every R1 000 of gross value added by basic sectors of the economy, an additional R1 980 of gross value added is created within non-basic sectors of the sub-regional economy.

3.6.1.3 CARVALHO CLASSIFICATION

The analysis is used to interpret the local economy's growth potential. The analysis seeks to compare the local economy's growth relative to the national

economy's growth and to assess the suitability of economic sectors for growth and development based on its potential to cluster. The Carvalho Classification describes each economic sector based on its relative growth and cluster potential in terms of 12 classes. Therefore, the classification of economic sectors is for descriptive purposes and to enable decision-makers to target key sectors based on growth potential.

Table 3.3: Emfuleni Local Economy Carvalho Classification

Economic Sectors and Sub-sectors	Provincial Relative Growth	Local Relative Growth	Classification
Agriculture	**Leading**	**Leading**	**Rising**
Agriculture	Leading	Leading	Rising
Forestry	Leading	Leading	Rising
Fishing	Lagging	Leading	Moderate
Mining	**Lagging**	**Leading**	**Moderate**
Manufacturing	**Lagging**	**Lagging**	**Challenging**
Food, beverages and tobacco	Lagging	Leading	Evolving
Textiles, clothing and leather products	Lagging	Leading	Transitional
Wood and paper, publishing and printing	Lagging	Leading	Transitional
Petroleum products, chemicals, rubber and plastic	Lagging	Lagging	Challenging
Other non-metal mineral products	Lagging	Lagging	Challenging
Metals, metal products, machinery and equipment	Lagging	Lagging	Challenging
Electrical machinery and apparatus	Lagging	Lagging	Challenging
Radio, TV, instruments, watches and clocks	Lagging	Lagging	Vulnerable
Transport equipment	Lagging	Leading	Transitional
Furniture, other manufacturing	Lagging	Leading	Evolving
Utilities	**Lagging**	**Lagging**	**Challenging**
Electricity and gas	Lagging	Lagging	Vulnerable
Water	Lagging	Lagging	Challenging
Construction	**Lagging**	**Leading**	**Evolving**
Trade	**Lagging**	**Lagging**	**Vulnerable**
Wholesale and retail trade	Lagging	Lagging	Vulnerable
Catering and accommodation services	Leading	Leading	Accelerating
Transport and Storage	**Leading**	**Leading**	**Accelerating**
Transport and storage	Leading	Leading	Accelerating
Communication	Leading	Lagging	Modest
Business and Financial Services	**Leading**	**Lagging**	**Yielding**
Finance and insurance	Leading	Lagging	Modest
Business Services	Leading	Lagging	Yielding
Professional business services	Leading	Lagging	Yielding
Business activities n.e.c.	Leading	Lagging	Yielding
Government	**Leading**	**Lagging**	**Yielding**
National and Provincial government	Lagging	Lagging	Vulnerable
Local government	Leading	Lagging	Promising
Community and Personal Services	**Leading**	**Lagging**	**Modest**
Education (Private)	Leading	Lagging	Modest
Health and social work (Private)	Lagging	Lagging	Marginal
Other community, social and personal services	Leading	Leading	Accelerating

Source: DEMACON Calculations, 2024

The preceding data shows that the economic sectors of the local economy are primarily growing at a rate similar to that of the comparative sectors at national level. There are no driving or accelerating sectors. Agriculture is the only rising sector.

Table 3.4: Interpretation of the Carvalho Classification of the Local Economy Sectors

Definition	Classification
Driving	Community is highly specialised in this sector, which is growing nationally/provincially and growing at an even higher rate locally
Accelerating	Community is neither highly specialised nor under-specialised in this sector, which is growing nationally/provincially and growing at an even higher rate locally

Rising	Relatively low proportion of local employment, but will likely increase due to growth in this sector, which is growing on a metropolitan level and growing at an even higher rate locally
Evolving	High local specialisation in a sector which grew at a provincial level at a slower rate than overall growth, local growth exceeded provincial growth in this sector
Transitional	Average specialisation in a sector which grew at a provincial level at a slower rate than overall growth, local growth exceeded metropolitan growth in this sector
Moderate	Relatively underrepresented in a sector which grew at a metropolitan level at a slower rate than overall growth; local growth exceeded metropolitan growth in this sector
Promising	High local specialisation in a sector which grew at a metropolitan level, local growth was slower than metropolitan growth in this sector
Yielding	Average specialisation in a sector which grew at a metropolitan level, local growth was slower than metropolitan growth in this sector
Modest	Relatively low specialisation in a sector which grew at a metropolitan level; local growth was slower than metropolitan growth in this sector
Challenging	Industries have a relatively high concentration of employment in the community, which suggests that they play a prominent role in overall employment in the community and should be monitored carefully
Vulnerable	Industries have an average concentration of employment
Marginal	Industries are under-represented in the community

Source: DEMACON Calculations, 2024

3.6.1.4 INDUSTRY TARGET CLASSIFICATION

This classification is similar to that of the Carvalho Model in that it is based on a combination of the location quotient, National Sector Growth and Local Sector Growth values and it is expressed qualitatively not quantitatively. It is somewhat different in the way that it classifies the sectors, the categories are phrases that suggest the kind of prospects for growth that could be expected and, in some cases, whether the sector should be a retention target.

Table 3.5: Emfuleni Local Economy Targeting Classification

Economic Sectors and Sub-sectors	Classification
Agriculture	Emerging Strength
Agriculture	Emerging Strength
Forestry	Emerging Strength
Fishing	Prospects limited by weak base and external trends
Mining	Prospects limited by weak base and external trends
Manufacturing	Prospects limited by external trends and declining competitiveness
Food, beverages and tobacco	Prospects limited by external trends
Textiles, clothing and leather products	Prospects limited by external trends
Wood and paper, publishing and printing	Prospects limited by external trends
Petroleum products, chemicals, rubber and plastic	Prospects limited by external trends and declining competitiveness
Other non-metal mineral products	Prospects limited by external trends and declining competitiveness
Metals, metal products, machinery and equipment	Prospects limited by external trends and declining competitiveness
Electrical machinery and apparatus	Prospects limited by external trends and declining competitiveness
Radio, TV, instruments, watches and clocks	Prospects limited by external trends and declining competitiveness
Transport equipment	Prospects limited by external trends
Furniture, other manufacturing	Prospects limited by external trends
Utilities	Prospects limited by external trends and declining competitiveness
Electricity and gas	Prospects limited by external trends and declining competitiveness
Water	Prospects limited by external trends and declining competitiveness
Construction	Prospects limited by external trends
Trade	Prospects limited by external trends and declining competitiveness
Wholesale and retail trade	Prospects limited by external trends and declining competitiveness
Catering and accommodation services	Current Strength
Transport and Storage	Current Strength
Transport and storage	Current Strength
Communication	Prospects limited by weak base and declining competitiveness
Business and Financial Services	High priority retention target

Finance and insurance	Prospects limited by weak base and declining competitiveness
Business Services	High priority retention target
Professional business services	High priority retention target
Business activities n.e.c.	High priority retention target
Government	High priority retention target
National and Provincial government	Prospects limited by external trends and declining competitiveness
Local government	High priority retention target
Community and Personal Services	Prospects limited by weak base and declining competitiveness
Education (Private)	Prospects limited by weak base and declining competitiveness
Health and social work (Private)	Prospects limited overall
Other community, social and personal services	Current Strength

Source: DEMACON Calculations, 2024

The industry target classification is displayed graphically by the subsequent Figure. The size of the circles represents the location quotient, that is, the relative size of the sector.

Sectors located in the top and bottom left quadrants are considered to have limited prospects because these industries are declining in the aggregate economy. If they are small, they have additional challenges and if they are within the negative range in terms of LSRG, they also suffer from declining competitiveness.

In business terminology, the upper left quadrant reflects industry groups that are increasing their market share in a declining market, industries in the lower left quadrant represents industries that are losing market share in a declining market.

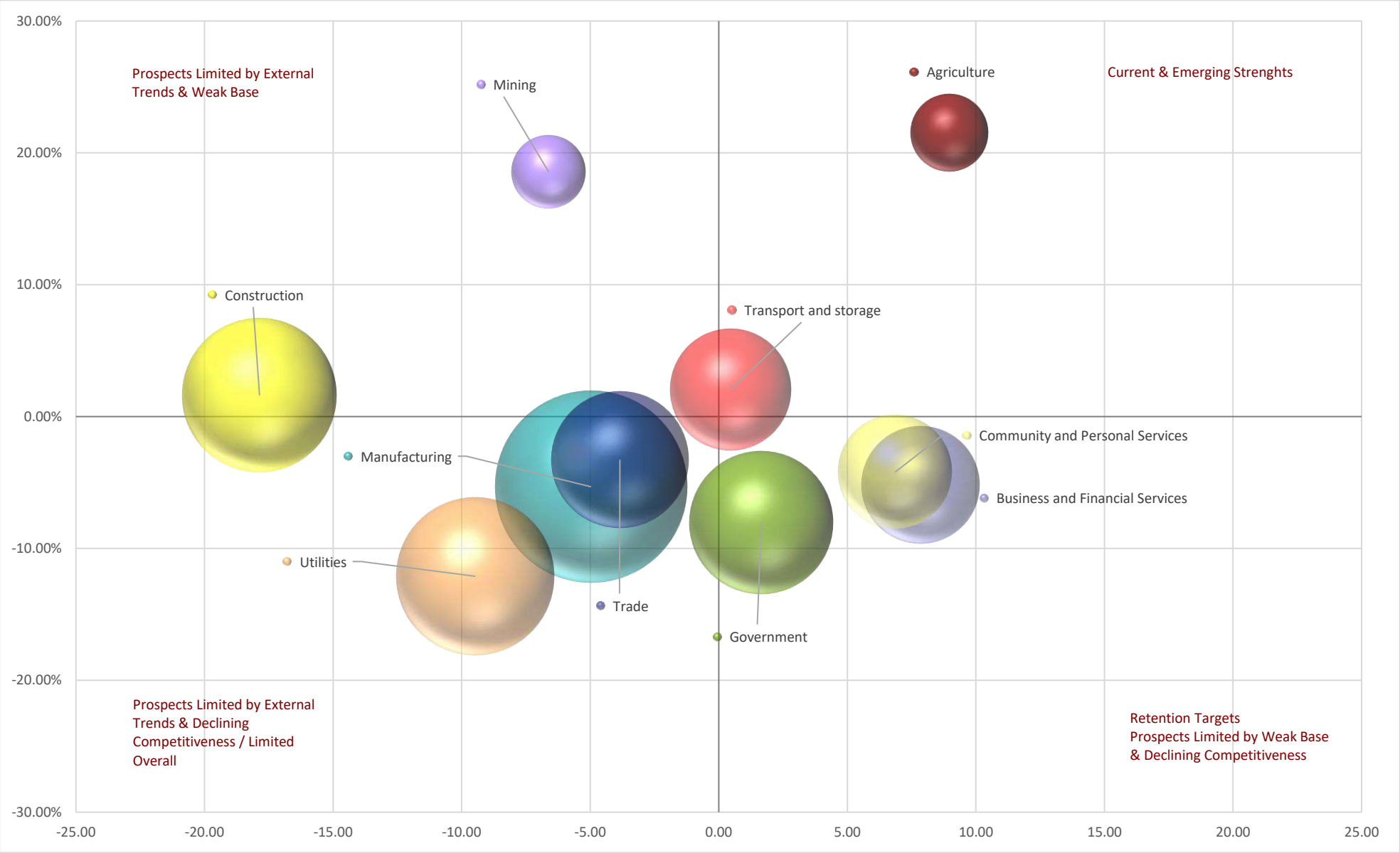
Sectors falling within the lower right quadrant are classified as retention targets (if large enough) because they are growing in the aggregate economy but more slowly locally. Smaller industry groups in this quadrant are deemed to have limited prospects.

Sectors within the upper right quadrant are growing in the aggregate economy and locally. These industries represent the strengths and emerging strengths of the local economy.

If the circles are large, it represents current strengths and if the circles are smaller then it reflects emerging strengths. In business terminology industries in the upper right quadrant are increasing their market share in an expanding market, whereas the industries in the lower right quadrant are losing market share in an expanding market.

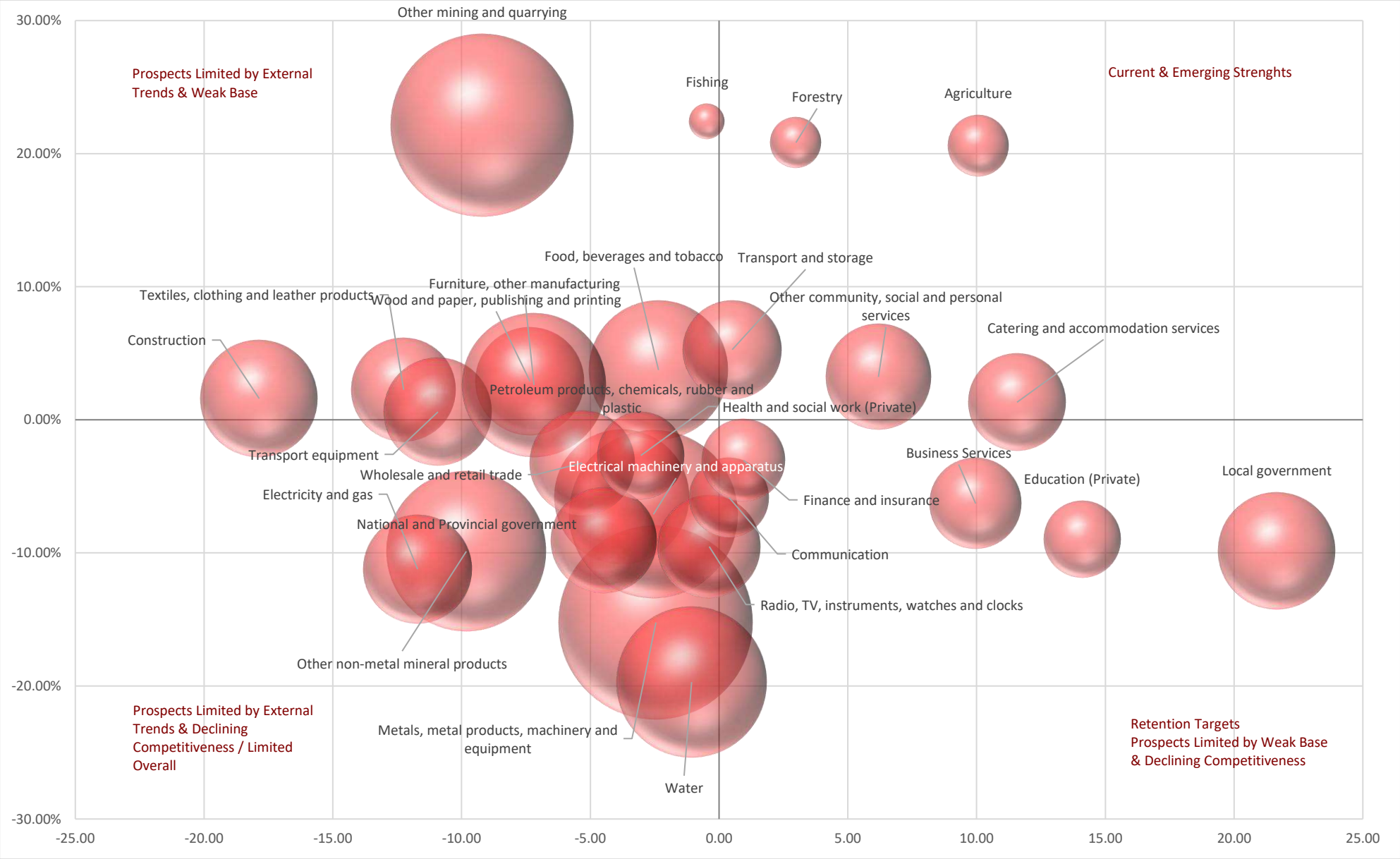
According to the industry targeting classification, the Agriculture and Transport and Storage sectors are the only current or emerging strengths.

Figure 3.1: Emfuleni Local Economy Primary Economic Sectors Targeting Classification



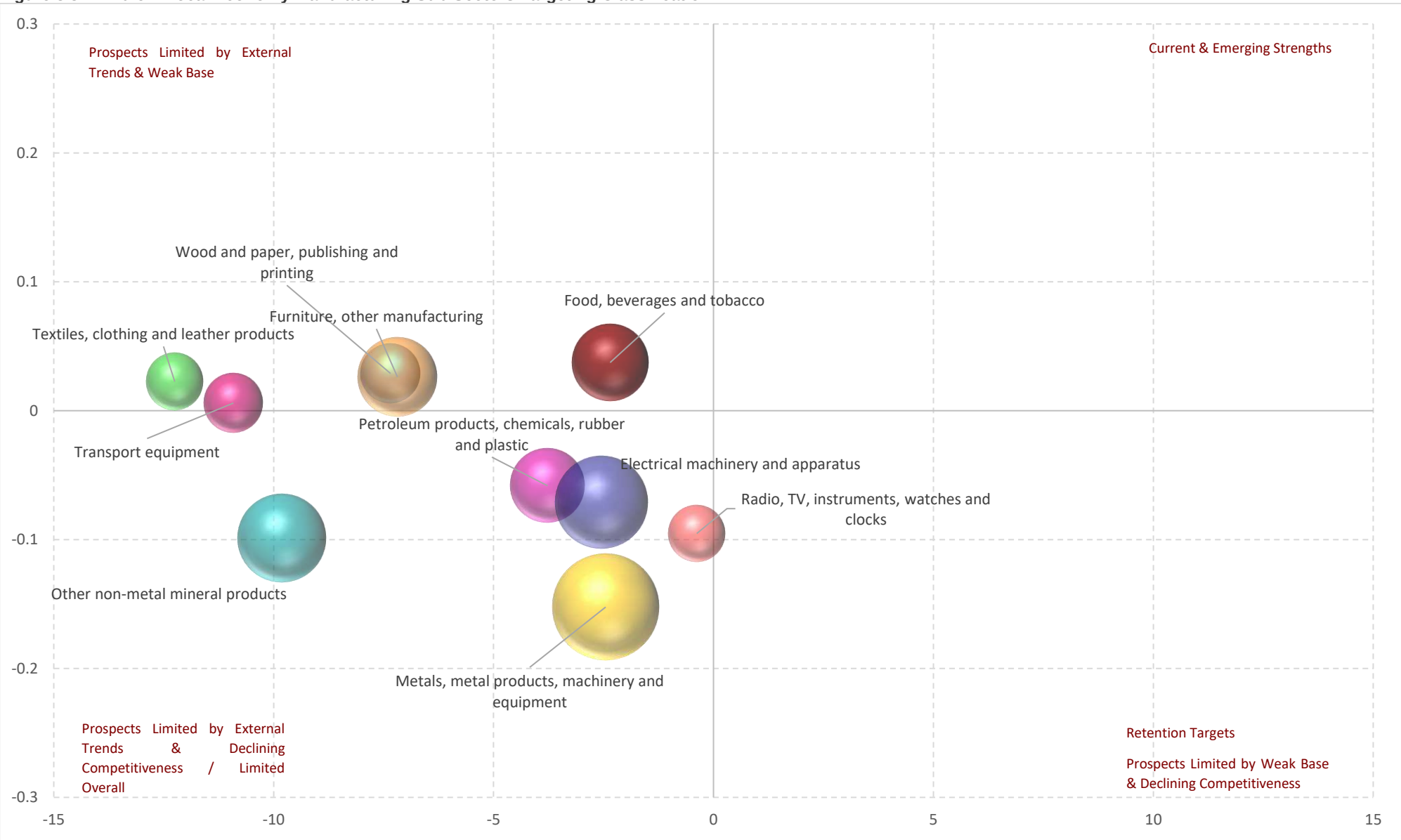
Source: DEMACON Calculations, 2024

Figure 3.2: Emfuleni Local Economy Sub-Sectors Targeting Classification



Source: DEMACON Calculations, 2024

Figure 3.3: Emfuleni Local Economy Manufacturing Sub-Sectors Targeting Classification



Source: DEMACON Calculations, 2024

3.6.2 Competitive Advantage Analysis – Employment Growth Based

3.6.2.1 Location Quotient Analysis

A location quotient identifies the level of specialisation in a geographic region. In simple terms, it measures the concentration of certain industry sectors in the region relative to the aggregate/reference economy.

Location Quotient (LQ) is a means of comparing the performance of regions against a benchmark region, usually the Province or the Nation. It compares how a sector is performing in a region, compared to the performance of the same sector in the benchmark region. A LQ of between 1 and 1.25 means that the regions are performing equally, whereas a LQ of less than 1 means that the regions are not performing well. A LQ of >1.25 shows that the region is outperforming the other regions.

Table 3.6: Location Quotients of the Emfuleni Local Economy

Primary Economic Sectors and Sub-sectors	LQ	Classification
Agriculture	**0.27**	**Low**
Agriculture	0.29	Low
Forestry	0.21	Low
Fishing	0.11	Low
Mining	**0.21**	**Low**
Manufacturing	**1.67**	**High**
Food, beverages, and tobacco	1.14	Medium
Textiles, clothing, and leather products	0.88	High
Wood and paper, publishing and printing	1.00	Medium
Petroleum products, chemicals, rubber, and plastic	1.57	High
Other non-metal mineral products	2.04	High
Metals, metal products, machinery, and equipment	2.77	High
Electrical machinery and apparatus	2.48	High
Radio, TV, instruments, watches, and clocks	0.96	Medium
Transport equipment	1.10	Medium
Furniture, other manufacturing	1.56	High
Utilities	**1.35**	**High**
Electricity and gas	1.16	Medium
Water	1.93	High
Construction	**1.26**	**High**
Trade	**1.15**	**Medium**
Wholesale and retail trade	1.18	Medium
Catering and accommodation services	0.95	Medium
Transport and Storage	**0.99**	**Medium**
Transport and storage	1.04	Medium
Communication	0.78	Medium
Business and Financial Services	**0.97**	**Medium**
Finance and insurance	0.82	Medium
Business Services	0.99	Medium
Professional business services	0.91	Medium
Business activities n.e.c.	1.06	Medium
Government	**0.87**	**Medium**
National and Provincial government	0.84	Medium
Local government	0.93	Medium
Community and Personal Services	**0.96**	**Medium**
Education (Private)	0.81	Medium
Health and social work (Private)	0.94	Medium
Other community, social and personal services	1.11	Medium

Source: DEMACON Calculations, 2024

The preceding data shows that the main economic sectors Manufacturing, Utilities and Construction are outperforming the region.

Sub-sectors outperforming the region include the following sub-sectors:

- Textiles, clothing and leather products
- Petroleum products, chemicals, rubber and plastic
- Other non-metal mineral products
- Metals, metal products, machinery and equipment
- Electrical machinery and apparatus
- Furniture and other manufacturing
- Water.

The data shows that the following main economic sectors of the local economy have a medium level of specialisation: Construction, Trade, Transport and Storage, Government, and Community and Personal Services.

The Agriculture and Mining sectors are the only sectors with a low location quotient.

3.6.2.2 Economic Base Analysis

An economic base analysis is designed to analyse the broad economic structure of the Emfuleni local economy. It does this by dividing the economy into two sectors:

- **Basic sectors** (which includes all output (goods and services) sold outside the borders of the local economy – brings money in for the local economy
- **Non-basic sectors** (which includes all output that is sold within the local economy) – caters to the local economy

A local region's export industries are its economic foundation, and all other industries thrive by servicing the export industries and one another. A change in the basic sector will automatically lead to a similar change in the non-basic sector. The ratio of non-basic to basic activity is reasonably stable over the long term. Overall, if a region can increase the level of basic employment, it can concomitantly increase total employment. For this study, the location quotient method is applied. It is important to understand that not all of a basic industry is 'basic'. Only that part of the industry that serves the export market is considered basic. It is the part of the industry that raises the location quotient above 1.0. Any employment below an LQ of 1.0 is Non-Basic – those jobs typically serve local demand.

Table 3.7: Emfuleni Local Economy Base Analysis

Economic Sectors and Sub-sectors	Sector Classification	BM Multiplier
Agriculture	**Non-basic sector**	
Agriculture	Non-basic sector	
Forestry	Non-basic sector	
Fishing	Non-basic sector	
Mining	**Non-basic sector**	
Manufacturing	**Basic sector**	**2.49**
Food, beverages and tobacco	Basic sector	8.01
Textiles, clothing and leather products	Non-basic sector	
Wood and paper, publishing and printing	Non-basic sector	
Petroleum products, chemicals, rubber and plastic	Basic sector	2.75
Other non-metal mineral products	Basic sector	1.96
Metals, metal products, machinery and equipment	Basic sector	1.56
Electrical machinery and apparatus	Basic sector	1.68
Radio, TV, instruments, watches and clocks	Non-basic sector	
Transport equipment	Basic sector	10.95
Furniture, other manufacturing	Basic sector	2.78
Utilities	**Basic sector**	**3.85**
Electricity and gas	Basic sector	7.18
Water	Basic sector	2.08
Construction	**Basic sector**	**4.86**
Trade	**Basic sector**	**7.74**
Wholesale and retail trade	Basic sector	6.63
Catering and accommodation services	Non-basic sector	
Transport and Storage	**Non-basic sector**	
Transport and storage	Basic sector	26.07
Communication	Non-basic sector	
Business and Financial Services	**Non-basic sector**	
Finance and insurance	Non-basic sector	
Business Services	Non-basic sector	
Government	Non-basic sector	
National and Provincial government	Non-basic sector	
Local government	Non-basic sector	
Community and Personal Services	Non-basic sector	
Education (Private)	Non-basic sector	
Health and social work (Private)	Non-basic sector	
Other community, social and personal services	Basic sector	10.12
Emfuleni Local Economy Basic Sector Multiplier		**3.20**

Source: DEMACON Calculations, 2024

The Manufacturing, Utilities, Construction, and Trade sectors are all basic sectors, indicating that they are exporting goods and services and ensuring that money comes into the local economy. These sectors drive the local economy and investment in these sectors will lead to investment in the supporting non-basic sectors. Non-basic sectors include Agriculture, Mining, Transport and Storage, Business and Financial Services, Government, and Community and Personal Services. The data also shows that the basic multiplier for the local economy is 3.20. The data suggests that for every employment opportunity created in the basic sector, approximately 3.20 employment opportunities are created in non-basic sectors.

3.6.2.3 CARVALHO CLASSIFICATION

The analysis is used to interpret the local economy's growth potential. The analysis seeks to compare the local economy's growth relative to the national economy's growth and to assess the suitability of economic sectors for growth and development based on its potential to cluster. The Carvalho Classification

describes each economic sector based on its relative growth and cluster potential in terms of 12 classes. Therefore, the classification of economic sectors is for descriptive purposes and to enable decision-makers to target key sectors based on growth potential.

Table 3.9: Emfuleni Local Economy Carvalho Classification

Economic Sectors and Sub-sectors	Provincial Relative Growth	Local Relative Growth	Classification
Agriculture	Leading	Leading	Rising
Agriculture	Leading	Leading	Rising
Forestry	Leading	Leading	Rising
Fishing	Leading	Leading	Rising
Mining	Leading	Leading	Rising
Manufacturing	Leading	Lagging	Promising
Food, beverages and tobacco	Leading	Leading	Accelerating
Textiles, clothing and leather products	Lagging	Leading	Transitional
Wood and paper, publishing and printing	Lagging	Leading	Transitional
Petroleum products, chemicals, rubber and plastic	Leading	Leading	Driving
Other non-metal mineral products	Lagging	Lagging	Challenging
Metals, metal products, machinery and equipment	Leading	Lagging	Promising
Electrical machinery and apparatus	Leading	Lagging	Promising
Radio, TV, instruments, watches and clocks	Leading	Lagging	Yielding
Transport equipment	Leading	Leading	Accelerating
Furniture, other manufacturing	Leading	Leading	Driving
Utilities	Leading	Lagging	Promising
Electricity and gas	Lagging	Lagging	Vulnerable
Water	Leading	Lagging	Promising
Construction	Lagging	Leading	Evolving
Trade	Leading	Lagging	Yielding
Wholesale and retail trade	Leading	Lagging	Yielding
Catering and accommodation services	Lagging	Leading	Transitional
Transport and Storage	Lagging	Lagging	Vulnerable
Transport and storage	Lagging	Lagging	Vulnerable
Communication	Leading	Lagging	Yielding
Business and Financial Services	Leading	Lagging	Yielding
Finance and insurance	Lagging	Lagging	Vulnerable
Business Services	Leading	Lagging	Yielding
Professional business services	Leading	Lagging	Yielding
Business activities n.e.c.	Leading	Lagging	Yielding
Government	Lagging	Lagging	Vulnerable
National and Provincial government	Lagging	Lagging	Vulnerable
Local government	Leading	Lagging	Yielding
Community and Personal Services	Leading	Lagging	Yielding
Education (Private)	Leading	Lagging	Yielding
Health and social work (Private)	Leading	Lagging	Yielding
Other community, social and personal services	Lagging	Lagging	Vulnerable

Source: DEMACON Calculations, 2024

The preceding data shows that the economic sectors of the local economy are primarily growing at a rate similar to that of the comparative sectors at national level. Therefore, the local economy has sizeable competitive advantage in the sense that its economic base and key sectors are growing at rates faster than the national average.

There are no driving main sectors, the only driving sub-sectors are “Petroleum products, chemicals, rubber and plastic” and “Furniture and other manufacturing”.

There are no accelerating main sectors. The only accelerating sub-sectors include “Food, beverages and tobacco” and “Transport equipment”.

Agriculture and Mining are classified as rising sectors, as well as all the agricultural sub-sectors.

Table 3.10: Interpretation of the Carvalho Classification of the Local Economy Sectors

Definition	Classification
Driving	Community is highly specialised in this sector, which is growing nationally/provincially and growing at an even higher rate locally
Accelerating	Community is neither highly specialised nor under-specialised in this sector, which is growing nationally/provincially and growing at an even higher rate locally
Rising	Relatively low proportion of local employment, but will likely increase due to growth in this sector, which is growing on a metropolitan level and growing at an even higher rate locally
Evolving	High local specialisation in a sector which grew at a provincial level at a slower rate than overall growth, local growth exceeded metropolitan growth in this sector
Transitional	Average specialisation in a sector which grew at a metropolitan level at a slower rate than overall growth, local growth exceeded metropolitan growth in this sector
Moderate	Relatively underrepresented in a sector which grew at a metropolitan level at a slower rate than overall growth; local growth exceeded metropolitan growth in this sector
Promising	High local specialisation in a sector which grew at a metropolitan level, local growth was slower than metropolitan growth in this sector
Yielding	Average specialisation in a sector which grew at a metropolitan level, local growth was slower than metropolitan growth in this sector
Modest	Relatively low specialisation in a sector which grew at a metropolitan level; local growth was slower than metropolitan growth in this sector
Challenging	Industries have a relatively high concentration of employment in the community, which suggests that they play a prominent role in overall employment in the community and should be monitored carefully
Vulnerable	Industries have an average concentration of employment
Marginal	Industries are under-represented in the community

Source: DEMACON Calculations, 2024

3.6.2.4 INDUSTRY TARGET CLASSIFICATION

This classification is similar to that of the Carvalho Model in that it is based on a combination of the location quotient, National Sector Growth and Local Sector Growth values and it is expressed qualitatively not quantitatively. It is somewhat different in the way that it classifies the sectors, the categories are phrases that suggest the kind of prospects for growth that could be expected and, in some cases, whether the sector should be a retention target.

Table 3.11: Emfuleni Local Economy Targeting Classification

Economic Sectors and Sub-sectors	Classification
Agriculture	Emerging Strength
Agriculture	Emerging Strength
Forestry	Emerging Strength
Fishing	Emerging Strength
Mining	Emerging Strength
Manufacturing	High priority retention target
Food, beverages and tobacco	Current Strength
Textiles, clothing and leather products	Prospects limited by external trends
Wood and paper, publishing and printing	Prospects limited by external trends
Petroleum products, chemicals, rubber and plastic	Current Strength
Other non-metal mineral products	Prospects limited by external trends and declining competitiveness
Metals, metal products, machinery and equipment	High priority retention target
Electrical machinery and apparatus	High priority retention target
Radio, TV, instruments, watches and clocks	High priority retention target
Transport equipment	Current Strength
Furniture, other manufacturing	Current Strength
Utilities	High priority retention target
Electricity and gas	Prospects limited by external trends and declining competitiveness
Water	High priority retention target
Construction	Prospects limited by external trends
Trade	High priority retention target
Wholesale and retail trade	High priority retention target
Catering and accommodation services	Prospects limited by external trends
Transport and Storage	Prospects limited by external trends and declining competitiveness
Transport and storage	Prospects limited by external trends and declining competitiveness

Communication	High priority retention target
Business and Financial Services	High priority retention target
Finance and insurance	Prospects limited by external trends and declining competitiveness
Business Services	High priority retention target
Professional business services	High priority retention target
Business activities n.e.c.	High priority retention target
Government	Prospects limited by external trends and declining competitiveness
National and Provincial government	Prospects limited overall
Local government	High priority retention target
Community and Personal Services	High priority retention target
Education (Private)	Prospects limited by weak base and declining competitiveness
Health and social work (Private)	High priority retention target
Other community, social and personal services	Prospects limited by external trends and declining competitiveness

Source: DEMACON Calculations, 2024

The industry target classification is displayed graphically by the subsequent Figure. The size of the circles represents the location quotient, that is, the relative size of the sector.

Sectors located in the top and bottom left quadrants are considered to have limited prospects because these industries are declining in the aggregate economy. If they are small, they have additional challenges and if they are within the negative range in terms of LSRG, they also suffer from declining competitiveness.

In business terminology, the upper left quadrant reflects industry groups that are increasing their market share in a declining market, industries in the lower left quadrant represents industries that are losing market share in a declining market.

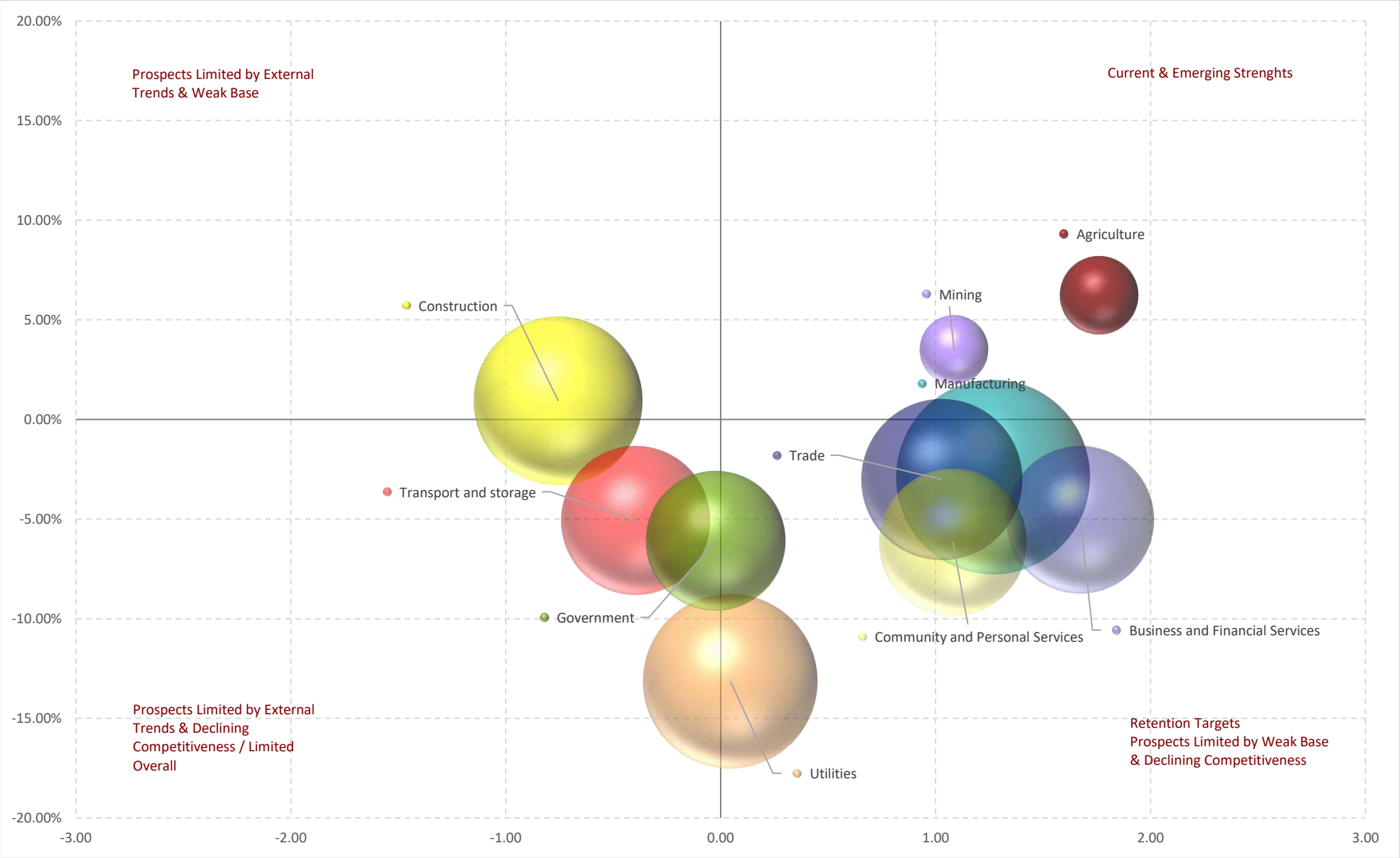
Sectors falling within the lower right quadrant are classified as retention targets (if large enough) because they are growing in the aggregate economy but more slowly locally. Smaller industry groups in this quadrant are deemed to have limited prospects.

Sectors within the upper right quadrant are growing in the aggregate economy and locally. These industries represent the strengths and emerging strengths of the local economy.

If the circles are large, it represents current strengths and if the circles are smaller then it reflects emerging strengths. In business terminology industries in the upper right quadrant are increasing their market share in an expanding market, whereas the industries in the lower right quadrant are losing market share in an expanding market.

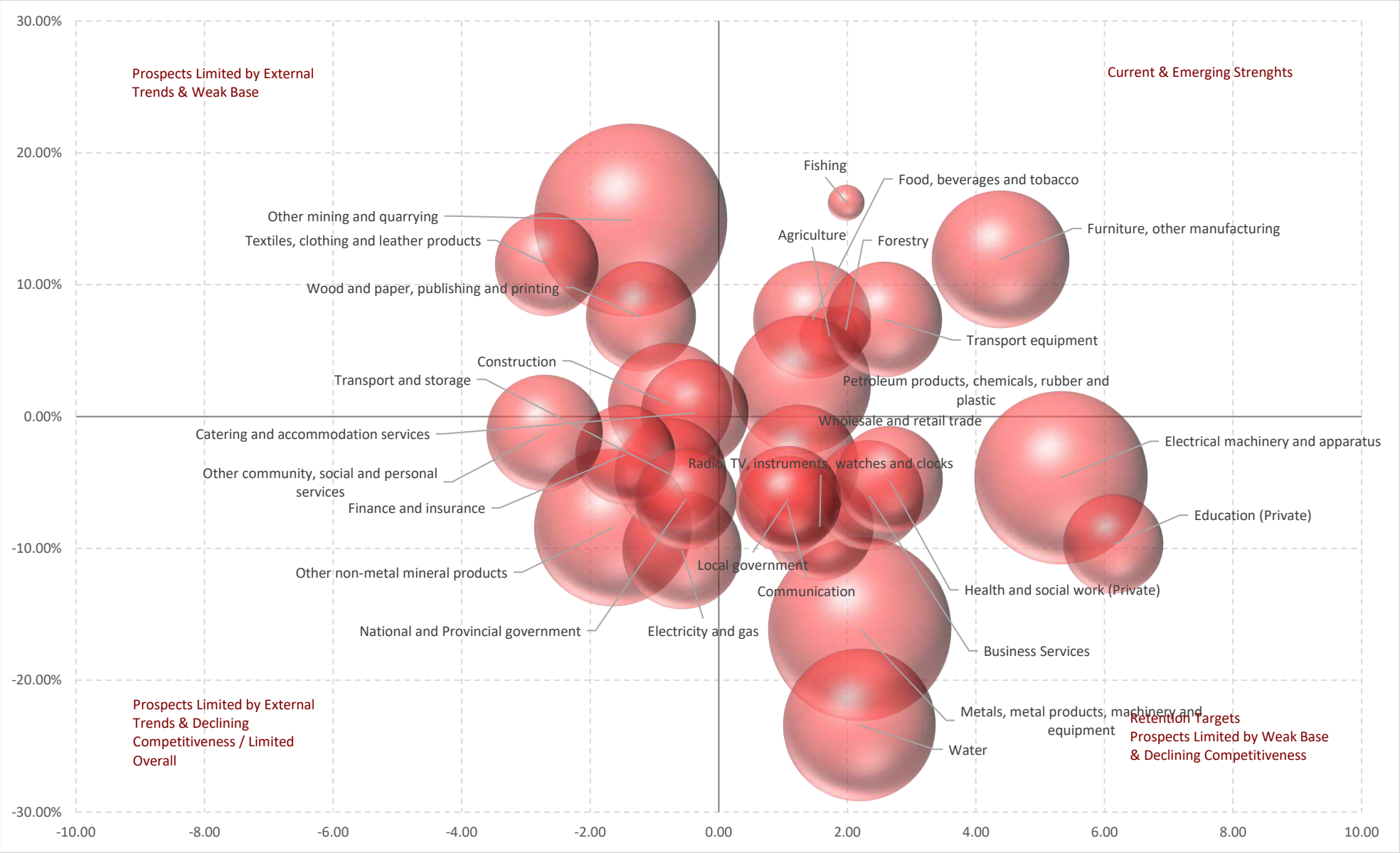
According to the industry targeting classification, the Agriculture and Mining sectors are the only emerging strengths.

Figure 3.4: Emfuleni Local Economy Primary Economic Sectors Targeting Classification



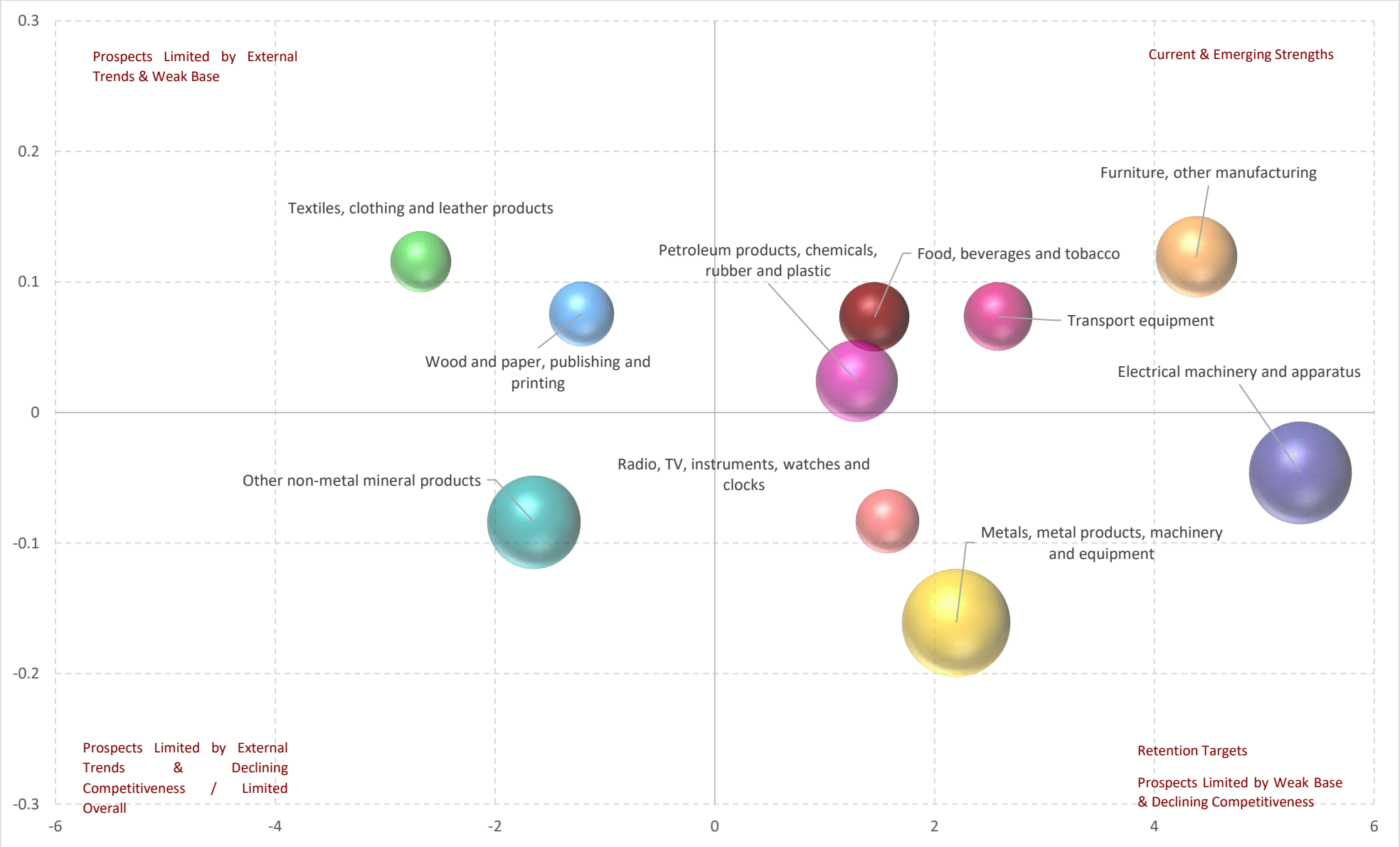
Source: DEMACON Calculations, 2024

Figure 3.5: Emfuleni Local Economy Sub-Sectors Targeting Classification



Source: DEMACON Calculations, 2024

Figure 3.6: Emfuleni Local Economy Manufacturing Sub-Sectors Targeting Classification



Source: DEMACON Calculations, 2024

3.7 METSIMAHOLO LOCAL ECONOMY COMPETITIVE ADVANTAGE ANALYSIS

The following analysis focuses on identifying and reviewing the competitive advantage that the Metsimaholo Sub-Regional Economy has, considering the broader National Economy (i.e., aggregate economy). The purpose is to identify whether the Metsimaholo Sub-Regional Economy has a competitive advantage over other sub-reginal economies/regions in the country because of its structure and historic performance. The outcome of the analysis also assists with identifying industries and economic sectors that could directly contribute to, or support, the existing drivers of the VAAL Aerotropolis or create additional land use opportunities that could be incorporated as part of a diverse economically driven offering and community support structure.

Competitive Advantage Analysis (CAA) is an assessment of the structure and performance of the economy of a geographic region to identify local strengths ("competitive advantages") and potential for economic development. The following approach used for CAA is focused on examining local industries/sectors to identify leading and lagging economic sectors and the potential prospects of these sectors for economic and employment growth. The outcome of the analysis reveals which economic sectors should be targeted for development based on growth trends, specialisation, and development potential.

In order to assess and identify economic sectors with the potential for economic and employment growth, the CAA is conducted for both the employment and economic growth drivers of the Metsimaholo5 Sub-Regional Economy. The aim is to identify the competitive advantage the sub-regional economy provides in terms of its capacity to support economic growth and employment creation within the sub-regional economy and in support of the proposed harbour development.

The following diagram depicts a concise overview of the analysis process and methodology:

3.7.1 COMPETITIVE ADVANTAGE ANALYSIS – ECONOMIC GROWTH BASED

3.7.1.1 LOCATION QUOTIENT ANALYSIS

A location quotient identifies the level of specialisation in a geographic region. In simple terms, it measures the concentration of certain industry sectors in the region relative to the aggregate/reference economy.

Location Quotient (LQ) is a means of comparing the performance of regions against a benchmark region, usually the Province or the Nation. It compares how a sector is performing in a region, compared to the performance of the same sector in the benchmark region. A LQ of between 1 and 1.25 means that the regions are performing equally, whereas a LQ of less than 1 means that the regions are not performing well. A LQ of >1.25 shows that the region is outperforming the other regions.

Table 3.12: Location Quotients of the Metsimaholo Local Economy

Primary Economic Sectors and Sub-sectors	LQ	Classification
Agriculture	**0.53**	**Low**
Agriculture	0.58	Low
Forestry	0.31	Low
Fishing	0.00	Low
Mining	**1.63**	**High**
Manufacturing	**2.78**	**High**
Food, beverages, and tobacco	0.44	Low
Textiles, clothing, and leather products	0.28	Low
Wood and paper, publishing and printing	0.21	Low
Petroleum products, chemicals, rubber, and plastic	10.44	Very High
Other non-metal mineral products	0.77	Medium
Metals, metal products, machinery, and equipment	0.91	Medium
Electrical machinery and apparatus	0.18	Low
Radio, TV, instruments, watches, and clocks	0.50	Low
Transport equipment	0.27	Low
Furniture, other manufacturing	0.60	Low
Utilities	**2.18**	**High**
Electricity and gas	2.41	High
Water	1.46	High
Construction	**1.16**	**Medium**
Trade	**0.61**	**Low**
Wholesale and retail trade	0.63	Low
Catering and accommodation services	0.48	Low
Transport and storage	**0.68**	**Low**

Primary Economic Sectors and Sub-sectors	LQ	Classification
Transport and storage	0.88	Medium
Communication	0.33	Low
Business and Financial Services	**0.61**	**Low**
Finance and insurance	0.50	Low
Business Services	0.64	Low
Professional business services	0.61	Low
Business activities n.e.c.	0.80	Medium
Government	**0.73**	**Low**
National and Provincial government	0.65	Low
Local government	0.91	Medium
Community and Personal Services	**0.63**	**Low**
Education (Private)	0.63	Low
Health and social work (Private)	0.55	Low
Other community, social and personal services	0.73	Low

Source: DEMACON Calculations, 2024

The preceding data shows that the main economic sectors Mining, Manufacturing and Utilites are all outperforming the region. Sub-sectors outperforming the region include the sub-sectors:

- Petroleum products, chemicals, rubber and plastic
- Electricity and Gas
- Water.

The data shows that Construction is the only economic sector of the local economy with a medium level of specialisation.

The main economic sectors with a low location quotient are Agriculture, Trade, Business and Financial Services, Government and Community and Personal Services.

3.7.1.2 ECONOMIC BASE ANALYSIS

An economic base analysis is designed to analyse the broad economic structure of the Metsimaholo local economy. It does this by dividing the economy into two sectors:

- **Basic sectors** (which includes all output (goods and services) sold outside the borders of the local economy – brings money in for the local economy
- **Non-basic sectors** (which includes all output that is sold within the local economy) – caters to the local economy

A local region's export industries are its economic foundation, and all other industries thrive by servicing the export industries and one another. A change in the basic sector will automatically lead to a similar change in the non-basic sector. The ratio of non-basic to basic activity is reasonably stable over the long term. Overall, if a region can increase the level of basic employment, it can concomitantly increase total employment. For this study, the location quotient method is applied. It is important to understand that not all of a basic industry is 'basic'. Only that part of the industry that serves the export market is considered basic. It is the part of the industry that raises the location quotient above 1.0. Any employment below an LQ of 1.0 is Non-Basic – those jobs typically serve local demand.

Table 3.13: Metsimaholo Local Economy Base Analysis

Economic Sectors and Sub-sectors	Sector Classification	BM Multiplier
Agriculture	**Non-basic sector**	
Agriculture	Non-basic sector	
Forestry	Non-basic sector	
Fishing	Non-basic sector	
Mining	**Basic sector**	**2.59**
Manufacturing	**Basic sector**	**1.56**
Food, beverages and tobacco	Non-basic sector	
Textiles, clothing and leather products	Non-basic sector	
Wood and paper, publishing and printing	Non-basic sector	
Petroleum products, chemicals, rubber and plastic	Basic sector	1.11
Other non-metal mineral products	Non-basic sector	
Metals, metal products, machinery and equipment	Non-basic sector	
Electrical machinery and apparatus	Non-basic sector	
Radio, TV, instruments, watches and clocks	Non-basic sector	
Transport equipment	Non-basic sector	
Furniture, other manufacturing	Non-basic sector	
Utilities	**Basic sector**	**1.85**
Electricity and gas	Basic sector	1.71
Water	Basic sector	3.18
Construction	**Basic sector**	**7.37**
Trade	**Non-basic sector**	
Wholesale and retail trade	Non-basic sector	
Catering and accommodation services	Non-basic sector	

Economic Sectors and Sub-sectors	Sector Classification	BM Multiplier
Transport and Storage	**Non-basic sector**	
Transport and storage	Non-basic sector	
Communication	Non-basic sector	
Business and Financial Services	**Non-basic sector**	
Finance and insurance	Non-basic sector	
Business Services	Non-basic sector	
Government	**Non-basic sector**	
National and Provincial government	Non-basic sector	
Local government	Non-basic sector	
Community and Personal Services	**Non-basic sector**	
Education (Private)	Non-basic sector	
Health and social work (Private)	Non-basic sector	
Other community, social and personal services	Non-basic sector	
Emfuleni Local Economy Basic Sector Multiplier		**1.09**

Source: DEMACON Calculations, 2024

The Mining, Manufacturing, Utilities, and Construction are all basic sectors, indicating that they are exporting goods and services and ensuring that money comes into the local economy. These sectors drive the local economy and investment in these sectors will lead to investment in the supporting non-basic sectors. Non-basic sectors include Agriculture, Transport and Storage, Business and Financial Services, Government, and Community and Personal Services. The data also shows that the basic multiplier for the local economy is 1.09. The economic base analysis shows that for every R1 000 of gross value added by basic sectors of the economy, an additional R1 090 of gross value added is created within non-basic sectors of the sub-regional economy.

3.7.1.3 CARVALHO CLASSIFICATION

The analysis is used to interpret the local economy's growth potential. The analysis seeks to compare the local economy's growth relative to the national economy's growth and to assess the suitability of economic sectors for growth and development based on its potential to cluster. The Carvalho Classification describes each economic sector based on its relative growth and cluster potential in terms of 12 classes. Therefore, the classification of economic sectors is for descriptive purposes and to enable decision-makers to target key sectors based on growth potential.

Table 3.13: Metsimaholo Local Economy Carvalho Classification

Economic Sectors and Sub-sectors	Provincial Relative Growth	Local Relative Growth	Classification
Agriculture	**Leading**	**Leading**	**Rising**
Agriculture	Leading	Leading	Rising
Forestry	Leading	Leading	Rising
Fishing	Lagging	Leading	Moderate
Mining	**Lagging**	**Leading**	**Evolving**
Manufacturing	**Lagging**	**Lagging**	**Challenging**
Food, beverages and tobacco	Lagging	Lagging	Marginal
Textiles, clothing and leather products	Lagging	Lagging	Marginal
Wood and paper, publishing and printing	Lagging	Lagging	Marginal
Petroleum products, chemicals, rubber and plastic	Lagging	Lagging	Challenging
Other non-metal mineral products	Lagging	Lagging	Vulnerable
Metals, metal products, machinery and equipment	Lagging	Lagging	Vulnerable
Electrical machinery and apparatus	Lagging	Lagging	Marginal
Radio, TV, instruments, watches and clocks	Lagging	Lagging	Marginal
Transport equipment	Lagging	Lagging	Marginal
Furniture, other manufacturing	Lagging	Lagging	Marginal
Utilities	**Lagging**	**Lagging**	**Challenging**
Electricity and gas	Lagging	Lagging	Challenging
Water	Lagging	Leading	Evolving
Construction	**Lagging**	**Leading**	**Evolving**
Trade	**Lagging**	**Lagging**	**Marginal**
Wholesale and retail trade	Lagging	Lagging	Marginal
Catering and accommodation services	Leading	Lagging	Modest
Transport and Storage	**Leading**	**Leading**	**Rising**
Transport and storage	Leading	Leading	Accelerating
Communication	Leading	Leading	Rising

Economic Sectors and Sub-sectors	Provincial Relative Growth	Local Relative Growth	Classification
Business and Financial Services	**Leading**	**Lagging**	**Modest**
Finance and insurance	Leading	Lagging	Modest
Business Services	Leading	Lagging	Modest
Professional business services	Leading	Lagging	Modest
Business activities n.e.c.	Leading	Lagging	Yielding
Government	**Leading**	**Leading**	**Rising**
National and Provincial government	Lagging	Leading	Moderate
Local government	Leading	Leading	Accelerating
Community and Personal Services	**Leading**	**Leading**	**Rising**
Education (Private)	Leading	Leading	Rising
Health and social work (Private)	Lagging	Leading	Moderate
Other community, social and personal services	Leading	Lagging	Modest

Source: DEMACON Calculations, 2024

The preceding data shows that the economic sectors of the local economy are primarily growing at a rate similar to that of the comparative sectors at national level. There are no driving or accelerating sectors. Agriculture, Transport and Storage, Government and Community and Personal Services are rising sectors.

Table 3.14: Interpretation of the Carvalho Classification of the Local Economy Sectors

Definition	Classification
Driving	Community is highly specialised in this sector, which is growing nationally/provincially and growing at an even higher rate locally
Accelerating	Community is neither highly specialised nor under-specialised in this sector, which is growing nationally/provincially and growing at an even higher rate locally
Rising	Relatively low proportion of local employment, but will likely increase due to growth in this sector, which is growing on a metropolitan level and growing at an even higher rate locally
Evolving	High local specialisation in a sector which grew at a provincial level at a slower rate than overall growth, local growth exceeded provincial growth in this sector
Transitional	Average specialisation in a sector which grew at a provincial level at a slower rate than overall growth, local growth exceeded metropolitan growth in this sector
Moderate	Relatively underrepresented in a sector which grew at a metropolitan level at a slower rate than overall growth; local growth exceeded metropolitan growth in this sector
Promising	High local specialisation in a sector which grew at a metropolitan level, local growth was slower than metropolitan growth in this sector
Yielding	Average specialisation in a sector which grew at a metropolitan level, local growth was slower than metropolitan growth in this sector
Modest	Relatively low specialisation in a sector which grew at a metropolitan level; local growth was slower than metropolitan growth in this sector
Challenging	Industries have a relatively high concentration of employment in the community, which suggests that they play a prominent role in overall employment in the community and should be monitored carefully
Vulnerable	Industries have an average concentration of employment
Marginal	Industries are under-represented in the community

Source: DEMACON Calculations, 2024

3.7.1.4 INDUSTRY TARGET CLASSIFICATION

This classification is similar to that of the Carvalho Model in that it is based on a combination of the location quotient, National Sector Growth and Local Sector Growth values and it is expressed qualitatively not quantitatively. It is somewhat different in the way that it classifies the sectors, the categories are phrases that suggest the kind of prospects for growth that could be expected and, in some cases, whether the sector should be a retention target.

Table 3.15: Metsimaholo Local Economy Targeting Classification

Economic Sectors and Sub-sectors	Classification
Agriculture	**Emerging Strength**
Agriculture	Emerging Strength
Forestry	Emerging Strength
Fishing	Prospects limited by weak base and external trends
Mining	**Prospects limited by external trends**
Manufacturing	**Prospects limited by external trends and declining competitiveness**
Food, beverages and tobacco	Prospects limited overall

Textiles, clothing and leather products	Prospects limited overall
Wood and paper, publishing and printing	Prospects limited overall
Petroleum products, chemicals, rubber and plastic	Prospects limited by external trends and declining competitiveness
Other non-metal mineral products	Prospects limited by external trends and declining competitiveness
Metals, metal products, machinery and equipment	Prospects limited by external trends and declining competitiveness
Electrical machinery and apparatus	Prospects limited overall
Radio, TV, instruments, watches and clocks	Prospects limited overall
Transport equipment	Prospects limited overall
Furniture, other manufacturing	Prospects limited overall
Utilities	**Prospects limited by external trends and declining competitiveness**
Electricity and gas	Prospects limited by external trends and declining competitiveness
Water	Prospects limited by external trends
Construction	**Prospects limited by external trends**
Trade	**Prospects limited overall**
Wholesale and retail trade	Prospects limited overall
Catering and accommodation services	Prospects limited by weak base and declining competitiveness
Transport and Storage	**Emerging Strength**
Transport and storage	Current Strength
Communication	Emerging Strength
Business and Financial Services	**Prospects limited by weak base and declining competitiveness**
Finance and insurance	Prospects limited by weak base and declining competitiveness
Business Services	Prospects limited by weak base and declining competitiveness
Professional business services	Prospects limited by weak base and declining competitiveness
Business activities n.e.c.	High priority retention target
Government	**Emerging Strength**
National and Provincial government	Prospects limited by weak base and external trends
Local government	Emerging Strength
Community and Personal Services	**Emerging Strength**
Education (Private)	Emerging Strength
Health and social work (Private)	Prospects limited by weak base and external trends
Other community, social and personal services	Prospects limited by weak base and declining competitiveness

Source: DEMACON Calculations, 2024

The industry target classification is displayed graphically by the subsequent Figure. The size of the circles represents the location quotient, that is, the relative size of the sector.

Sectors located in the top and bottom left quadrants are considered to have limited prospects because these industries are declining in the aggregate economy. If they are small, they have additional challenges and if they are within the negative range in terms of LSRG, they also suffer from declining competitiveness.

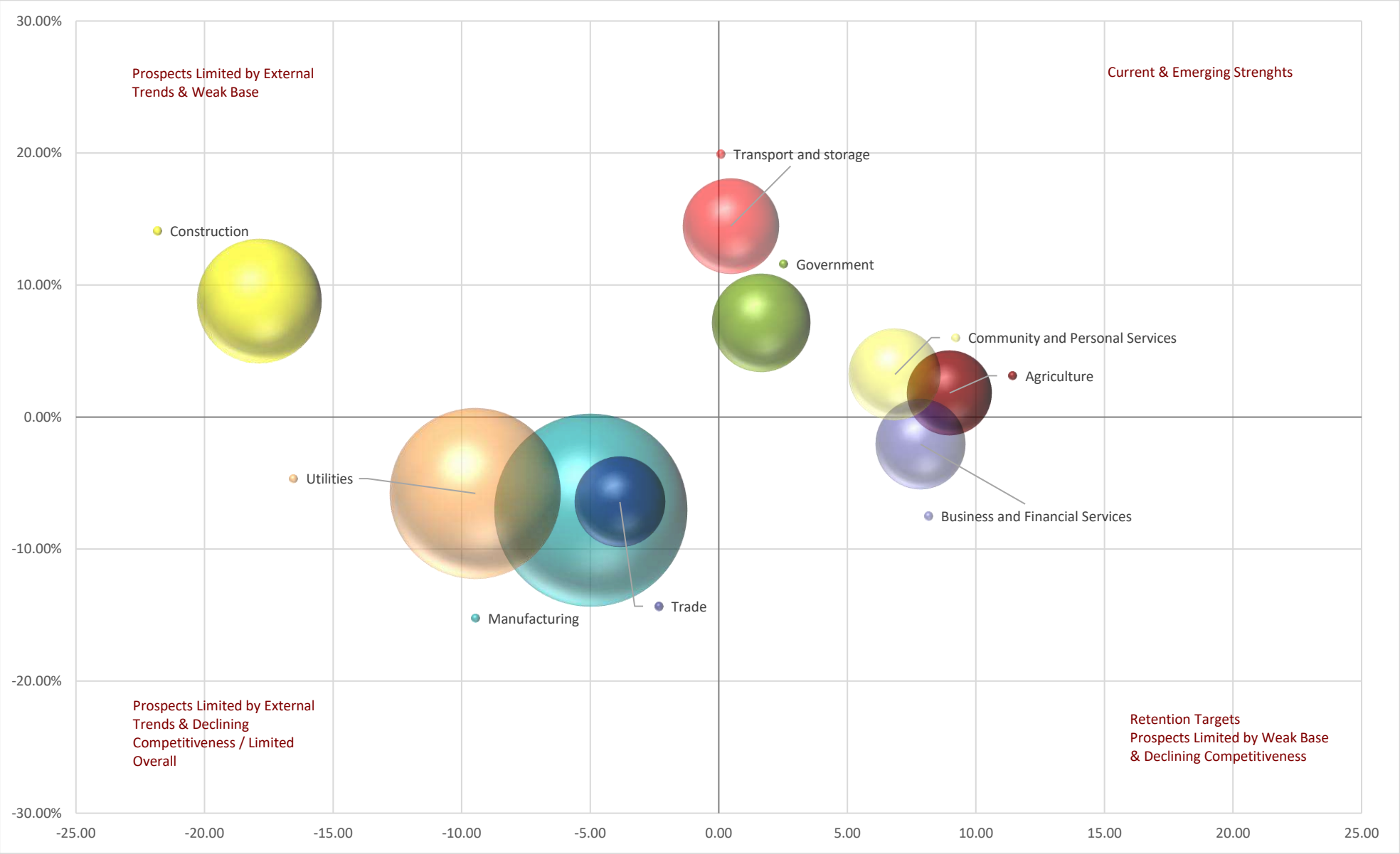
In business terminology, the upper left quadrant reflects industry groups that are increasing their market share in a declining market, industries in the lower left quadrant represents industries that are losing market share in a declining market.

Sectors falling within the lower right quadrant are classified as retention targets (if large enough) because they are growing in the aggregate economy but more slowly locally. Smaller industry groups in this quadrant are deemed to have limited prospects. Sectors within the upper right quadrant are growing in the aggregate economy and locally. These industries represent the strengths and emerging strengths of the local economy.

If the circles are large, it represents current strengths and if the circles are smaller then it reflects emerging strengths. In business terminology industries in the upper right quadrant are increasing their market share in an expanding market, whereas the industries in the lower right quadrant are losing market share in an expanding market.

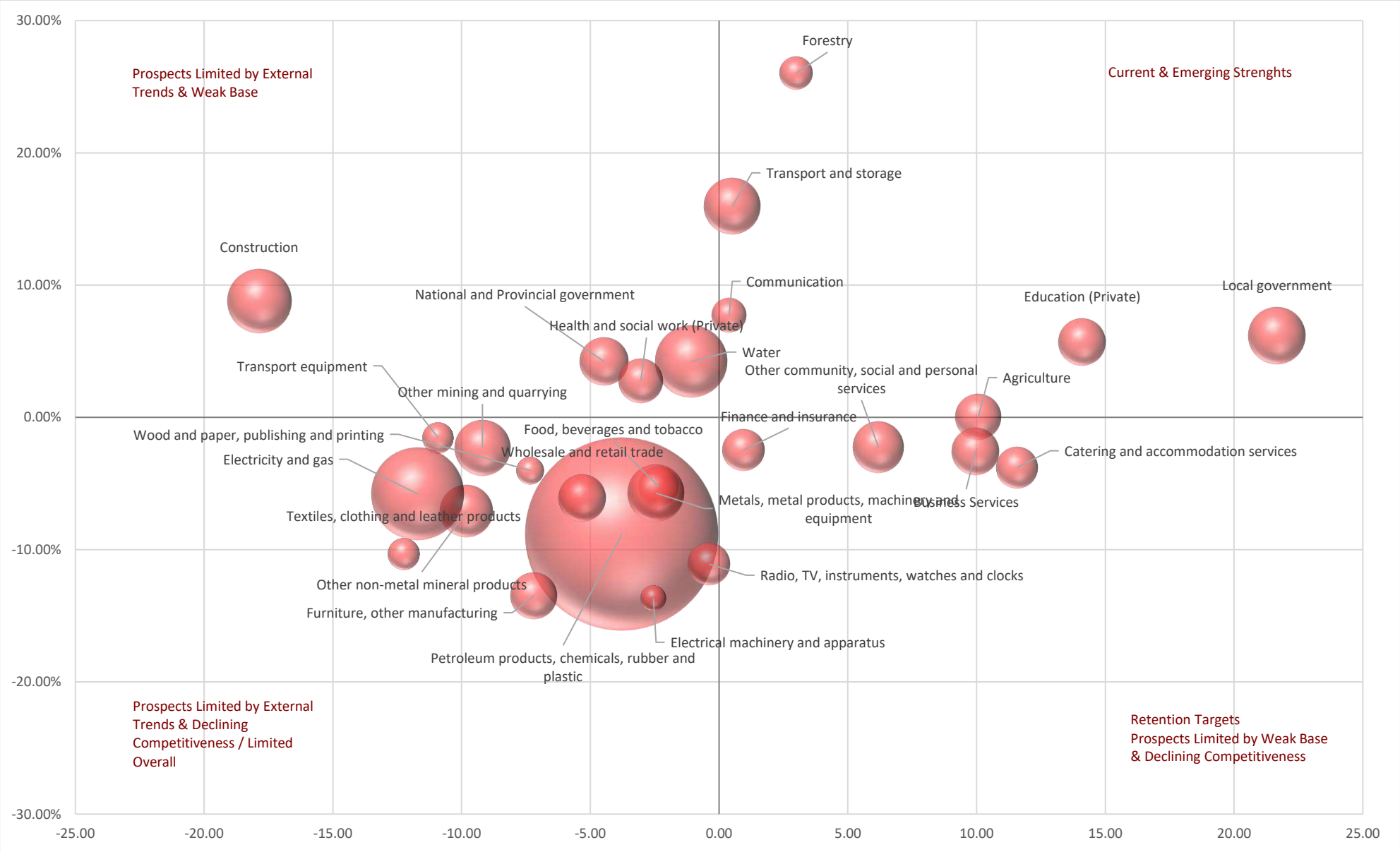
According to the industry targeting classification, the Agriculture, Government, Community and Personal Service and Transport and Storage sectors are all current or emerging strengths.

Figure 3.7: Metsimaholo Local Economy Primary Economic Sectors Targeting Classification



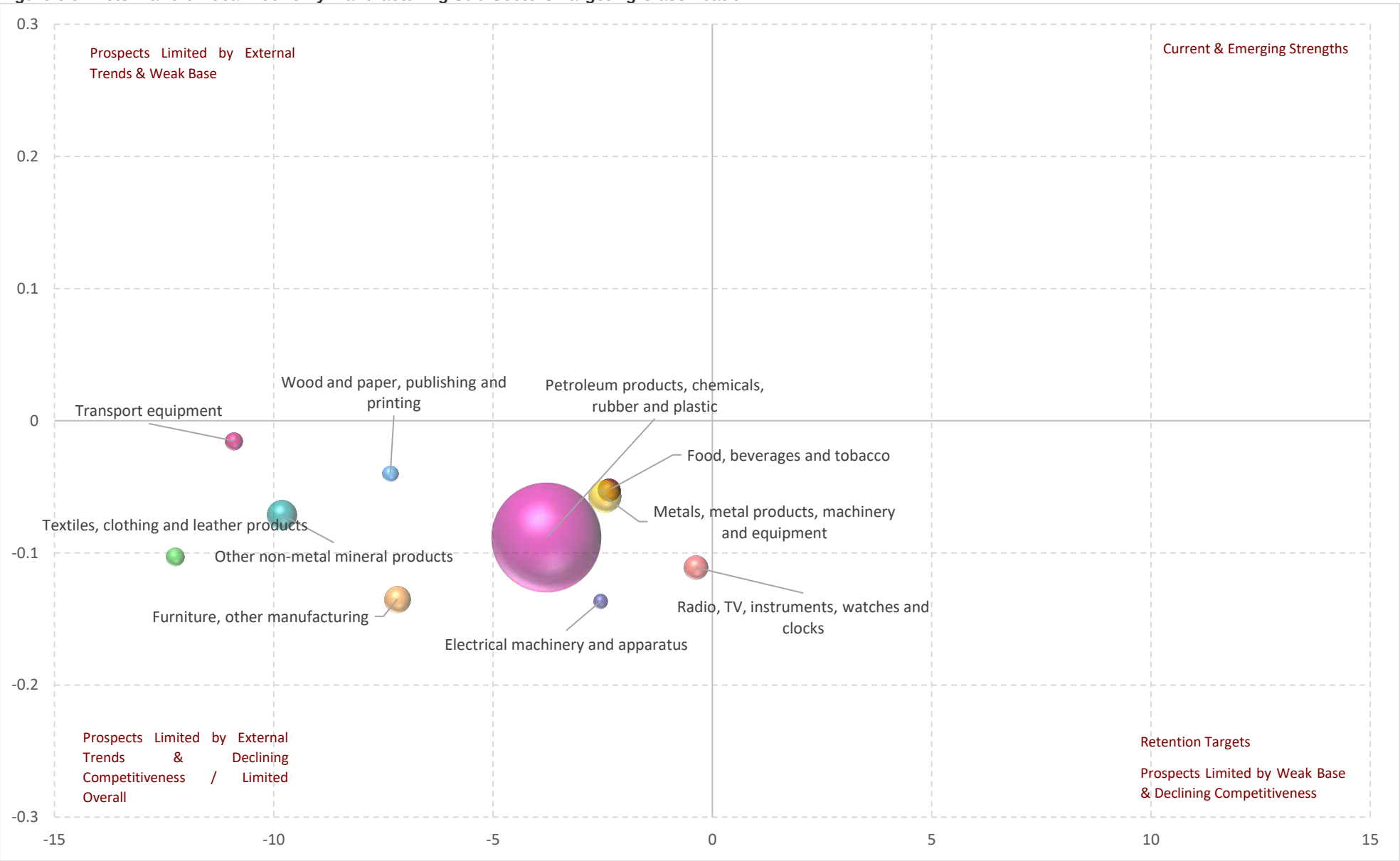
Source: DEMACON Calculations, 2024

Figure 3.8: Metsimaholo Local Economy Sub-Sectors Targeting Classification



Source: DEMACON Calculations, 2024

Figure 3.9: Metsimaholo Local Economy Manufacturing Sub-Sectors Targeting Classification



Source: DEMACON Calculations, 2024

3.8 CLUSTER ANALYSIS

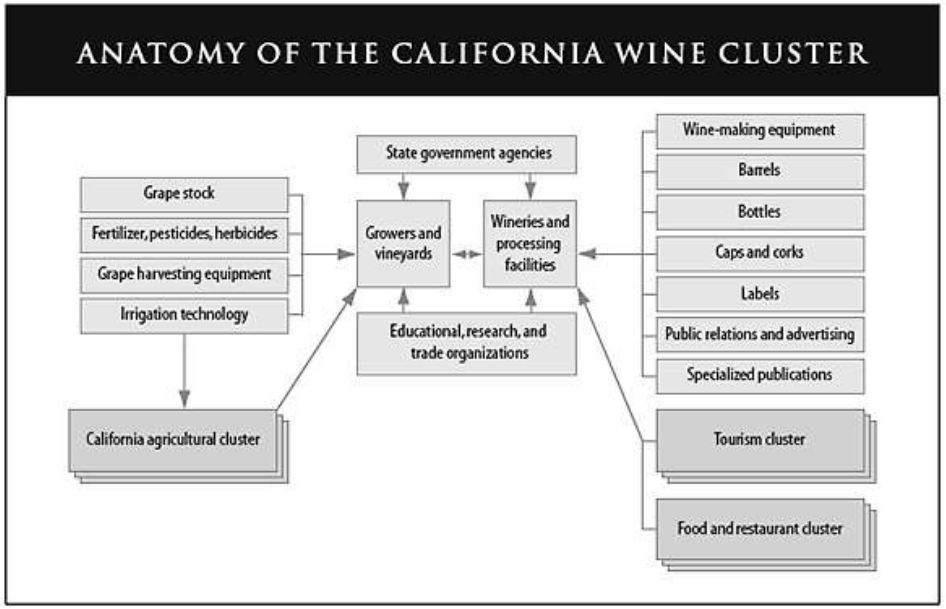
When considering the concept of economic clusters, it is important to make a distinction between the concept of agglomeration and clusters. The two concepts target a similar grouping of economic activity, but the broader concept includes and excludes sections of economic activity.

The agglomeration effect of economic activity identifies that firms of similar industries tend to locate in similar geographic localities due to the benefit of economies of scale and market mass. Clustering focuses on the same tendency of comparable firms from specific industries to locate in similar locations, but also considers the broader context of economic interdependency. In other words, clustering focuses on not only firms from a specific industry but also the proximity of supporting value chain industries, technology, skills and institutional support.

In the context of this report as well as the intended outcome of this analysis, the key concept of this analysis is economic clusters, otherwise also referred to as industrial clusters. According to Porter (1998) – the pioneer and driver of cluster theory – clusters are "geographic concentrations of interconnected companies and institutions in a particular field". Considering the definition and work completed by Porter (1998), clusters are a critical component to competition because clusters encompass an array of linked industries and other entities. Linked industries and entities for instance include enterprises engaged in a specific industrial activity that has access to not only suppliers of specialised inputs, skills and institutional capacity, but also downstream channels and customers as well as manufacturers of complementary products. Clusters often include a degree of skills development, research and development as well as technological advances, typically also supported by governmental institutions and organisations.

Clusters are therefore concentrations, or agglomerations, of typical value chain components and support infrastructure that enables an overarching industry to be competitive not only locally but internationally. For example, the most widely known and recognised clusters in the world can be identified as Silicon Valley, Hollywood, Car manufacturing in Southern Germany, and the Italian footwear industry. The diagram below provides an example of the wine cluster found in California:

Figure 3.10: Examples of a Cluster (California Wine)



Source: DEMACON ex Porter (1998)

The diagram shows that clusters are the result of sections of an industry's value chain grouping together and driving productive economic activity between various elements of the value chain. As noted by the United Nations (2001), "clusters are interdependent due to the flow of goods and services between them and to the fact that their products typically are functionally interrelated. They are linked not only by their commonalities but also by their complementarities".

Considering the preceding, an analysis of the clusters that represent the industries targeted by the proposed development is important to:

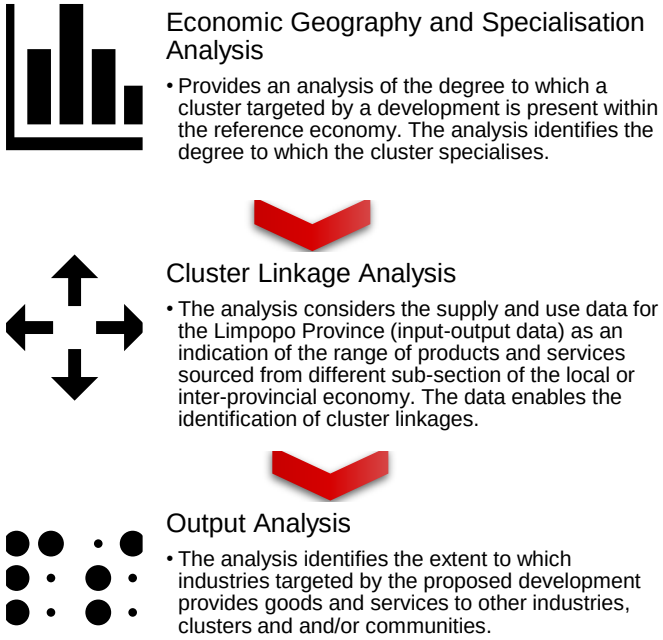
- Understand the extent of cluster formation not only in and around the local Emfuleni Economic node but the broader regional economy as well,
- Understand whether target industry clusters have sufficient economic weight and agglomeration factors to support growth,
- Understand key drivers that could be tapped into or enhanced by the proposed development.

Clusters typically encompass entire industries and are not fully concentrated within a single environment. A development rather plays a supporting and inter-linked role in the context of clusters by attracting and establishing enterprises through foreign or domestic direct investment. A development forms part of an industry's value chain by enhancing the growth and development of industries that support a clusters productivity or export potential.

In the context of the preceding, the cluster analysis undertaken in the chapter, therefore, highlights gaps and opportunities that can be explored by the proposed development. The data assist with driving investment attraction and further enhancing localised clusters for greater economic growth and development.

3.8.1 Cluster Analysis Approach

To undertake the cluster mapping analysis, three phases of analysis are employed. The three phases of analysis are outlined in the following diagram.



3.8.1.1 Economic Geography and Specialisation Analysis

An economic geography analysis is completed to spatially identify the extent to which economic sectors/industries targeted by the proposed development has concentrated/clustered throughout a reference economy, i.e. the Gauteng Province economy. The purpose of the analysis is to identify the specialisation of the industries targeted by the proposed development and to spatially represent the distribution and connectivity of potential clusters.

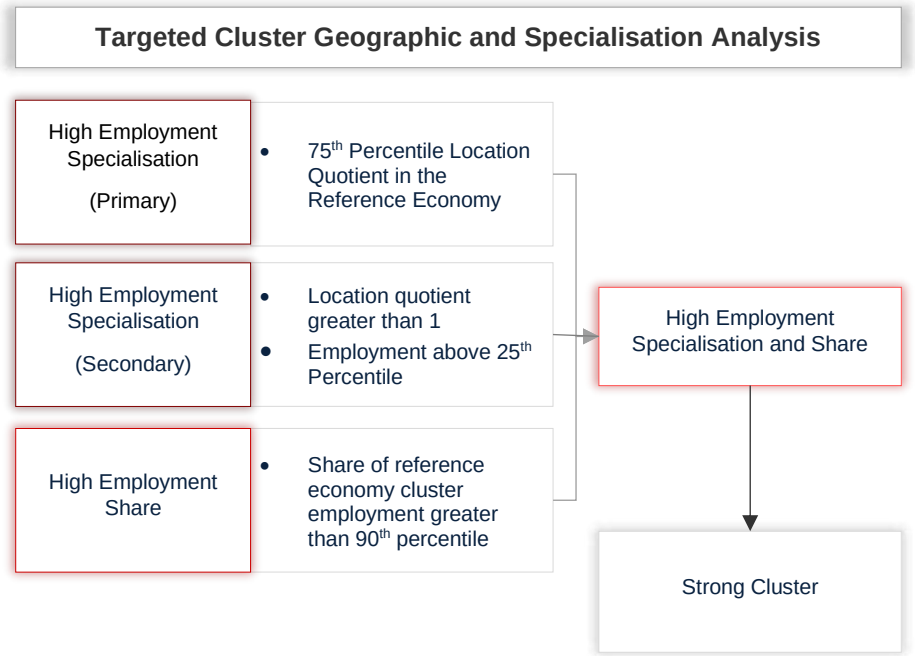
Specialisation is the measure of an industry's location quotient, i.e. the ratio of an industry's share of total local employment in a location relative to its share of total provincial employment. Where a target industry in a local economy has a location quotient of more than 1, the data indicates a higher than average cluster concentration. Each local economy has a particular pattern of specialization in several clusters, which drives productivity and growth in the economy.

Specialisation is measured through the following criteria:

- High Employment Specialisation
  - Primary criteria – the location quotient of cluster employment must be greater than the 75th percentile when measured across all economic areas
  - Secondary criteria (differentiates borderline cases) – the location quotient of cluster employment must be greater than 1 and the share of reference economy cluster employment must be greater than the 25th percentile
- High Employment Share
  - The share of reference economy cluster employment must be greater than the 90th percentile when measured across all economic areas
- High Employment Specialisation and Share
  - Areas that meet all the above criteria

Local economies where clusters have formed and have a high employment specialisation are identified as strong clusters. Due to the specialisation of industries and the formation of clusters, local economies tend to experience higher growth in new business formation and start-up employment.

Figure 3.11: Geographic and Specialisation Analysis



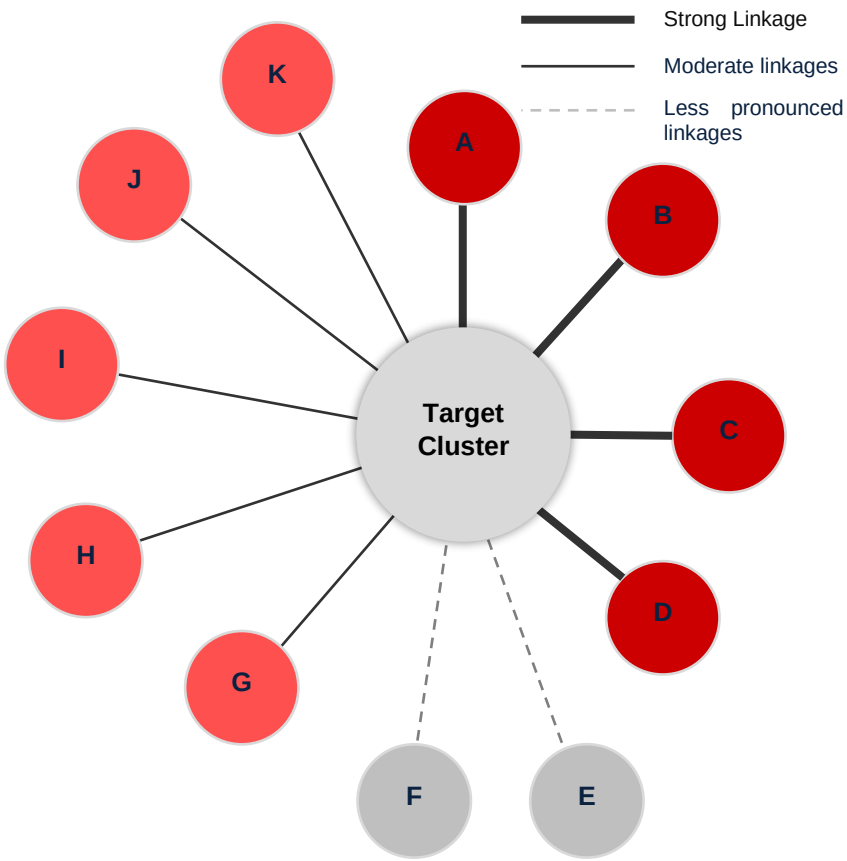
3.8.1.2 CLUSTER LINKAGE ANALYSIS

Cluster linkage analysis focuses on determining the linkage that an industry cluster has with other industry/economic clusters within its local, regional, provincial and national contexts. The analysis is based on an input-output analysis that seeks to define the relationship between a target cluster and supporting clusters – the analysis also considers industries contained within clusters and their role and relationship with target clusters.

Input-output analysis is used to determine industry interdependence. The input-output analysis provides insight into the interdependence of a targeted industry by considering transactional flows throughout the economy. Transactional flows indicate economic sectors from which inputs are derived within and outside a designated provincial economy and the role that imports and exports play in ensuring economic output.

The analysis, therefore, identifies key sectors/industries that provide inputs to the target cluster. The sectors/industries are measured in terms of their linkage role and function to the targeted cluster. The linkage is finally reviewed in terms of its economic geography and specialisation to determine the localised connectivity of the target and supporting clusters.

Figure 3.12: Illustration of Cluster Linkage Analysis



Cluster linkages are measured through the following criteria:

- **Strong cluster linkages:** considers the transactional flow of goods and services between different clusters in reference economy. The average flow of transactions is used to measure between cluster relatedness – 75th

percentile and more of transactional flows between a target cluster and other input clusters – also considers the 20th percentile and more of industries supplying to targeted clusters.

- **Linkages:** considers the transactional flow of goods and services between different clusters in reference economy. The average flow of transactions is used to measure between cluster relatedness – 50th to 74th percentile of transactional flows between a target cluster and other input clusters – also considers the 20th percentile and more of industries supplying to targeted clusters.

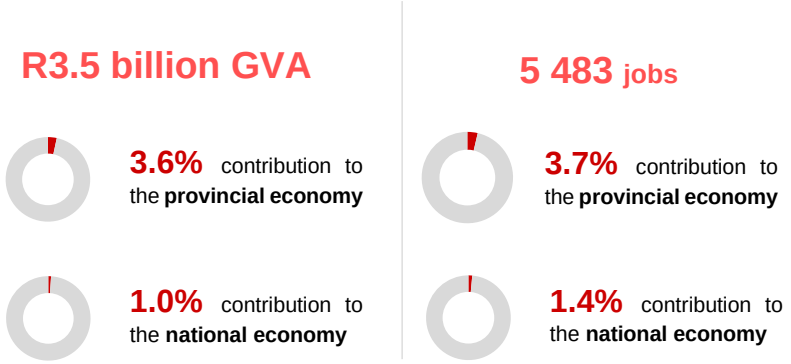
3.8.2 Transportation And Logistics Cluster Analysis

The following section is focused on providing an overview and cluster analysis of the transportation and logistics industry. The purpose of that analysis is to identify the concise status quo of the industry and to determine the economic cluster context of the industry value chain. The outcome of the analysis indicates the potential market gaps that may exist as opportunity areas for the proposed Aerotropolis. The data also assists with framing the feasibility and need of an Aerotropolis in the local economy, especially an aerotropolis targeting a logistics hub as a core function and investment driver.

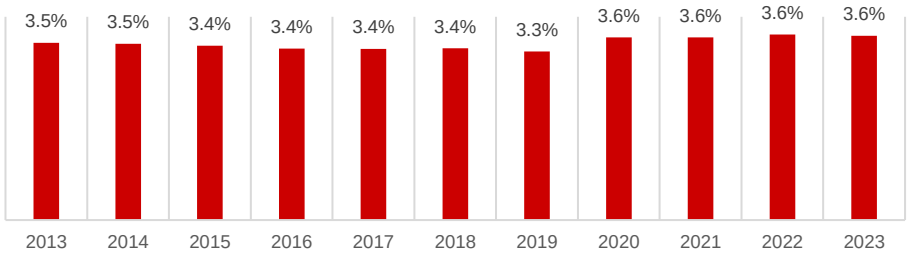
3.8.2.1 Status Quo Review

The following provides a concise review of the logistics industry of the Emfuleni local economy.

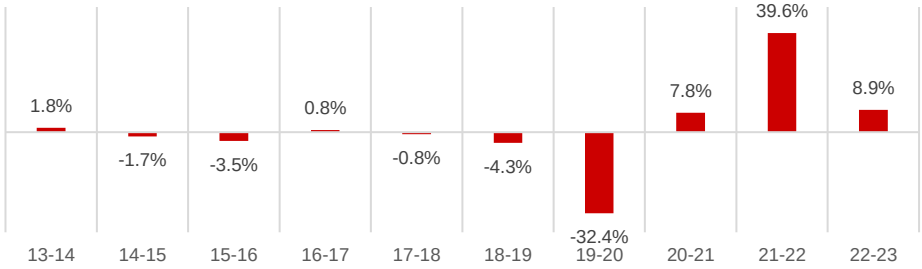
Figure 3.13: Emfuleni Logistics Economic Status Quo



Local Economy Contribution to the Total GVA Output of the Logistics Industry of the Province



Average Annual Growth Rate (GVA R/million 2013 to 2023)



The preceding data shows that the Emfuleni Local Economy plays a limited role in the logistics economic output generated by the Gauteng Province. The Emfuleni Local Economy contributes 3.6% to the province's logistics industry, i.e. approximately R3.5 billion per annum. The Gauteng Province as a whole contributes approximately 30.9% to the logistics industry of South Africa.

The economic contribution of the logistics sector to the province is relatively stable, increasing slightly from 3.5% in 2013 to 3.6% in 2023.

The growth in the logistics sector of the local economy averages 1.6% over the long term. The sector has recovered well post-COVID 19.

The growth of the logistics industry is dependent on growth in several economic sectors such as manufacturing and trade and is also determined by consumer spending capacity, i.e. capability to make use of public transport, etc. growth and development of these sectors are important to ensure that the logistics sector can continuously grow and expand. Export and import activity do provide a strong and direct growth attribute, but localised manufacturing capacity, as well as raw

products produced by the agricultural and mining sector, are important exporter commodities and logistics dependent.

3.8.2.2 CLUSTER ANALYSIS

The following section is focused on the cluster analysis of the transport and logistics industry in the Emfuleni local economy and broader Gauteng reference economy. The purpose of the section is to determine the extent to which the transport and logistics industry in the local and reference economy are clustered and the extent to which gaps and opportunities exist. The analysis considers the transport and logistics industry which consists of freight and passenger transport (as defined by the Standard Industrial Classification of 2012).

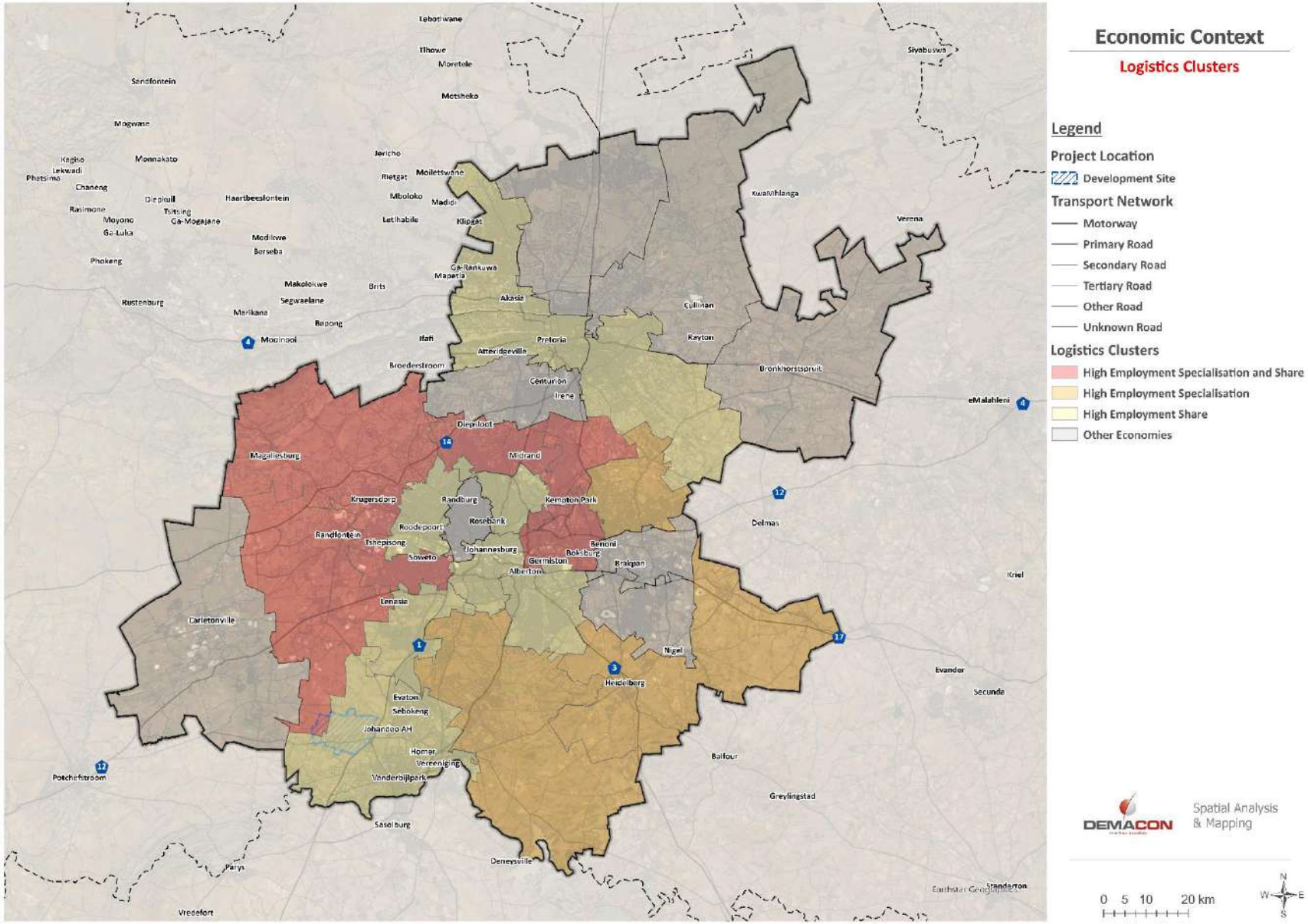
The section identifies the economic geography of transport and logistics clusters in the Gauteng reference economy and then undertakes an analysis to identify the linkages and relationships between the transport and logistics cluster and other input clusters (related clusters). The analysis also explores forward linkages of the logistics industry to identify demand drivers and potential target markets.

ECONOMIC GEOGRAPHY AND SPECIALISATION OF TRANSPORT AND LOGISTICS CLUSTER

The following analysis provides an overview of the economic geography of the transport and logistics clusters in the Gauteng reference economy. For the following analysis, an overview of freight-related land transport clusters is provided to illustrate the extent to which freight-related clustering is present throughout the Gauteng reference economy. The analysis also provides a perspective of the complete transport and logistics industry to illustrate the extent to which the movement of people influence cluster demand and growth. Subsequent input and output analysis are based on the entirety of the transport and logistics sector.

The following figures provide a spatial overview of transport and logistics cluster geographies in the Gauteng Province. The map shows that the Merafong and City of Ekurhuleni - Alberton to Vosloorus (EKU-F) local economies are strong logistics cluster geographies in the Gauteng reference economy. The strong cluster potential of the preceding local economies is a result of the high level of employment specialisation (i.e. LQs above the Provincial average) and the sizeable proportion of transport and logistics employment created in the local economies. The preceding economies are considered to be the primary transport and logistics cluster geographies of the province.

Map 3.3: Logistics Cluster Geographies in the Gauteng Province



Source: DEMACON GIS, 2024

The following table provides a qualitative and quantitative overview of transport and logistics cluster geographies in the Gauteng Province.

Table 3.16: Cluster Geography and Specialisation Analysis of the Logistics and Transport Industry Clusters

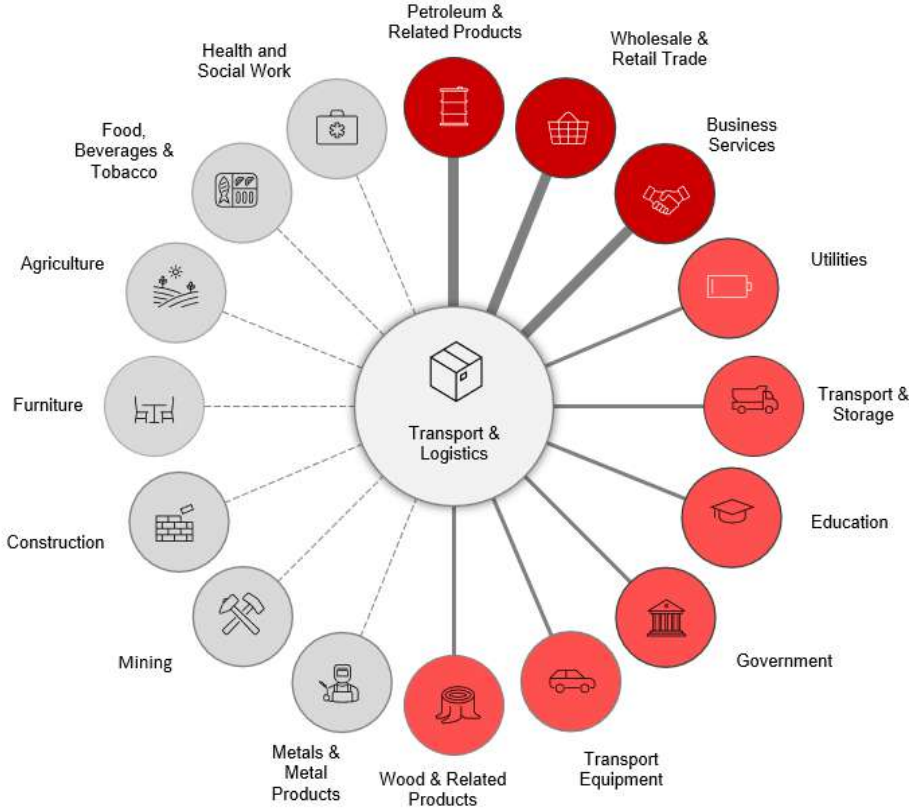
Economic Region	Transport and Logistics Cluster (Total)	
	LQ	Classification
Emfuleni (GT421)	0.88	High Employment Share
Midvaal (GT422)	1.21	
Lesedi (GT423)	1.58	
Mogale City (GT481)	1.05	
Merafong City (GT484)	1.16	High Employment Specialisation and Share
Rand West City (GT485)	1.29	
City of Ekurhuleni - Kempton Park to Boksburg (EKU-A)	1.96	
City of Ekurhuleni - Tembisa to Edenvale (EKU-B)	0.63	
City of Ekurhuleni - Daveyton (EKU-C)	1.22	
City of Ekurhuleni - Benoni to Springs (EKU-D)	0.90	
City of Ekurhuleni - Kwa-Thema to Nigel (EKU-E)	1.00	
City of Ekurhuleni - Alberton to Vosloorus (EKU-F)	1.11	High Employment Specialisation and Share
City of Johannesburg - Midrand (JHB-A)	0.68	
City of Johannesburg - Randburg (JHB-B)	0.94	High Employment Share
City of Johannesburg - Roodepoort (JHB-C)	0.82	High Employment Share
City of Johannesburg - Soweto (JHB-D)	1.02	
City of Johannesburg - Alexandra (JHB-E)	0.91	High Employment Share
City of Johannesburg - Johannesburg (JHB-F)	0.89	High Employment Share
City of Johannesburg - Orange Farm (JHB-G)	0.93	High Employment Share
City of Tshwane - Akasia/Soshanguve (TSH-1)	0.93	High Employment Share
City of Tshwane - Sinoville/Hammanskraal (TSH-2)	0.90	
City of Tshwane - Pretoria (TSH-3)	0.77	High Employment Share
City of Tshwane - Centurion (TSH-4)	0.75	
City of Tshwane - Cullinan/Rayton (TSH-5)	0.81	
City of Tshwane - East (TSH-6)	0.82	High Employment Share
City of Tshwane - Bronkhorstspruit (TSH-7)	0.88	High Employment Share
Emfuleni (GT421)	1.21	
Midvaal (GT422)	1.58	
Lesedi (GT423)	1.05	

Source: DEMACON Calculations, 2024

CLUSTER INPUT LINKAGE ANALYSIS

The following section is focused on an analysis of cluster linkages. The purpose is to identify and explore linkages that the Emfuleni local economy's transport and logistics industry has with other economic sector and industry clusters. The analysis reviews input-output economic data for the transport and logistics industry and seeks to identify the core and key input/backward linkages that the transport and logistics industry has. The analysis measures the prevalence of supporting clusters within the broader reference economy and seeks to determine the extent to which potential development opportunities exist. The following figure and table provide an overview of the primary and key linkages to the transport and logistics industry.

Figure 3.14: Transport and Logistics Related Input Clusters and Linkages



The coloured circles represent clusters/economic sectors that are related and provide inputs to the transport and logistics industry. The lines represent the link classification, i.e. thick line represents a strong linkage, a thin line represents a moderate linkage and a dotted line represents a less pronounced linkage. The following table provides an overview of the preceding figure.

Table 3.17: Input Table to the Transport and Logistics Industry – Cluster Link Analysis

Input Cluster	Primary User Sub-Cluster (Link Driver)		Total Input Cluster Percentage Contribution to Total Inputs	Link Classification
	Sub-Cluster	Percentage of Inputs Used by the Cluster		
Agriculture	Transport & Storage	100.0%	0.4%	Less Pronounced
Mining	Transport & Storage	100.0%	0.9%	Less Pronounced
Food, beverages and tobacco	Transport & Storage	100.0%	0.3%	Less Pronounced
Textiles, clothing and leather products	Transport & Storage	100.0%	0.0%	Less Pronounced
Wood and paper, publishing and printing	Transport & Storage	100.0%	1.1%	Moderate Link
Petroleum products, chemicals, rubber and plastic	**Transport & Storage**	**100.0%**	**50.5%**	**Strong Link**
Other non-metal mineral products	Transport & Storage	100.0%	0.0%	Less Pronounced
Metals, metal products, machinery and equipment	Transport & Storage	100.0%	0.9%	Less Pronounced
Electrical machinery and apparatus	Transport & Storage	100.0%	0.0%	Less Pronounced
Radio, TV, instruments, watches and clocks	Transport & Storage	100.0%	0.0%	Less Pronounced
Transport equipment	Transport & Storage	100.0%	1.3%	Moderate Link
Furniture, other manufacturing	Transport & Storage	100.0%	0.4%	Less Pronounced
Utilities	Transport & Storage	100.0%	5.3%	Moderate Link
Construction	Transport & Storage	100.0%	0.5%	Less Pronounced
Wholesale and retail trade	**Transport & Storage**	**100.0%**	**18.1%**	**Strong Link**
Transport and Storage	Transport & Storage	100.0%	3.9%	Moderate Link
Business Services	**Transport & Storage**	**100.0%**	**12.3%**	**Strong Link**
Government	Transport & Storage	100.0%	1.5%	Moderate Link
Education (Private)	Transport & Storage	100.0%	2.4%	Moderate Link
Health and social work (Private)	Transport & Storage	100.0%	0.2%	Less Pronounced
Other community, social and personal services	Transport & Storage	100.0%	0.0%	Less Pronounced

Source: DEMACON Calculations, 2024

The data outlined by the preceding table shows that several strong links are present between the transport and logistics cluster and input economic clusters.

The petroleum and related products sector is the most pronounced economic cluster which supplies inputs to the transport and logistics industry. Approximately 50.5% of all inputs to the transport and logistics cluster is sourced from this sector. A further 18.1% of inputs are sourced from wholesale and retail trade sector, and 12.3% from business services sector. Other key economic clusters that contribute to the transport and logistics cluster include the utilities sector (5.3%), transport and storage sector (3.9%), education (2.4%), government (1.5%), transport equipment (1.3%) and the wood, paper and publishing sector (1.1%).

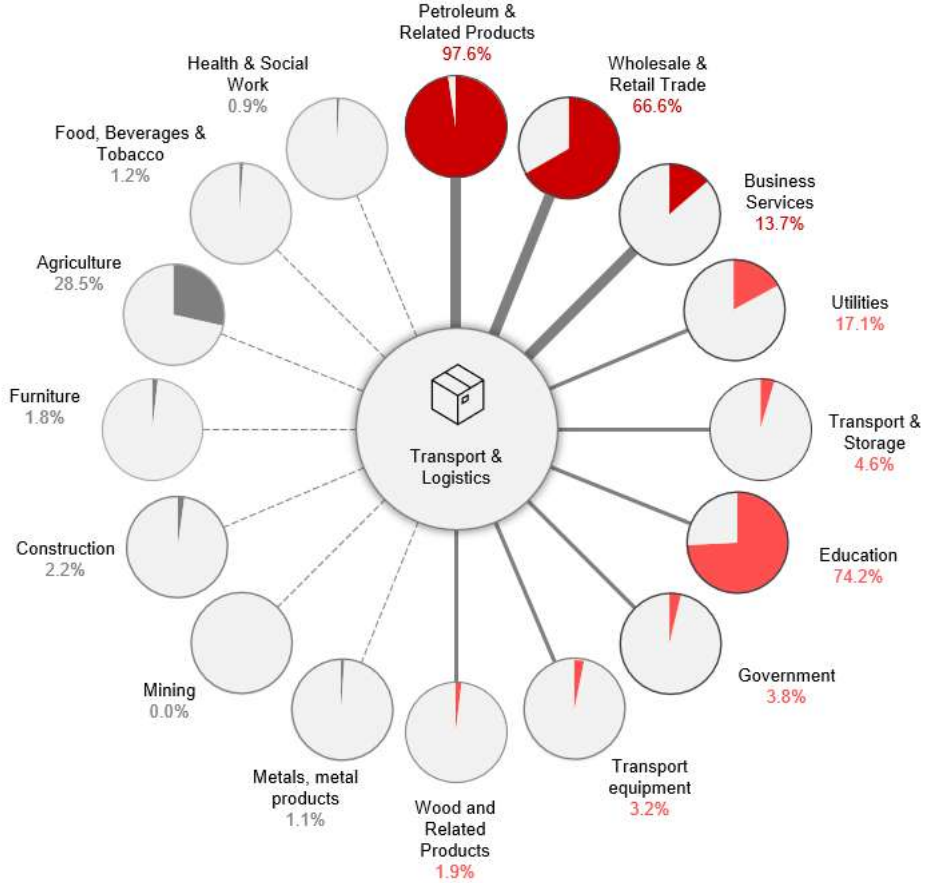
The following figure illustrates the degree to which the local transport and logistics industry sources inputs from the Gauteng and nationally based suppliers and producers. The data further illustrates that inputs are primarily sourced from within the provincial economy. It should be borne in mind that the preceding analysis does not illustrate the origin geography of inputs sourced by clusters providing inputs to the transport and logistics industry.

Therefore, the distribution and connectivity to input clusters within the Gauteng Province are important to drive transport and logistics development. The availability and quality of transport infrastructure is important to facilitate the continued growth of the economy. The role and function of logistics, therefore, is also important as the backbone for the distribution of products and services produced within the local and provincial economies.

Existing clusters within the local economy should therefore be key focus areas to enable the transport and logistics cluster to operate at an optimal level. The growth and development of supporting industries should also be enhanced to encourage sustainable and diversified economic growth.

The development should therefore seek to drive multi-functional and multi-modal logistical operations to enhance localised logistical capacity and to allow for economic growth to be underpinned by a strong logistical function. The diversified nature of the local economy allows the logistical sector to support growth, especially considering the export capabilities that the local economy has.

Figure 3.15: Provincially and Nationally Sourced Transport and Logistics Inputs



OUTPUT ANALYSIS AND DEMAND DRIVERS

The following section is focused on identifying the forward-linkages of the transport and logistics industry. The purpose of the section is to review the distribution of demand for transport and logistics operations by the various economic clusters of the local and provincial economy and, how these demand drivers are distributed throughout the economy as economic entities requiring logistical support to transport goods and services, the distribution of final products consumed by households and, products exported to international markets.

The analysis also assists with identifying the demand drivers of the transport and logistics industry. Demand drivers influence the growth of the industry whereby a deceleration of demand from key users of transport and logistics functions and operations could lead to diminished output, GDP and employment.

The forward-linkages of the transport and logistics industry combined with an analysis of demand drivers influencing the industry's growth provides a perspective of probable focus areas for the proposed Vaal Aerotropolis and identifies the sustained/feasible nature of key focus areas.

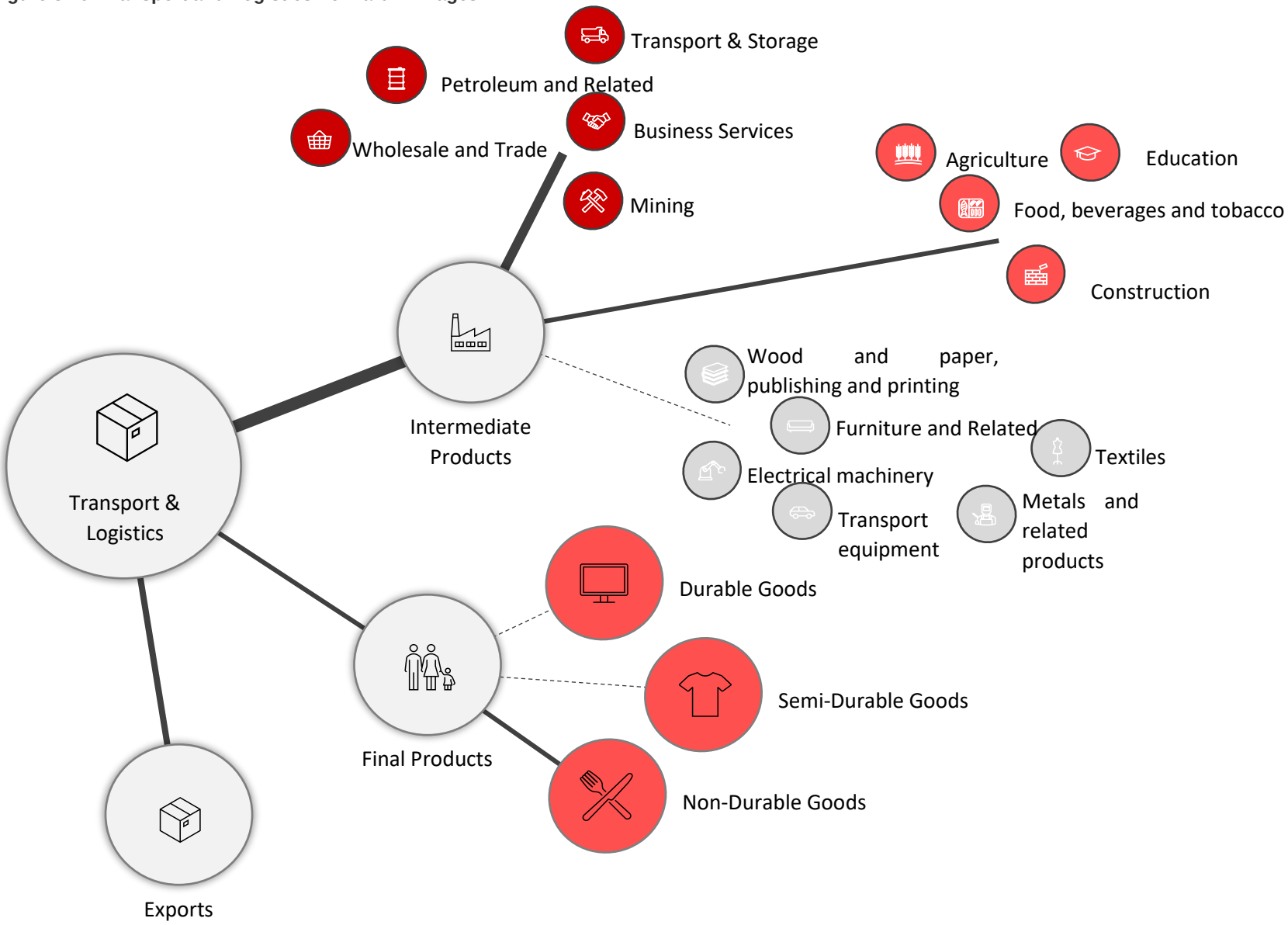
The following table shows that the transport and logistics cluster is instrumental when considering the movement of goods and services throughout the intraregional economy and to international consumers. The transport and logistics cluster enables clusters within the economy to move goods and services and enables the opportunity for growth and development.

The following figure illustrates the high-level forward-linkages of the transport and logistics industry. The data shows that more than half of the goods and services transported by the transport and logistics industry cluster are intermediate products primarily consumed by households. The transport and distribution of final goods and services such as food, consumer goods, healthcare products and petroleum represent approximately a tenth of all products and services distributed by the industry.

The export of goods and services represents slightly more than 30% of the cluster's functionality. The data, therefore, suggest that transport and logistics play a critical role in the movement and distribution of goods and services from the local and regional economy to international consumers.

The data shows that the transportation and distribution of mining raw materials and goods, petroleum products, transport equipment, wholesale and retail products, and business services are a key focus for the transport and logistics cluster. The nature and variety of goods and services transported and distributed by the transport and logistics cluster could be enhanced through an intermodal facility that combines multiple modes of transport, storage facilities, handling capabilities, etc. to effectively and efficiently distribute local and international products, services and transport functions. The regional importance of Emfuleni as a central urban, economic, manufacturing and logistical node enables the local geography to support economic growth through logistical capabilities and capacity.

Figure 3.16: Transport and Logistics Forward-Linkages



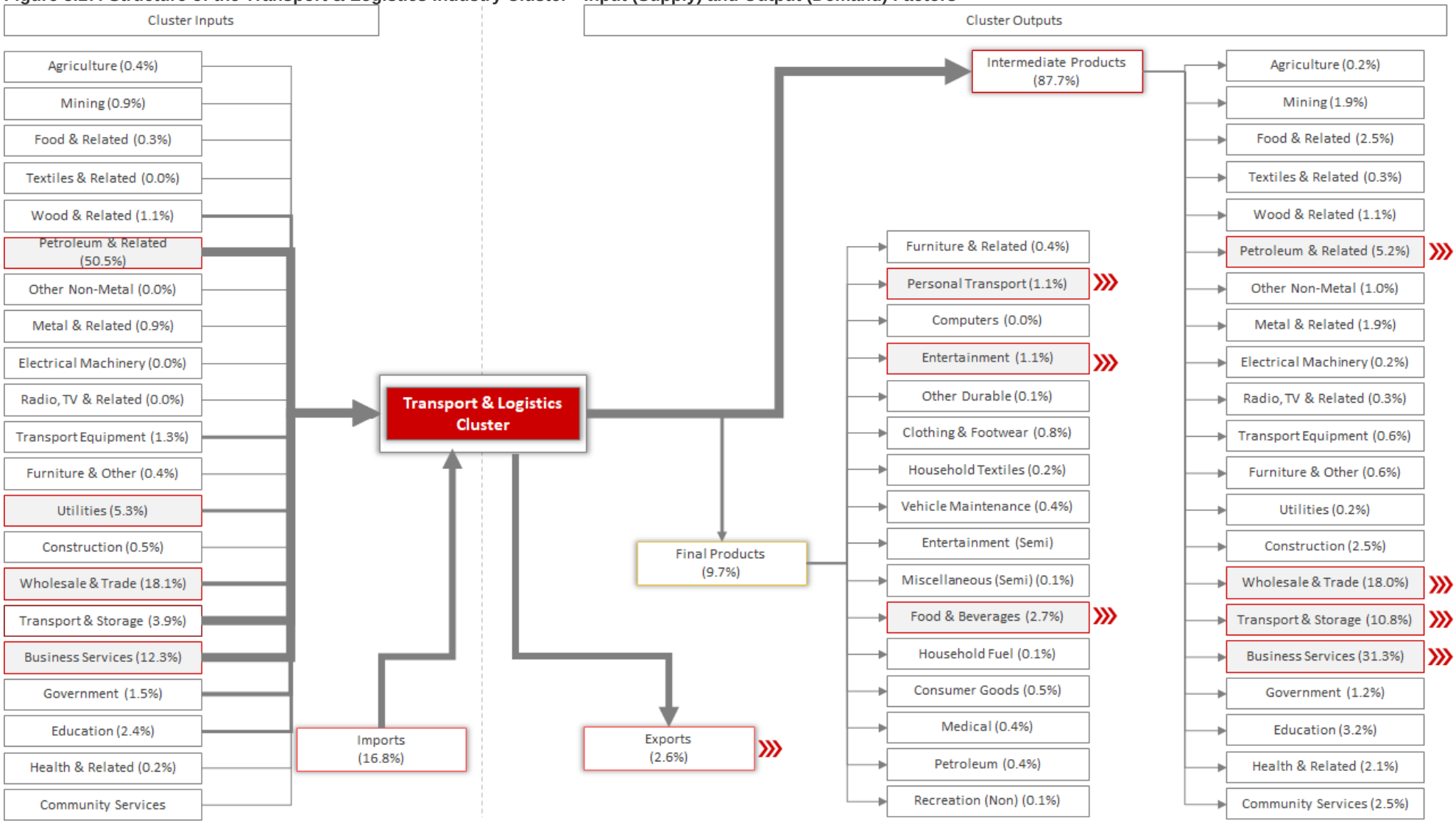
Source: DEMACON ex 2024

Table 3.18: Output Table of the Transport and Logistics Industry – Output Analysis

Consumer Sector / Goods	Primary Output-Sub-Cluster		% Distribution of Total Output Acquired per Consumer Sector / Good	Link Classification	Local vs National Markets		Demand Driver
	Main Output Sub-Cluster	% Output Acquired by Consumers			Gauteng	Remainder of SA	
Agriculture	Transport & Storage	100.0%	0.2%	Less Pronounced	40.0%	60.0%	
Mining	Transport & Storage	100.0%	1.9%	Less Pronounced	100.0%	0.0%	
Food, beverages and tobacco	Transport & Storage	100.0%	2.5%	Moderate Link	38.5%	61.5%	Secondary Driver
Textiles, clothing and leather products	Transport & Storage	100.0%	0.3%	Less Pronounced	88.6%	11.4%	
Wood and paper, publishing and printing	Transport & Storage	100.0%	1.1%	Less Pronounced	73.0%	27.0%	
Petroleum products, chemicals, rubber and plastic	**Transport & Storage**	**100.0%**	**5.2%**	**Strong Link**	**73.1%**	**26.9%**	**Demand Driver**
Other non-metal mineral products	Transport & Storage	100.0%	1.0%	Less Pronounced	75.5%	24.5%	
Metals, metal products, machinery and equipment	Transport & Storage	100.0%	1.9%	Less Pronounced	53.0%	47.0%	
Electrical machinery and apparatus	Transport & Storage	100.0%	0.2%	Less Pronounced	57.2%	42.8%	
Radio, TV, instruments, watches and clocks	Transport & Storage	100.0%	0.3%	Less Pronounced	100.0%	0.0%	
Transport equipment	Transport & Storage	100.0%	0.6%	Less Pronounced	18.5%	81.5%	
Furniture, other manufacturing	Transport & Storage	100.0%	0.6%	Less Pronounced	54.5%	45.5%	
Utilities	Transport & Storage	100.0%	0.2%	Less Pronounced	32.3%	67.7%	
Construction	Transport & Storage	100.0%	2.5%	Moderate Link	100.0%	0.0%	Secondary Driver
Wholesale and retail trade	**Transport & Storage**	**100.0%**	**18.0%**	**Strong Link**	**100.0%**	**0.0%**	**Demand Driver**
Transport and Storage	**Transport & Storage**	**100.0%**	**10.8%**	**Strong Link**	**7.6%**	**92.4%**	**Demand Driver**
Business Services	**Transport & Storage**	**100.0%**	**31.3%**	**Strong Link**	**44.2%**	**55.8%**	**Demand Driver**
Government	Transport & Storage	100.0%	1.2%	Less Pronounced	98.4%	1.6%	
Education (Private)	Transport & Storage	100.0%	3.2%	Moderate Link	100.0%	0.0%	Secondary Driver
Health and social work (Private)	Transport & Storage	100.0%	2.1%	Moderate Link	66.5%	33.5%	Secondary Driver
Other community, social and personal services	Transport & Storage	100.0%	2.5%	Moderate Link	66.5%	33.5%	Secondary Driver
Durable goods	Transport & Storage	100.0%	2.4%	Moderate Link	76.4%	23.6%	Secondary Driver
Semi-durable goods	Transport & Storage	100.0%	2.0%	Less Pronounced	76.9%	23.1%	
Non-durable goods	**Transport & Storage**	**100.0%**	**5.4%**	**Strong Link**	**77.5%**	**22.5%**	**Demand Driver**

Source: DEMACON Calculations, 2024

Figure 3.17: Structure of the Transport & Logistics Industry Cluster - Input (Supply) and Output (Demand) Factors



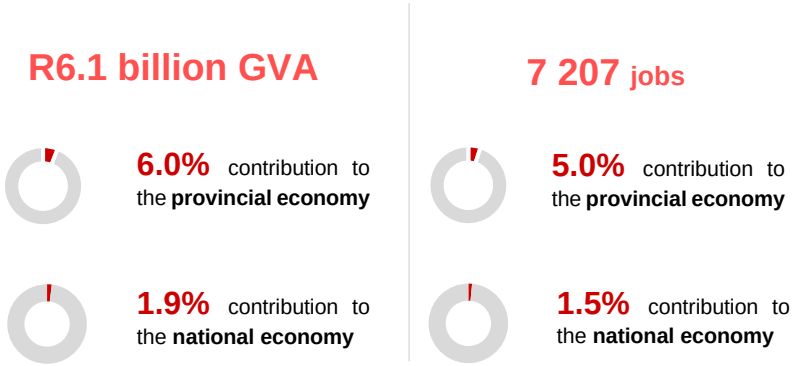
3.8.3 AGRO-PROCESSING CLUSTER ANALYSIS

The following section is focused on providing an overview and cluster analysis of the agro-processing industry. The purpose of that analysis is to identify the concise status quo of the industry and to determine the economic cluster context of industry value chain. The outcome of the analysis provides an indication of the potential market gaps that may exist as opportunity areas for the proposed Aerotropolis. The data also assists with framing the feasibility and need of an Aerotropolis in the local economy, especially an Aerotropolis targeting agro processing as a core function and investment driver.

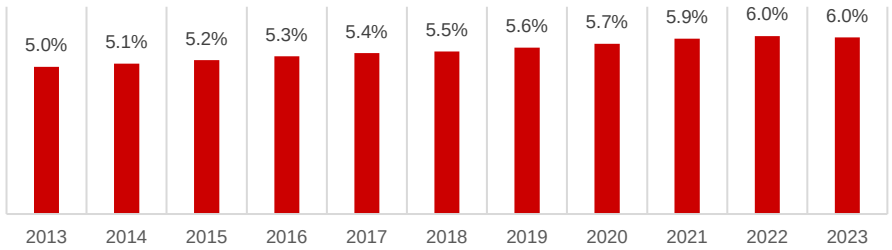
3.8.3.1 STATUS QUO REVIEW

The following provides a concise review of the logistics industry of the Emfuleni local economy.

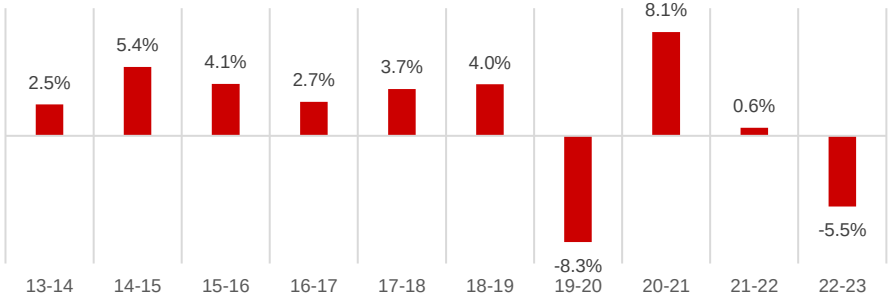
Figure 3.18: Emfuleni Agro-Processing Economic Status Quo



Local Economy Contribution to the Total GVA Output of the Agro Processing Industry of the Province



Average Annual Growth Rate (GVA R/million 2013 to 2023)



The preceding data shows that the Emfuleni Local Economy plays a limited role in the agro processing economic output generated by the Gauteng Province. The Emfuleni Local Economy contributes 6.0% to the province's agro processing industry, i.e. approximately R6.1 billion per annum. The Gauteng Province as a whole contributes approximately 32.0% to the agro processing industry of South Africa.

The economic contribution of the agro processing sector to the province is relatively stable, increasing slightly from 5.0% in 2013 to 6.0% in 2023.

The growth in the agro processing sector of the local economy averages 1.7% over the long term.

The growth of the agro processing industry is dependent on growth in several economic sectors such as manufacturing and trade and is also determined by consumer spending capacity, i.e. capability to make use of public transport, etc. growth and development of these sectors are important to ensure that the sector can continuously grow and expand. Export and import activity do provide a strong and direct growth attribute, but localised manufacturing capacity, as well as raw products produced by the agricultural and mining sector, are important exporter commodities and logistics dependent.

3.8.3.2 CLUSTER ANALYSIS

The following section is focused on the cluster analysis of the agro-processing industry in the Emfuleni local economy and broader Gauteng reference economy. The purpose of the section is to determine the extent to which the agro-processing industry in the local and reference economy are clustered and the extent to which gaps and opportunities exist.

The section identifies the economic geography of agro-processing clusters in the Gauteng reference economy and then undertakes an analysis to identify the linkages and relationships between the agro-processing cluster and other input clusters (related clusters). The analysis also explores forward linkages of the agro-processing industry in order to identify demand drivers and potential target markets.

ECONOMIC GEOGRAPHY AND SPECIALISATION OF AGRO PROCESSING CLUSTERS

The following analysis provides an overview of the economic geography of agro-processing clusters in the Gauteng reference economy. The data suggests (refer to the Figure and Table below) that the Emfuleni, CoE Tembisa to Edenvale (Region B), CoJ Soweto (Region D), CoJ Orange Farm (Region G), and CoT Akasia / Soshanguve (Region 1) local economies are strong agro-processing cluster geographies in the Gauteng reference economy. The strong cluster potential of the preceding local economies is as a result of the high level of agro-processing employment specialisation (i.e. LQs above the Provincial average) and the sizeable proportion of agro-processing employment created in the local economies. The preceding economies are considered to be the primary agro-processing cluster geographies of the province.

The following table provides a qualitative and quantitative overview of agro-processing cluster geographies in the Gauteng Province.

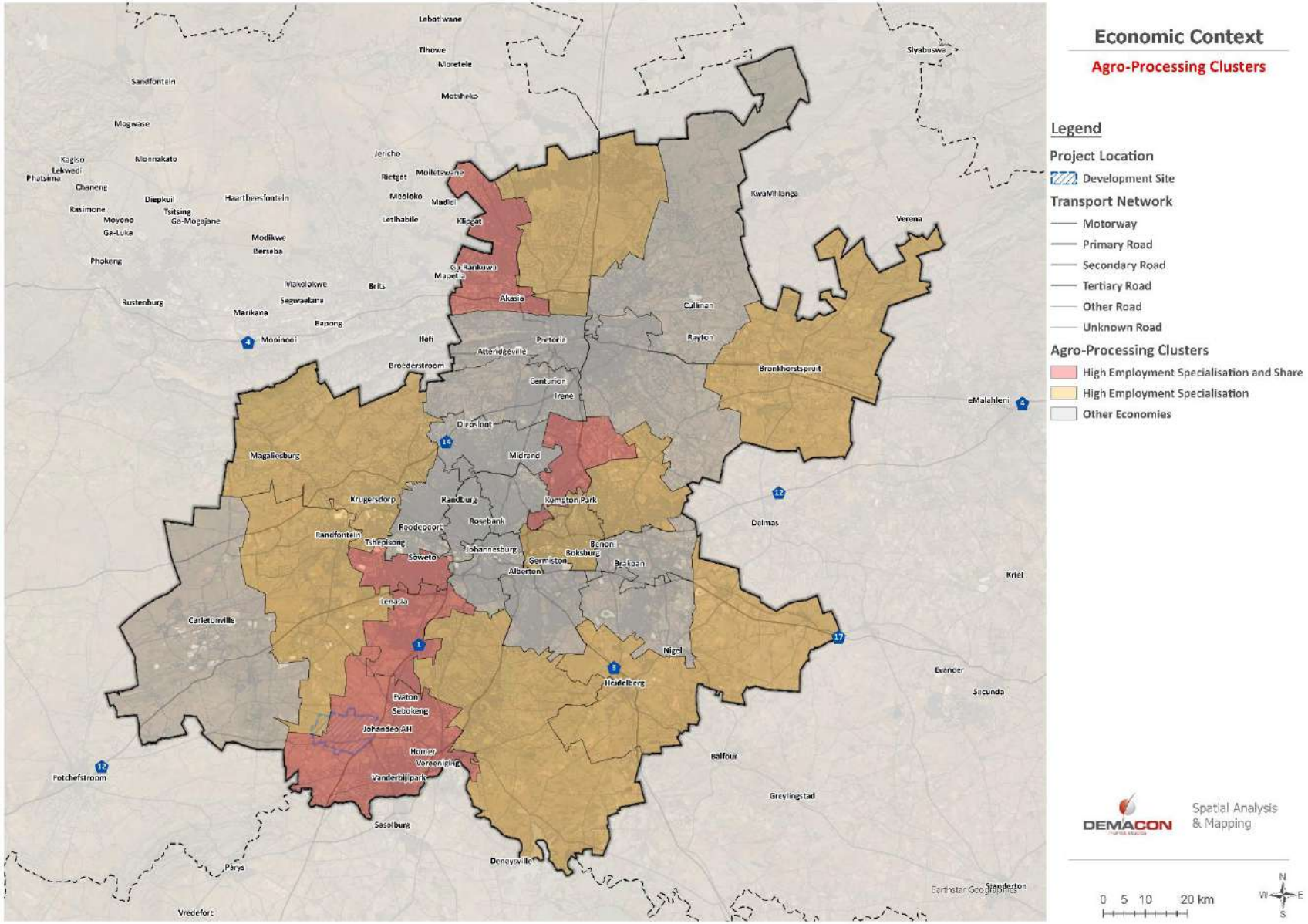
Table 3.19: Cluster Geography and Specialisation Analysis of the Agro-Processing Clusters

Economic Region	LQ	Employment Share	Classification
Emfuleni (GT421)	1.30	5.9%	High Employment Specialisation and Share
Midvaal (GT422)	1.69	1.4%	High Employment Specialisation
Lesedi (GT423)	1.49	1.1%	High Employment Specialisation
Mogale City (GT481)	1.16	3.8%	High Employment Specialisation
Merafong City (GT484)	0.96	2%	
Rand West City (GT485)	1.26	3.2%	High Employment Specialisation
City of Ekurhuleni - Kempton Park to Boksburg (EKU-A)	1.03	4.1%	High Employment Specialisation
City of Ekurhuleni - Tembisa to Edenvale (EKU-B)	1.42	8.9%	High Employment Specialisation and Share
City of Ekurhuleni - Daveyton (EKU-C)	1.11	3.3%	High Employment Specialisation
City of Ekurhuleni - Benoni to Springs (EKU-D)	0.98	2.4%	
City of Ekurhuleni - Kwa-Thema to Nigel (EKU-E)	0.99	3.7%	
City of Ekurhuleni - Alberton to Vosloorus (EKU-F)	0.97	8.1%	
City of Johannesburg - Midrand (JHB-A)	0.94	5.8%	
City of Johannesburg - Randburg (JHB-B)	0.66	3%	
City of Johannesburg - Roodepoort (JHB-C)	0.82	5.5%	
City of Johannesburg - Soweto (JHB-D)	1.21	9.2%	High Employment Specialisation and Share
City of Johannesburg - Alexandra (JHB-E)	0.76	4%	
City of Johannesburg - Johannesburg (JHB-F)	0.90	6.2%	
City of Johannesburg - Orange Farm (JHB-G)	1.12	5.5%	High Employment Specialisation and Share
City of Tshwane - Akasia/Soshanguve (TSH-1)	1.04	5.7%	High Employment Specialisation and Share
City of Tshwane - Sinoville/Hammanskraal (TSH-2)	1.16	2.7%	High Employment Specialisation
City of Tshwane - Pretoria (TSH-3)	0.69	3.7%	
City of Tshwane - Centurion (TSH-4)	0.76	3.5%	
City of Tshwane - Cullinan/Rayton (TSH-5)	0.75	0.7%	
City of Tshwane - East (TSH-6)	0.73	4.3%	
City of Tshwane - Bronkhorstspruit (TSH-7)	1.78	1.5%	High Employment Specialisation

Source: DEMACON Calculations, 2024

The following figure provides a spatial overview of agro-processing cluster geographies in the Gauteng Province.

Map 3.4: Agro Processing Cluster Geographies in the Gauteng Province

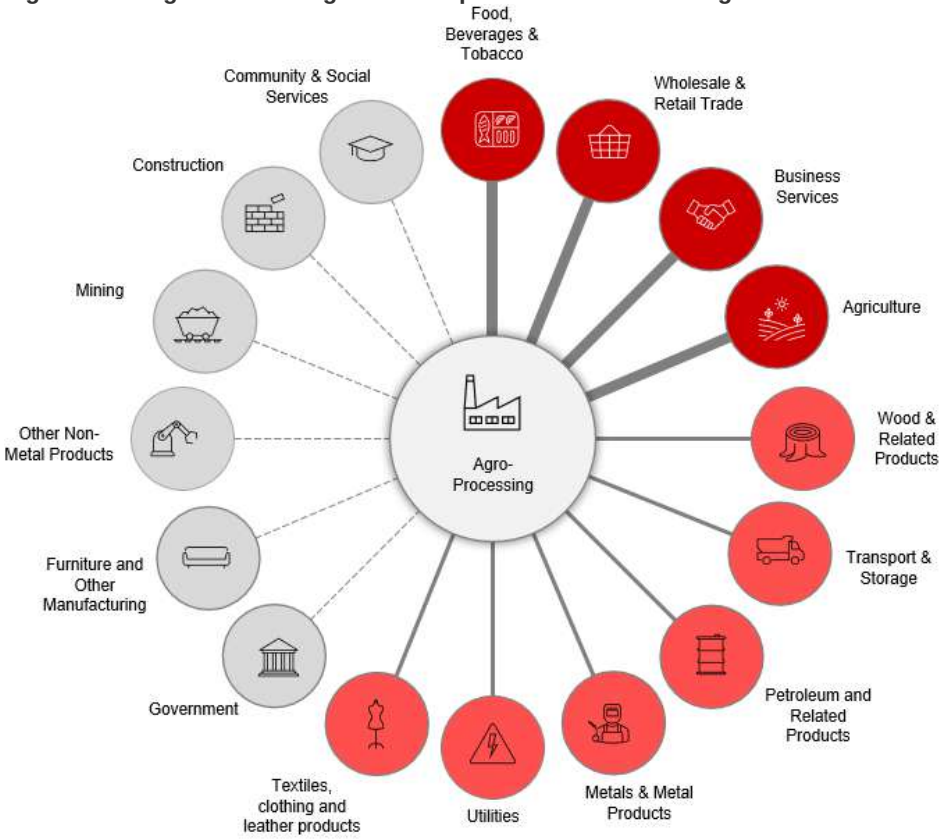


Source: DEMACON GIS, 2024

CLUSTER INPUT LINKAGE ANALYSIS

The following section is focused on an analysis of cluster linkages. The purpose is to identify and explore linkages that the Emfuleni local economy's transport and logistics industry has with other economic sector and industry clusters. The analysis reviews input-output economic data for the transport and logistics industry and seeks to identify the core and key input/backward linkages that the transport and logistics industry has. The analysis measures the prevalence of supporting clusters within the broader reference economy and seeks to determine the extent to which potential development opportunities exist. The following figure and table provide an overview of the primary and key linkages to the transport and logistics industry.

Figure 3.19: Agro Processing Related Input Clusters and Linkages



The coloured circles represent clusters/economic sectors that are related and provide inputs to the transport and logistics industry. The lines represent the link classification, i.e. thick line represents a strong linkage, a thin line represents a moderate linkage and a dotted line represents a less pronounced linkage.

The following table provides an overview of the preceding figure.

Table 3.20: Input Table to the Agro Processing Industry – Cluster Link Analysis

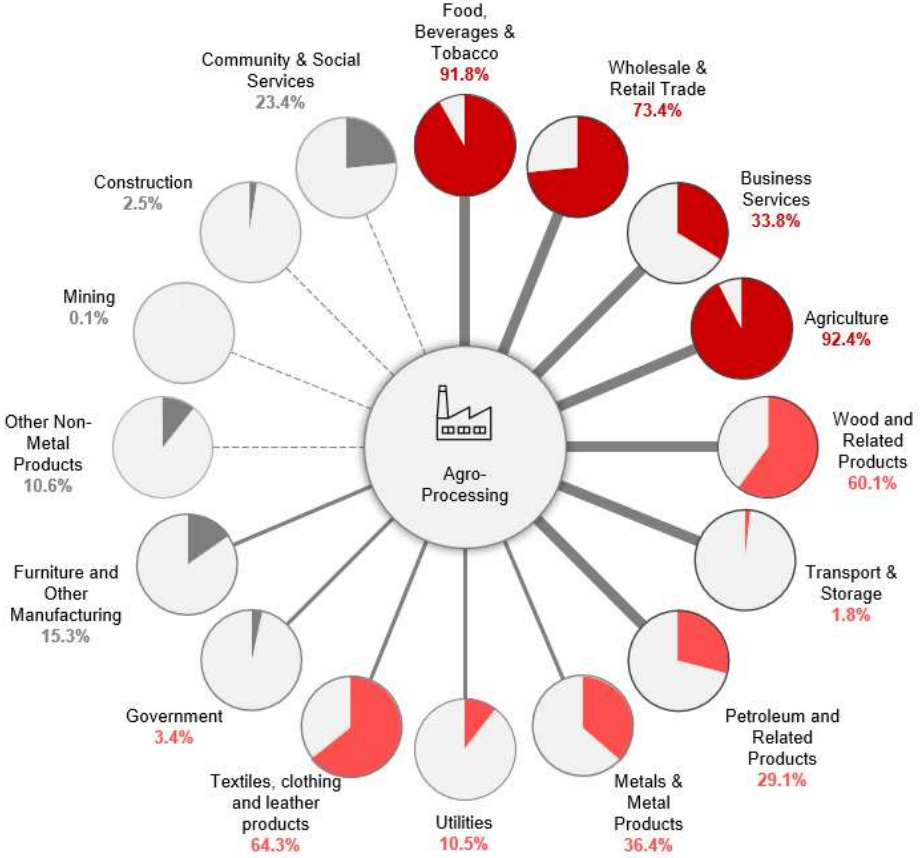
Input Cluster	Primary User Sub-Cluster (Link Driver)		Total Input Cluster Percentage Contribution to Total Inputs	Link Classification
	Sub-Cluster	Percentage of Inputs Used by the Cluster		
Agriculture	**Food**	**44.8%**	**8.1%**	**Strong Link**
Mining	Food	44.2%	0.3%	Less Pronounced
Food, beverages and tobacco	**Food**	**83.3%**	**37.6%**	**Strong Link**
Textiles, clothing and leather products	Wearing apparel	47.6%	1.0%	Moderate Link
Wood and paper, publishing and printing	Paper and paper products	66.1%	7.7%	Moderate Link
Petroleum products, chemicals, rubber and plastic	Food	35.0%	5.0%	Moderate Link
Other non-metal mineral products	Beverages and tobacco	81.7%	0.6%	Less Pronounced
Metals, metal products, machinery and equipment	Food	31.6%	2.2%	Moderate Link
Electrical machinery and apparatus	Rubber products	87.6%	0.0%	Less Pronounced
Radio, TV, instruments, watches and clocks	Wearing apparel	60.7%	0.0%	Less Pronounced
Transport equipment	Food	45.4%	0.1%	Less Pronounced
Furniture, other manufacturing	Food	32.9%	0.7%	Less Pronounced
Utilities	Food	43.0%	1.8%	Moderate Link
Construction	Food	35.6%	0.3%	Less Pronounced
Wholesale and retail trade	**Food**	**58.3%**	**18.3%**	**Strong Link**
Transport and Storage	Food	42.7%	6.4%	Moderate Link
Business Services	**Beverages and tobacco**	**35.9%**	**8.6%**	**Strong Link**
Government	Food	41.8%	0.9%	Less Pronounced
Education (Private)	Beverages and tobacco	46.7%	0.3%	Less Pronounced
Health and social work (Private)	Beverages and tobacco	45.5%	0.1%	Less Pronounced
Other community, social and personal services	Wood and wood products	30.8%	0.3%	Less Pronounced

Source: DEMACON Calculations, 2024

The data outlined by the preceding table shows that several strong links are present between the agro processing cluster and input economic clusters.

The following figure illustrates the degree to which the local agro-processing industry sources inputs from Gauteng and nationally based suppliers and producers. The data further illustrates that inputs are primarily sourced from within the Gauteng provincial economy. It should be borne in mind that the preceding analysis does not illustrate the origin geography of inputs sourced by clusters providing inputs to the agro-processing industry.

Figure 3.20: Provincially and Nationally Sourced Agro-Processing Inputs



Therefore, the distribution and connectivity to input clusters within the Gauteng Province is important in order to drive agro-processing development. The availability and quality of transport infrastructure is important in order to facilitate continued growth of the agro-processing industry and related clusters. The role and function of logistics therefore is also important as the backbone for distribution of products and services produced within the Emfuleni and provincial economies.

Existing clusters within the Emfuleni local economy should therefore be key focus areas for agro-processing development. Considering that the agro-processing industry in the Emfuleni local economy is based on food production and processing, the key focus for an SEZ development should seek to enhance and grow the capability of the food processing sub-cluster and should seek to develop the value chain of existing supply clusters.

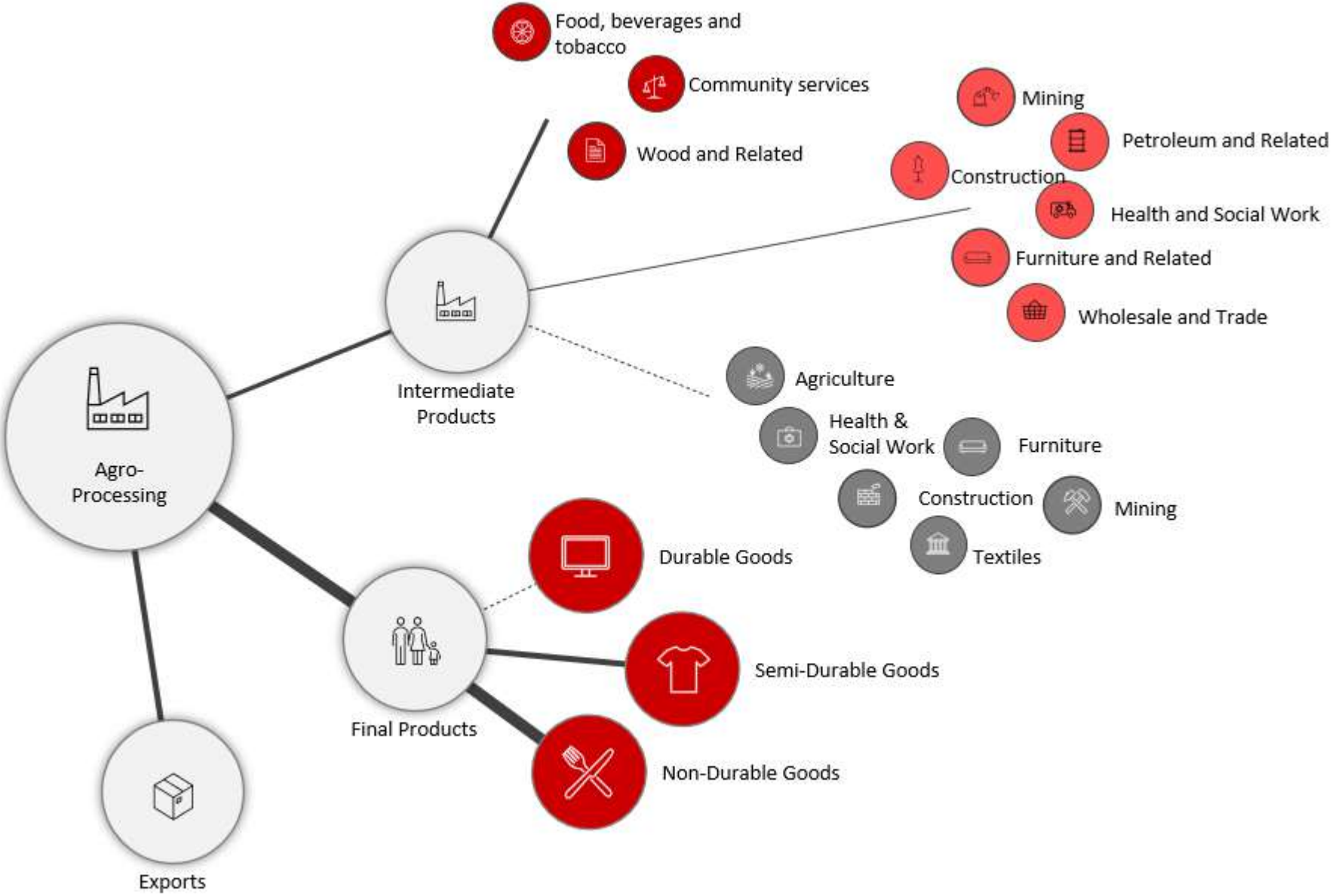
OUTPUT ANALYSIS AND DEMAND DRIVERS

The following section is focused on identifying the forward-linkages of the agro-processing industry. The purpose of the section is to review the distribution of outputs generated by the agro-processing industry and, how these outputs are distributed throughout the economy as intermediate products, as final products consumed by households and, products exported to international markets. The analysis also assists with identifying the demand drivers of the agro-processing industry. Demand drivers influence the growth of the industry whereby a deceleration of demand from key consumers of agro-processed products could lead to diminished output, GDP and employment.

The forward-linkages of the agro-processing industry combined with an analysis of demand drivers influencing the industry's growth provides a perspective of probable focus areas for the proposed aerotropolis and identifies the sustained/feasible nature of key focus areas.

The following table shows that approximately 45.2% of the output generated by the agro-processing industry is produced by the non-durable final products and processing cluster, followed by output produced by the food, beverages and tobacco (21.7%) and Wood and paper, publishing and printing (5.8%) sub-clusters. The following figure illustrates the high-level forward-linkages of the agro-processing industry. The data shows that more than half of the agro-processing industry cluster's output is final products primarily consumed by households. Non-durable food goods represent the majority of output derived from the agro-processing cluster in the local economy. Intermediate products, i.e. such as products used as inputs to the production of final products, represent approximately 23% of the agro-processing cluster's output. Exports of goods and services represent slightly more than 10.2% of the cluster's output.

Figure 3.21: Agro-Processing Forward-Linkages



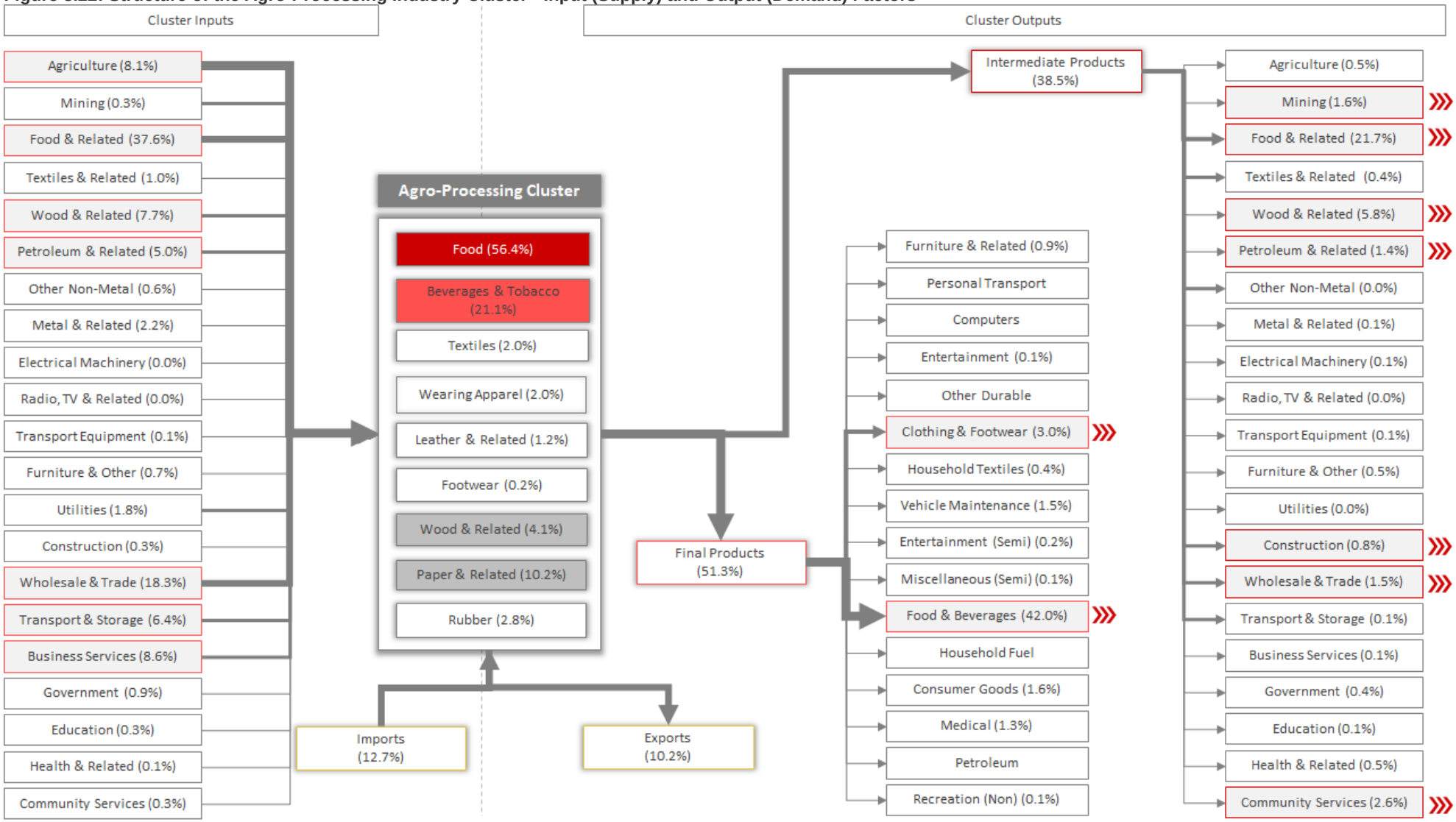
Source: DEMACON ex 2024

Table 3.21: Output Table of the Transport and Logistics Industry – Output Analysis

Consumer Sector / Goods	Primary Output-Sub-Cluster		% Distribution of Total Output Acquired per Consumer Sector / Good	Link Classification	Local vs National Markets		Demand Driver
	Main Output Sub-Cluster	% Output Acquired by Consumers			Gauteng	Remainder of SA	
Agriculture	Food	78.9%	0.5%	Less Pronounced	67.2%	32.8%	
Mining	Wood and wood products	77.2%	1.6%	Moderate Link	7.3%	92.7%	Secondary Driver
Food, beverages and tobacco	**Food**	**90.4%**	**21.7%**	**Strong Link**	**92.9%**	**7.1%**	**Demand Driver**
Textiles, clothing and leather products	Textiles	79.7%	0.4%	Less Pronounced	86.6%	13.4%	
Wood and paper, publishing and printing	**Paper and paper products**	**94.0%**	**5.8%**	**Strong Link**	**87.7%**	**12.3%**	**Demand Driver**
Petroleum products, chemicals, rubber and plastic	Food	52.3%	1.4%	Moderate Link	77.4%	22.6%	Secondary Driver
Other non-metal mineral products	Wood and wood products	64.6%	0.0%	Less Pronounced	21.2%	78.8%	
Metals, metal products, machinery and equipment	Food	46.5%	0.1%	Less Pronounced	50.4%	49.6%	
Electrical machinery and apparatus	Wood and wood products	77.8%	0.1%	Less Pronounced	49.6%	50.4%	
Radio, TV, instruments, watches and clocks	Paper and paper products	85.3%	0.0%	Less Pronounced	68.6%	31.4%	
Transport equipment	Rubber products	26.1%	0.1%	Less Pronounced	6.0%	94.0%	
Furniture, other manufacturing	Wood and wood products	42.8%	0.5%	Less Pronounced	81.9%	18.1%	
Utilities	Food	39.4%	0.0%	Less Pronounced	25.2%	74.8%	
Construction	Wood and wood products	70.4%	0.8%	Moderate Link	94.3%	5.7%	Secondary Driver
Wholesale and retail trade	Food	72.1%	1.5%	Moderate Link	95.5%	4.5%	Secondary Driver
Transport and Storage	Rubber products	45.9%	0.1%	Less Pronounced	5.5%	94.5%	
Business Services	Wood and wood products	57.4%	0.1%	Less Pronounced	3.1%	96.9%	
Government	Food	71.3%	0.4%	Less Pronounced	80.9%	19.1%	
Education (Private)	Paper and paper products	98.9%	0.1%	Less Pronounced	68.3%	31.7%	
Health and social work (Private)	Food	73.4%	0.5%	Less Pronounced	67.4%	32.6%	
Other community, social and personal services	**Food**	**62.7%**	**2.6%**	**Strong Link**	**91.9%**	**8.1%**	**Demand Driver**
Durable goods	Paper and paper products	30.8%	0.9%	Moderate Link	77.2%	22.8%	Secondary Driver
Semi-durable goods	**Wearing apparel**	**43.3%**	**5.2%**	**Strong Link**	**83.8%**	**16.2%**	**Demand Driver**
Non-durable goods	**Food**	**54.2%**	**45.2%**	**Strong Link**	**45.5%**	**54.5%**	**Demand Driver**

Source: DEMACON Calculations, 2024

Figure 3.22: Structure of the Agro-Processing Industry Cluster - Input (Supply) and Output (Demand) Factors



3.9 SYNTHESIS

Within the analysis the following **manufacturing clusters** were identified:

- Petroleum products, chemicals, rubber and plastic
- Furniture and other manufacturing

Petroleum Products, Chemicals, Rubber and Plastic

GENERIC INDUSTRY SUBCOMPONENTS

- Coke, petroleum products and nuclear fuel
  - Petroleum oils
  - Bitumen
  - Oil milieu residues
  - Petroleum jelly and wax
  - Mineral waxes
  - Retort coke, coke/semi-coke of coal
- Basic chemicals
  - Polymers of ethylene
  - Mineral or chemical fertilizers
- Other chemical products
  - Medicaments, therapeutic, prophylactic use
  - Blood, antisera, vaccines, toxins and cultures
  - Insecticides, fungicides, herbicides
  - Soaps and polishes
  - Beauty, make-up and skin care preparations
- Rubber products
  - Tyres and inner tubes
  - Conveyor and similar belts
  - Rubber tube, pipe, hose
  - Hygienic or pharmaceutical articles or rubber (e.g. surgical gloves)
- Plastic products
  - Containers and packaging
  - Plastic furniture
  - Bathroom wares
  - Lamps and light fittings

Furniture and Other Manufacturing

GENERIC INDUSTRY SUBCOMPONENTS

- Seats
- Other furniture and parts thereof
- Mattress supports, mattresses, bedding
- Equipment for gymnastics, sports, outdoor games
- Other toys, scale models, puzzles, etc.
- Articles for funfairs, table and parlour games
- Fuel wood
- Candles, tapers and the like
- Pens and mechanical pens
- Brooms, brushes, mops, feather dusters, etc.
- Matches

Value Chain Development

Lessons in economic development world-wide have shown that while anchor projects can result in significant FDI value, the jobs created per rand will be higher where the cluster platform is strong. The region must ensure a fertile environment for the downstream linkages, investment and SMME growth. To generate the largest number of jobs, an investment promotion approach to on-going activity in the targeted region will be substantially strengthened by strong local clusters.

The manufacturing sector is identified in the NDP as one of the key sectors of competitive advantage that will serve as a platform to launch a new growth trajectory. In seeking to stimulate manufacturing, government aims to leverage public and private procurement to promote localisation and industrial diversification. This creates opportunities for local manufacturing industries to expand production and its product offering.

SOCIO-ECONOMIC ANALYSIS

4

4 SOCIO-ECONOMIC ANALYSIS

4.1 INTRODUCTION

The demand for economic/non-economic activities is, in part, based on demand generated by the demographic component of a specific market area or catchment. The current demographic composition in a market area coupled with past trends and future potential growth, impact on the current and future demand for economic activities.

The purpose of this chapter is to provide analysis of the demographic component of the resident market area that can be considered alongside Chapter 4 to complete a demographic and economic perspective of interactions between population and their local economic conditions.

The chapter sets out a delineated market area and reviews information about the population that reside in the market area, focusing on demographic and socio-economic characteristics of the resident market population influencing the proposed development location.

4.2 SOCIO-ECONOMIC MARKET AREA DELINEATION

To gain insight into the socio-economic character of potential market participants to the proposed development, a market area is delineated. A market area assists with determining the main socio-economic market characteristics affecting the proposed development.

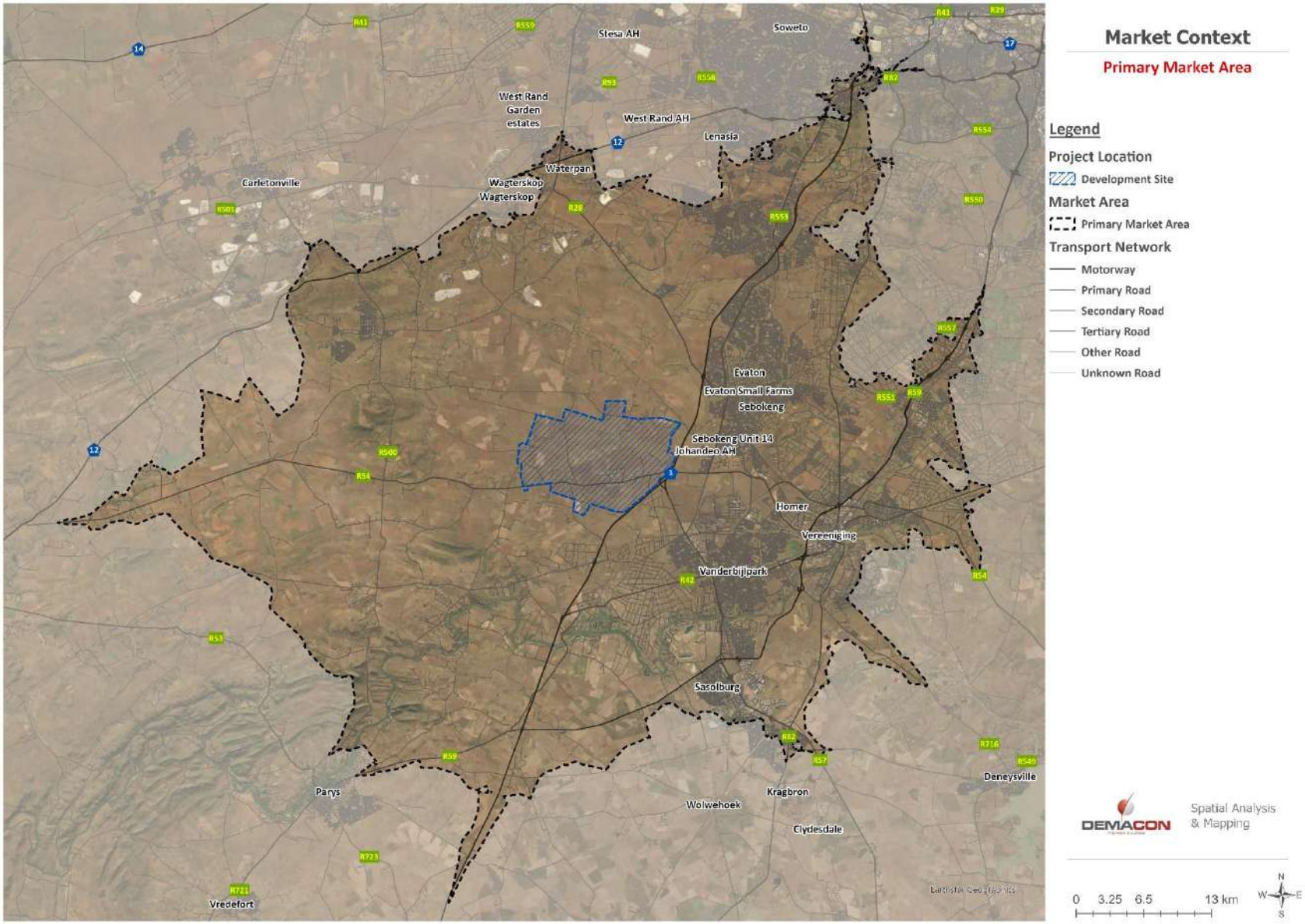
The primary market area for the project is based on a polygon (±30-minute drive time isochrone).

This chapter provides the key socio-economic indicators of the primary market, informed by general SACSC criteria, as well as the following:

- Consumer market behaviour and expenditure trends
- Regional and sub-regional levels of accessibility
- Geographic barriers
- General consumer mobility patterns and drive times.

The following section provides an analysis of the demographic profile of the primary market area of the proposed development. The demographic profile considers the primary market area and the demographic component that is resident to the market area.

Map 4.1: Socio-Economic Market Area delineated by an approximated 30 minute drive time isochrone



Source: DEMACON GIS, 2024

4.3 Primary Market Area Demographic Analysis

The following section provides an analysis of the demographic profile of the primary market area of the proposed development. The demographic profile considers the primary market area and the demographic component that is resident to the market area.

4.3.1 Demographic Size and Composition

Population Size

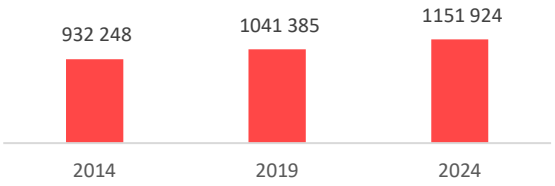
1 150 135 PEOPLE IN THE **PRIMARY** TRADE AREA

Population Average Annual **Growth Rate** **2.20%**

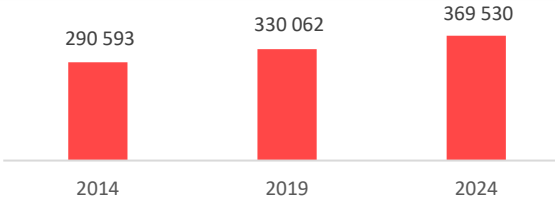
368 875 HOUSEHOLDS

Household Average Annual **Growth Rate** **2.52%**

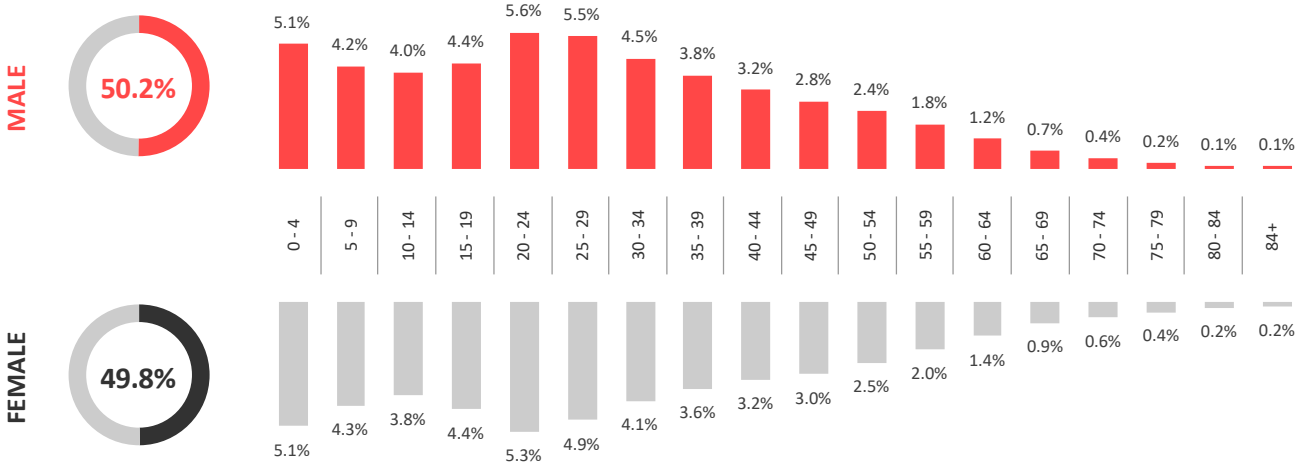
Population Growth



Household Growth



Age and Gender Profile



Population Group

Black African	84.1%
Coloured	3.1%
Indian / Asian	2.6%
White	10.2%

Migration Profile

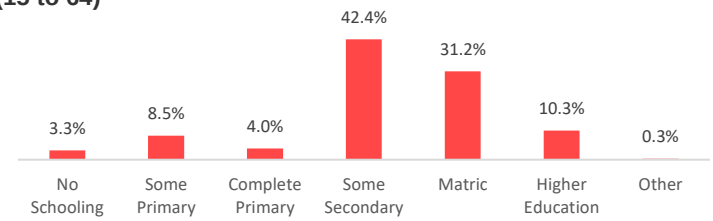
Data indicates that 36.4% of people migrated to the receiving environment since 2011

Education Profile

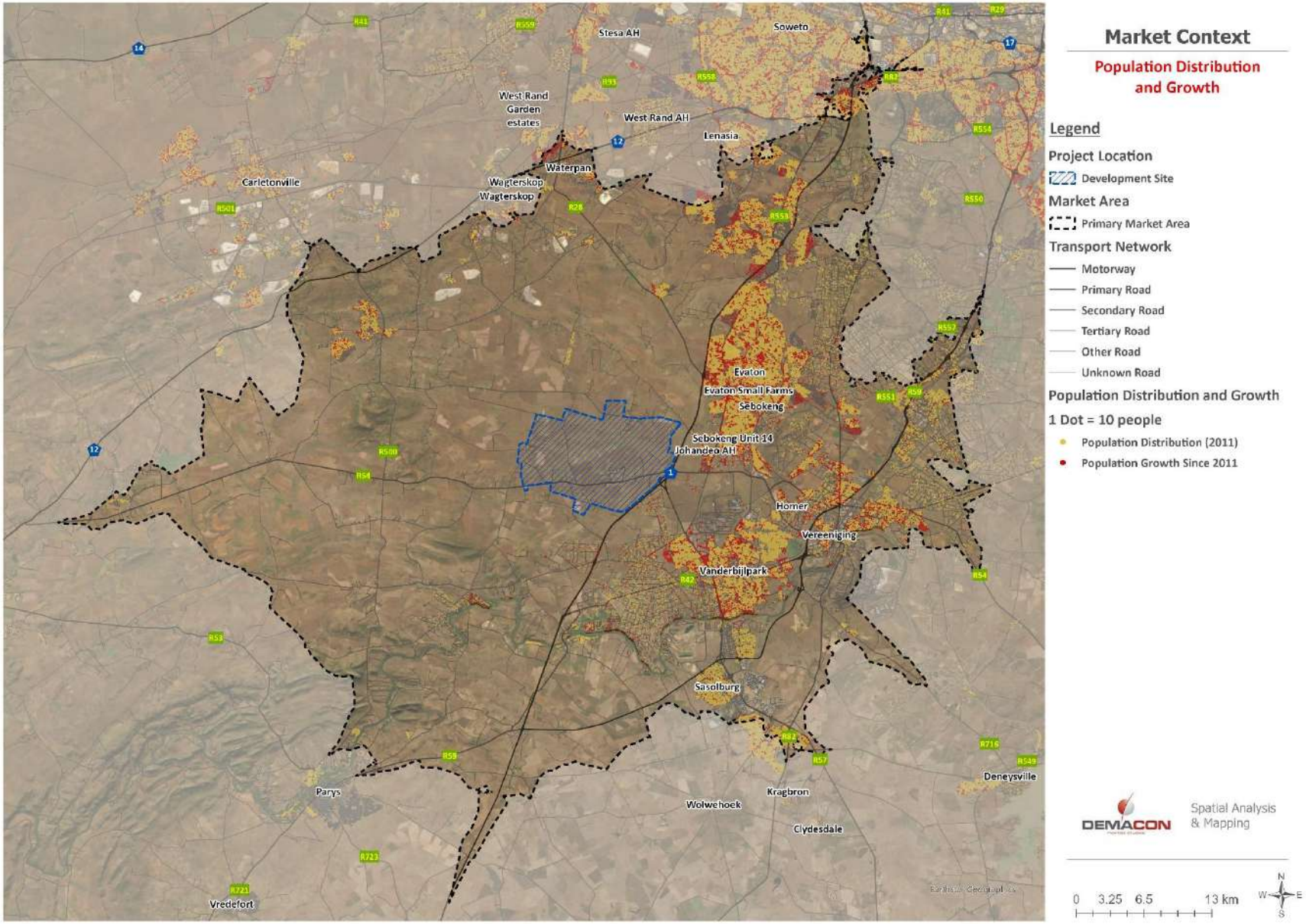
Educational Institution Attendance (Persons 20+ Years)

43.0%	20.0%	17.4%
attend an UNIVERSITY	attend an FET COLLEGE	attend a ORDINARY SCHOOL

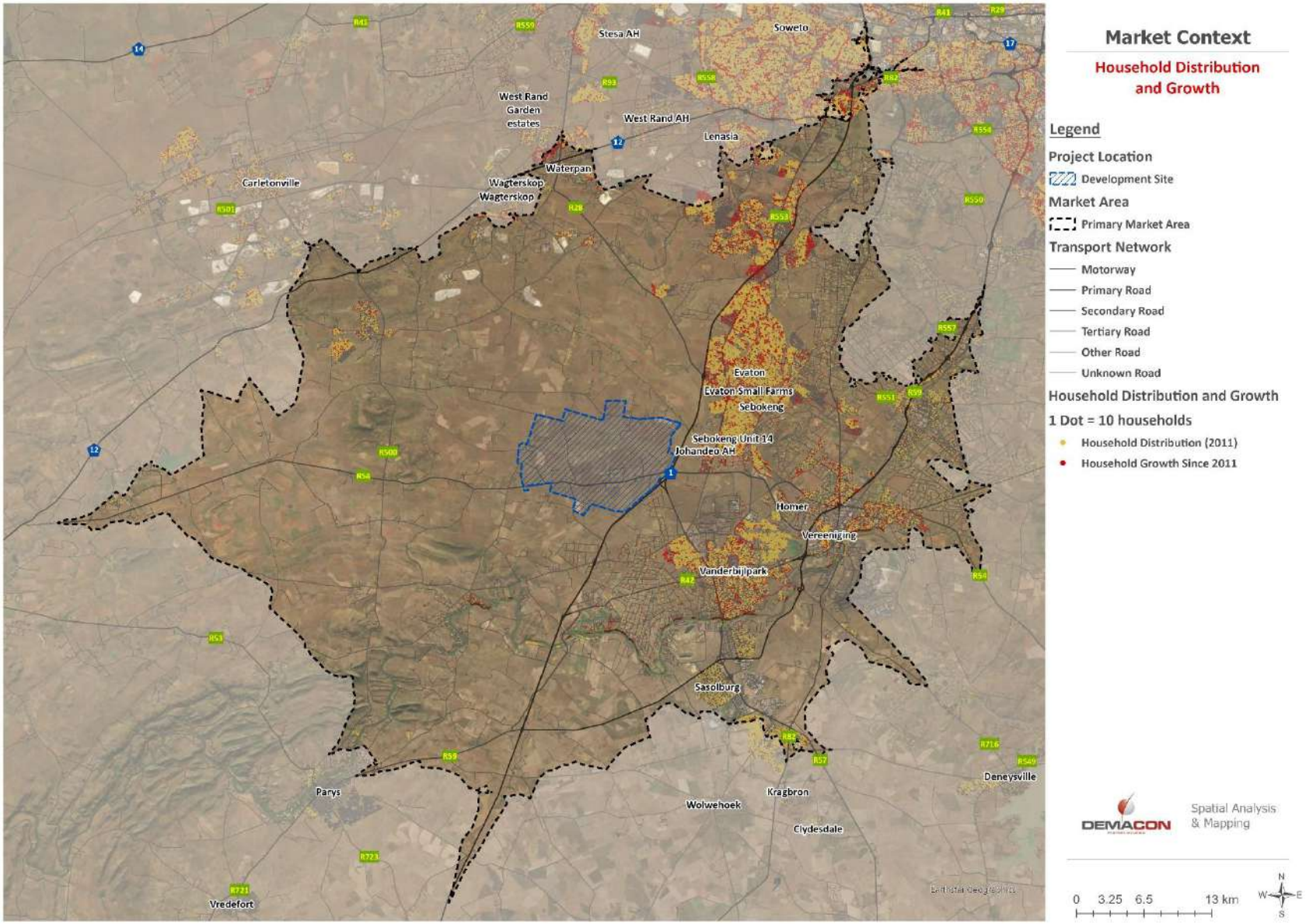
Highest Level of Education Obtained – Working Age Population (15 to 64)



Map 4.2: Population Distribution and Growth



Map 4.3: Household Distribution and Growth

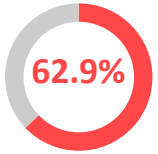


Source: DEMACON ex StatsSA, 2024

4.3.2 Labour Force Profile

Economically Active Segment

ECONOMICALLY
ACTIVE
Population

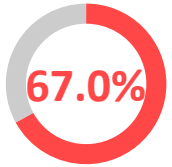


37.1% Not Economically Active

Economically active population refers to a person of working age 15 to 65 who are either employed or unemployed.

Not economically active population refers to a person of working age 15 to 65 who are unable to work or persons engaged in educational activities or are homemakers.

Employment Profile



Employed
Economically
Active

33.0% Unemployed Economically Active

Employed and unemployed persons are considered to be economically active and thus is a segment of the economically active percentage.

Occupation Profile

Skilled Occupations
19.8%

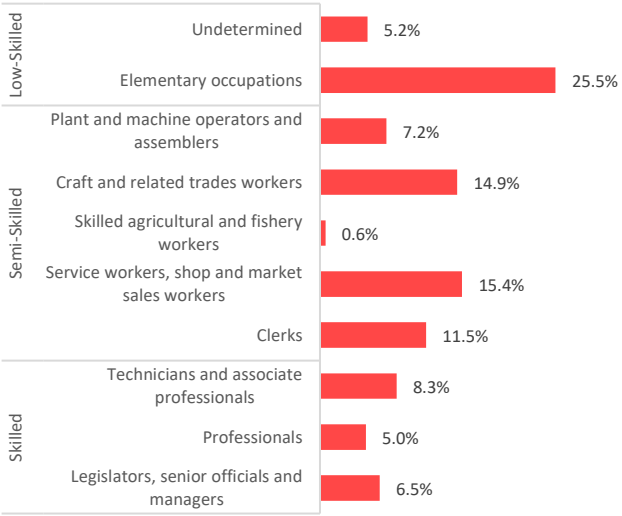
Semi-Skilled Occupations
49.6%

Low-Skilled Occupations
25.5%

ELEMENTARY
ARE MOST POPULAR
25.5%

SERVICE WORKERS, SHOP AND MARKET SALES WORKERS
ARE THE SECOND MOST POPULAR
15.4%

TECHNICIANS AND ASSOCIATE PROFESSIONALS
ARE THE THIRD MOST POPULAR
14.9%



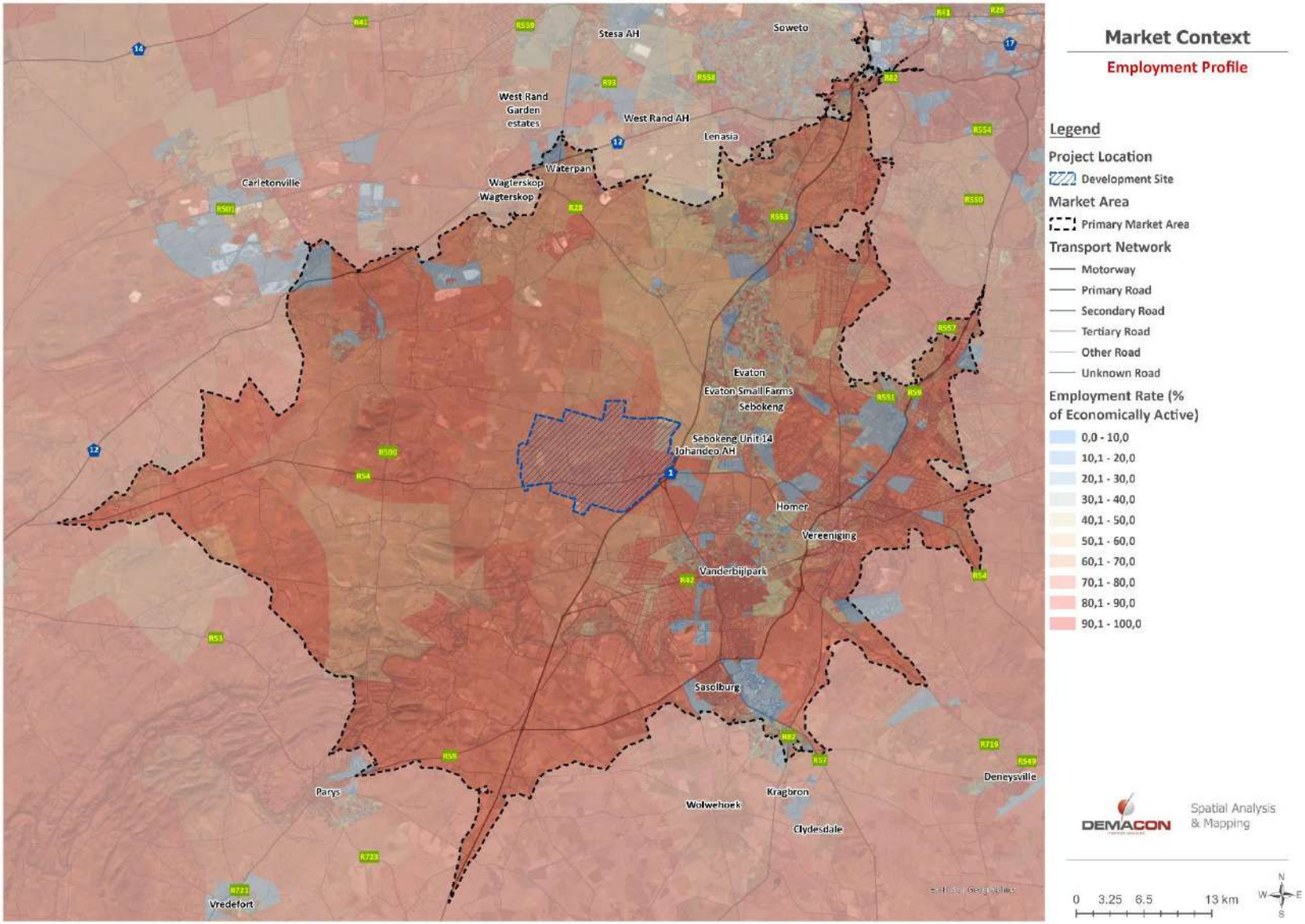
Employment per Industry

6.2%
Employed in the
Primary Sector

24.4%
Employed in the
Secondary Sector

57.2%
Employed in the
Tertiary Sector

Map 4.4: Employment Rate Distribution



Source: DEMACON ex StatsSA, 2024

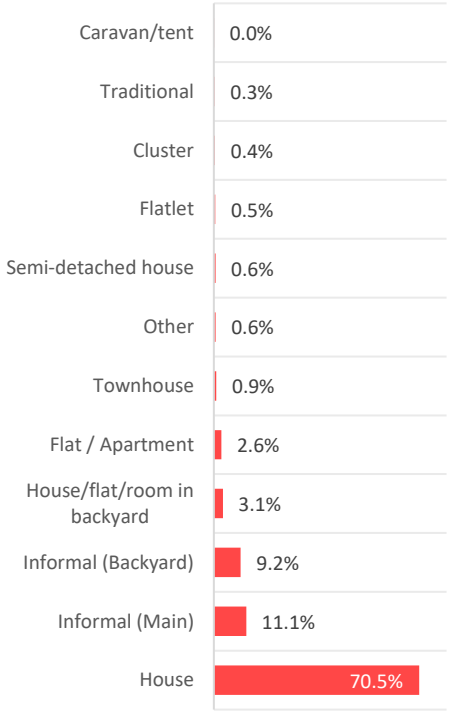
4.3.3 HOUSEHOLD PROFILE

DWELLING TYPOLOGY

Majority of Households Reside in a **Formal Dwelling** **79.2%**

20.5% of households reside in an **informal dwelling**

0.3% of households reside in a **traditional dwelling**



TENURE STATUS

36.6% of households **own** and have **paid** for the property where they reside

12.9% of households **own** but have **not finished paying** for the property where they reside

27.5% of households **rent** the property where they reside

23.0% of households **occupy** the property where they reside **rent free**

HOUSEHOLD INCOME PROFILE

Average annual household income for all SEM Groups (2024)

R103 938

Average annual household income for SEM Groups 2+ (2024)

R309 465

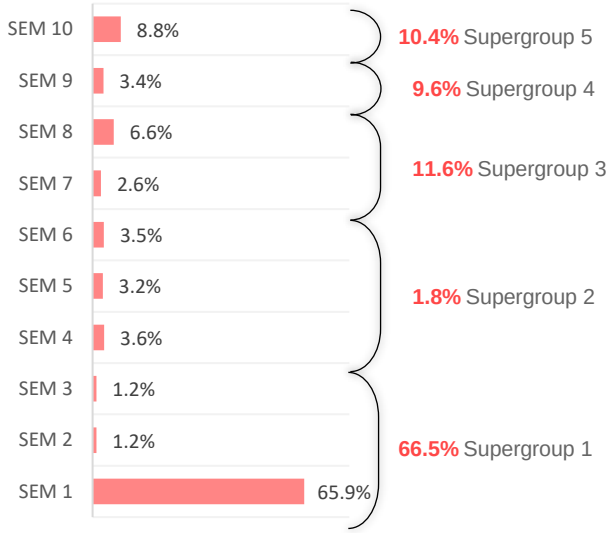
Average monthly household income for all SEM Groups (2024)

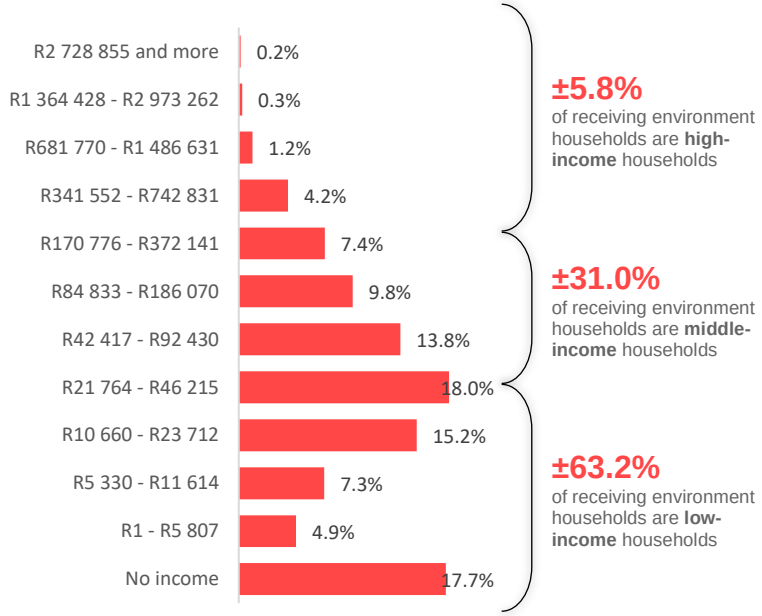
R8 661

Average monthly household income for SEM Groups 2+ (2024)

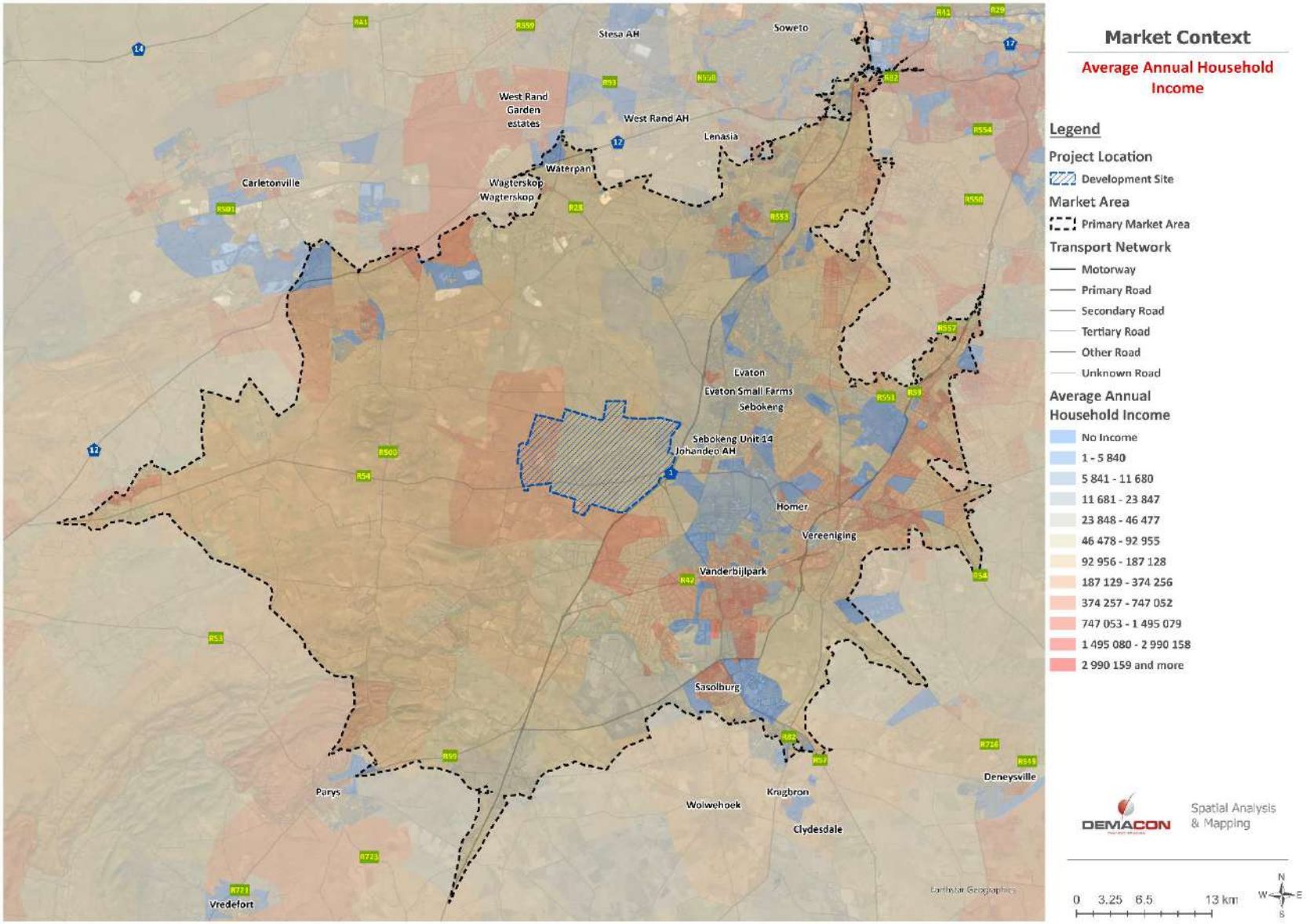
R25 789

SOCIO-ECONOMIC MONITOR



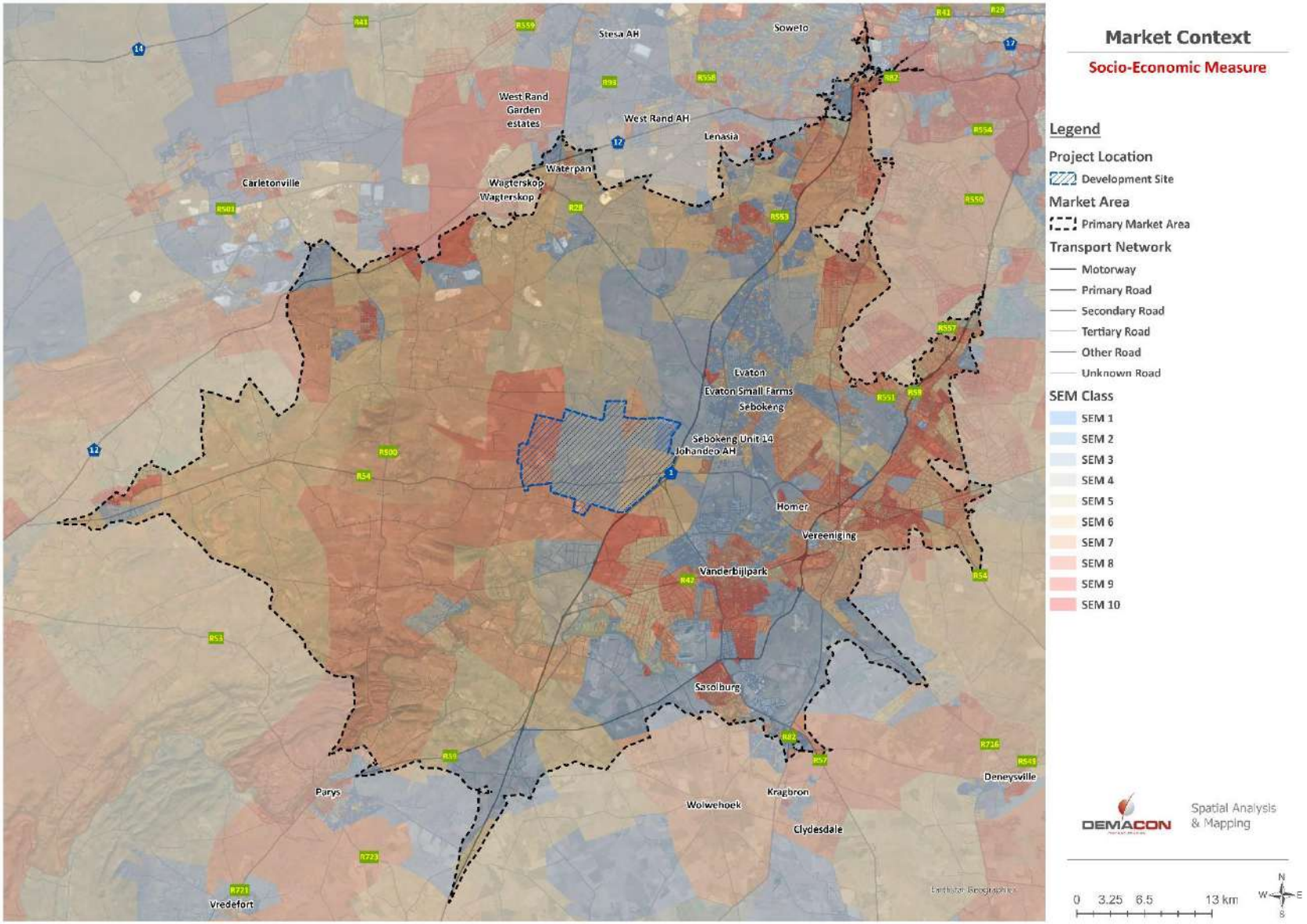


Map 4.5: Average Annual Household Income



Source: DEMACON ex StatsSA, 2024

Map 4.6: Socio-Economic Measure (SEM)



Source: DEMACON ex StatsSA, 2024

4.3.4 Demographic Profile And Generational Consumers

	ALPHA GENERATION	GENERATION Z	MILLENNIALS	GENERATION X	BABY BOOMERS	SILENT GENERATION
Current Age	**0-5 years**	**6-24 years**	**25-40 years**	**41-56 years**	**57-75 years**	**76+ years**
Percentage of Target Market	**12.1%**	**34.1%**	**27.7%**	**17.4%**	**7.6%**	**1.1%**
Characteristics	• Raised in homes with smart speakers & devices • Technology is built into everyday items • Many attend schools virtually – gravitating towards online schooling	• Flexible work environments • Clear directions & transparency • Seek personal growth in reaching performance goals • Value offline relationships and person-to-person interaction • Prioritise authenticity, truth & connectivity in their relationships & expect it from society	• Seek meaningful work • Want to grow and use creative skills • Technology savvy • Yearn to grow professionally • Skills training, mentorship & feedback necessary to stay at company • Self-confident • Not afraid to challenge the status quo/ management	• Laid back • Low-key & independent • Entrepreneurial spirit • Value friendly, flexible workplaces & productivity over hours spent at work • Seeks out efficiency & innovation • Value autonomy to make own choices • Create relationships with mentors • Effectively manage work-life balance	• Hardworking • Ambitious • Seek luxury status symbols in their personal lives • Take risks to pursue goals • Dedicated to their jobs • Attribute self-worth to their occupations • Finding work-life balance is challenging	• Traditional values • Financial prudence • Interpersonal respect • Determination • Resilience • Work ethic • Analog sensibilities • Loyal • Financially conservative
Social Media Channel of Choice	• Instagram, TikTok	• TikTok, SnapChat, YouTube	• Instagram, Facebook, Pinterest	• Facebook, LinkedIn	• Facebook	
Most responsive to	• Video, Influencers	• Video, Influencers	• Reviews, Blogs	• Word-of-mouth, E-mail, Marketing	• Traditional Advertising	• Traditional Advertising
Device of Choice	• Smartphones/ tablets & voice-demand devices	• Smartphones	• Multi-Device	• Desktop and Laptop	• Prefer in-person interactions	• Prefer in-person interactions
Shaping Events	• Global pandemic, social justice movement, Brexit	• Smartphones, social media, seeing financial struggles of parents	• The Great Recession, Technological Explosion of the Internet, Social Media	• End of the Cold War, Rise of personal computing, feeling lost between the two huge generations	• Post-WWII, Cold War, Hippie Movement	• World War II

	ALPHA GENERATION	GENERATION Z	MILLENNIALS	GENERATION X	BABY BOOMERS	SILENT GENERATION
Finances	• Digital natives that will expect fully integrated, personalised consumer experiences. It is expected that they will be one of the most educated and wealthy generations.	• Like GenX (their parents) in financial attitudes but wanting to avoid debt after seeing Millennials'' struggles	• Massive student debts delay major life purchases	• Carrying the highest debt load while still raising children and saving for retirement	• Managing retirement with life expectancies on the rise	• Retired & financially vulnerable • Lack of financial stability • Think of finances in terms of the rest of their lives
Shopping Characteristics	• Value- & service-driven consumers • Prefer one-day delivery, lightning-fast payments, value-added loyalty schemes & content creation • Wants to use technology to make a difference • Prefers brands that have a positive impact on the world • Environment & Sustainability largest looming issues • Interest in products from sustainable sources that weren't made from or packaged in plastic • Desire to be engaged with on issues that matter to them	• Have never known life without the internet • Distrusting of branding and advertising • Prefers testimonials/ influencer content • Prefers to see real people in real situations • Prefers brands that contribute to social & economic causes • Most likely to pre-shop on smartphones • Does not like Facebook/ Twitter • Dislikes ads that make life look perfect	• Largest group in the workforce • Does not like traditional ads • Prefers user-generated content, social selling, and word-of-mouth • Suspicious of being sold or lied to by brands • Prefers companies that support a cause • Very price conscious/ seeks the best value • Motivated by brand engagement, especially through social media	• Prefers honest and clear product and marketing messages • Require clear paths to purchase • Most likely to conduct online research at home and shop in purchase • Most influenced by email marketing • Prefers unique, high-quality products • Customer service is the most important driver of loyalty • Incentivised by discounts/ freebies/ coupons • Does not care for brand engagement	• Holds customer service above all other factors • Most likely to abandon purchase based on customer service interaction • Unlike to test new products • Maintain brand loyalty • Unlike to use friend/ family referrals in decision making • Prefer in-store shopping • Prefers loyalty programmes that are straight forward • Prefers simplicity and easy to understand content • Will use social media as entry point into brand or product research	• Attracted to loyalty and rewards programmes and places that offer discount to pensioners • Focused on value for money and product quality • Prioritises products that are reliable, fairly-priced & budget-friendly • Purchases necessities & only small luxuries • Prefers brand names • Prefers to shop in-store • Prefers products that are practical and solve a problem that they have

4.3.5 Socio-Economic Profile Synthesis and Key Considerations

POPULATION SIZE AND GROWTH

- Approximately 1.15 million people / 368 875 households reside in the primary market area.
- The average annual growth rate of population is 2.2% per annum, while the average annual growth rate of households is 2.5% per annum.

AGE AND GENDER PROFILE

- The age and gender profile reveals that:
  - The largest segment of the resident population is between the ages of 15 to 34 (38.7%) – classified as the youth population,
  - The second largest segment of the resident population are between the ages of 35 to 64 (30.9%) – classified as the adult population,
  - The third largest segment of the resident population are between the ages of 0 and 14 (26.5%) – classified as children, and
  - The smallest segment of the resident population is older than 64 years (3.9%) – classified as elderly.
- The profile shows a proportionally large contribution from the youth and adult categories, indicating a large expanding working age population.

RACIAL PROFILE

- The racial profile of the primary market area shows that the largest segment is Black African (84.1%), followed by a segment of White (10.2%), and smaller segments of Coloured (3.1%) and Indian / Asian (2.6%) populations.

MIGRATION PROFILE

- Since 2011, the primary market area has experienced a proportionally large influx of population, 36.4% of the population are migrants of which, 32.0% of migrants are South African, while 4.4% are from outside the South African border.

EDUCATION PROFILE

Highest Level of Education Attained

- Of the population within working age, 3.3% have obtained no education.
- A large portion of the primary market area has some secondary education (42.4%), or Grade12 / Matric (31.2%).
- A small percentage of the population have a higher education (10.3%).

Attendance at an Education Institution (Persons Aged 20 and Older)

- Of the persons aged 20 years and older, 7.7% are currently enrolled at an educational institution. They are primarily enrolled at a university (43.0%), followed by enrolments at a FET College (20.0%) or an ordinary school (17.4%).

EMPLOYMENT PROFILE

Economically Active Population and Employment

- Of the population of the primary market area, 62.9% are economically active, meaning that just more than two thirds of the population are of working age and are actively participating in the economy or seeking employment.
- The remaining 37.1% represent population that fall outside the scope of the economically active population definition and represent people who are not available for work such as full-time scholars and students, full-time homemakers, those who are retired and those who are unable or unwilling to work.
- Of the economically active population, 67.0% are employed and 33.0% are unemployed. The primary market area is characterised by moderately high unemployment levels, reflecting moderate to high dependency ratios.

Employment per Industry

- Of the population, 6.2% of employed persons are employed in the primary economic sector of which the mining sector is the most prominent.

- The tertiary economic sector is proportionally, the largest contributor in terms of employment (57.2%) of which the community, social and other personal services sector and the trade sector are the most prominent.
- The secondary economic sector proportionally contributes 24.4%, of which the manufacturing sector is the most prominent.

Employment per Occupation

- In the primary market area, 19.8% of the employed population are employed in skilled occupations of which technicians and associate professionals form the largest segments.
- Semi-skilled employed occupations proportionally make up 49.6% of employed persons of which craft and related workers and service workers, shop and market sales workers are the most prominent.
- Low skilled occupations contribute 25.5% to the total employed persons. Elementary occupations are the most prominent.

DWELLING TYPOLOGY

- The primary dwelling type for households in the primary market area are house or brick structures – formal dwellings (79.2%). The largest segment of formal dwellings are free standing houses on single erven (70.5%).
- Of the households in the primary market area, 20.5% resides in informal dwellings, of which 11.1% are informal dwellings on an erf and 9.2% are informal dwellings in the backyard.

TENURE STATUS

- Of households in the primary market area, 36.6% own the dwelling/property in which they reside and have fully paid the bond registered to the property with a further 12.9% of households in the process of paying off their bond.
- A large segment of households (27.5%) rent their current dwelling, whilst 23.0% occupy their current dwelling rent-free.

HOUSEHOLD INCOME PROFILE

- Affluent households (R1.3 million and more) make up 0.5% of households.
- Approximately 17.7% of households in the primary market area earn no formal income.
- The weighted average annual household income for the resident population for 2024 amounts to R103 938 per annum, which amounts to R8 661 per month for all SEM groups.
- For SEM groups 2 and higher, the average income is R309 465 per annum, which amounts to R25 789 per month.
- Independent research affirms that income is typically understated.

SEM PROFILE

- The discontinuation of the All-Media Products Survey (by the South African Audience Research Foundation (SAARF)), on which the Living Standard Measure (LSM) classifications were based, gave way to a new measurement system called The Socio-Economic Measure model (SEM). The newly released SEM model is a more accurate reflection of South African society in terms of how people live and is not dependent solely on durables, as the historical LSMs have been. The new SEM offers marketers a statistical and technical solution that depicts how our citizens are living, not only what they have in their homes.
- Approximately 66.5% of the primary market area's households are classified within the SEM Supergroup 1 with 33.5% of households classified within the SEM Supergroup 2+ categories.

4.4 60 Minute Drive Time Demographic Analysis

Population Size

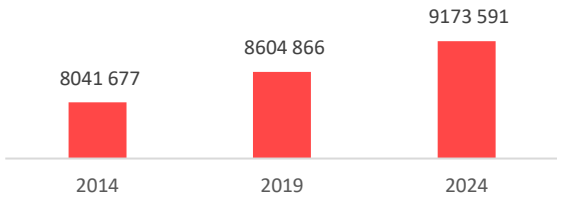
9 173 591 PEOPLE IN THE **PRIMARY** TRADE AREA

Population Average Annual **Growth Rate** **1.36%**

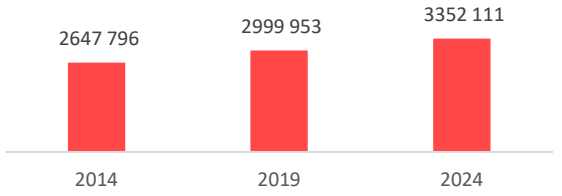
3 352 111 HOUSEHOLDS

Household Average Annual **Growth Rate** **2.48%**

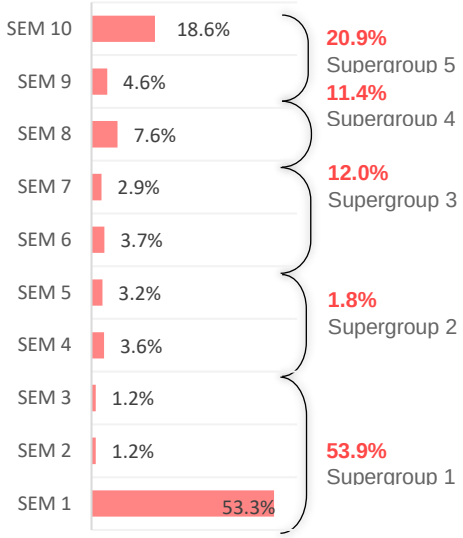
Population Growth



Household Growth



Socio-Economic Monitor



Population Group

Black African	72.5%
Coloured	5.0%
Indian / Asian	3.6%
White	18.9%

Migration Profile

Data indicates that 26.7% of people migrated to the receiving environment since 2011

Household Income Profile

Average annual household income for all SEM Groups (2024)

R214 896

Average annual household income for SEM Groups 2+ (2024)

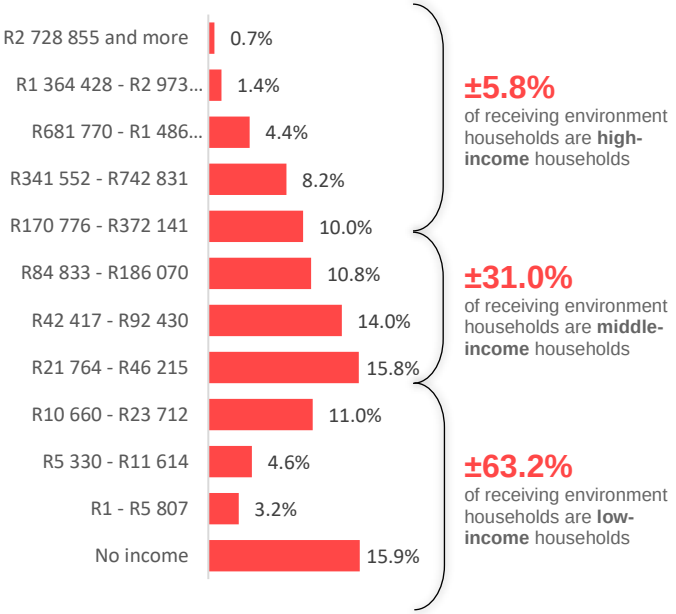
R488 928

Average monthly household income for all SEM Groups (2024)

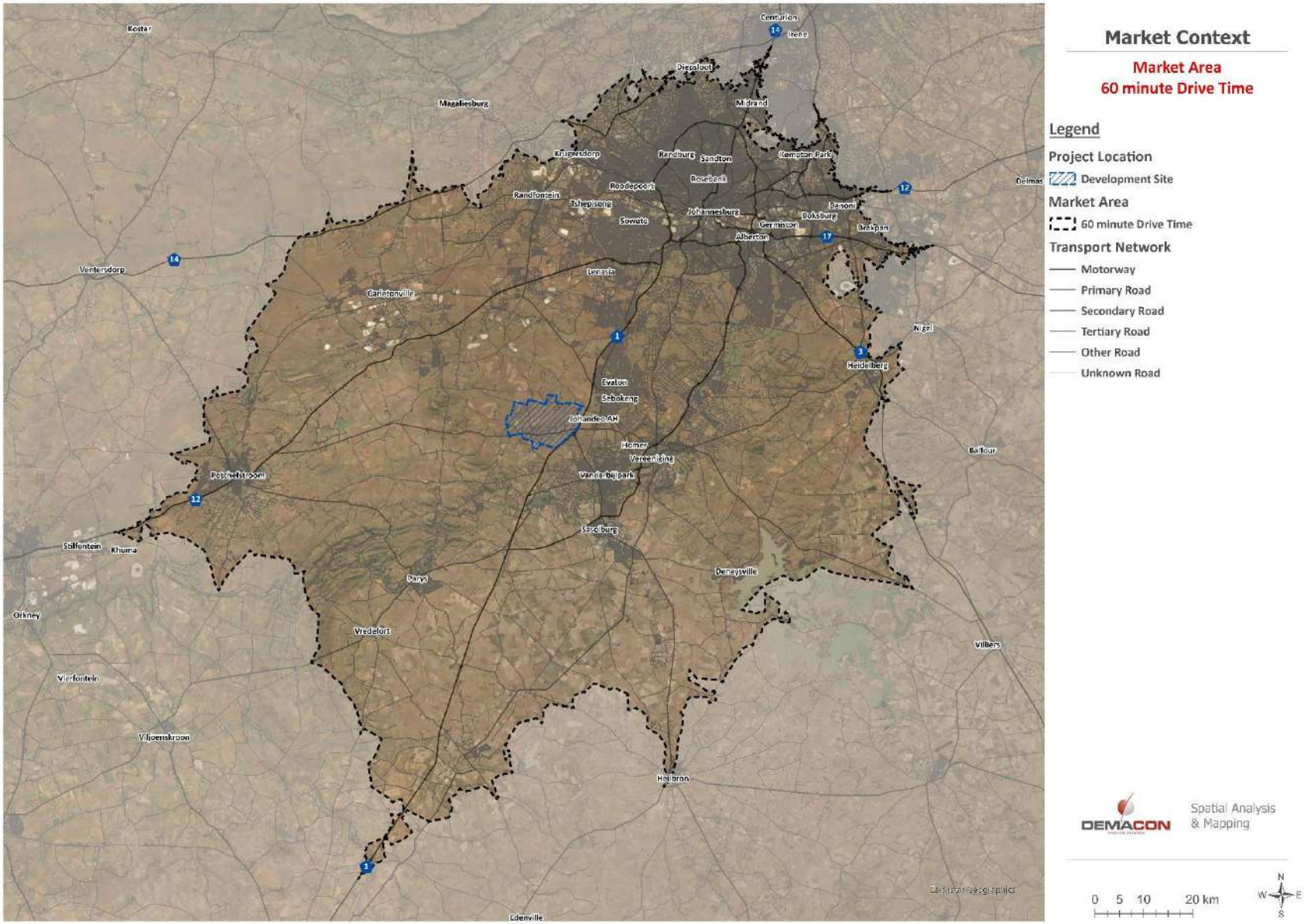
R17 908

Average monthly household income for SEM Groups 2+ (2024)

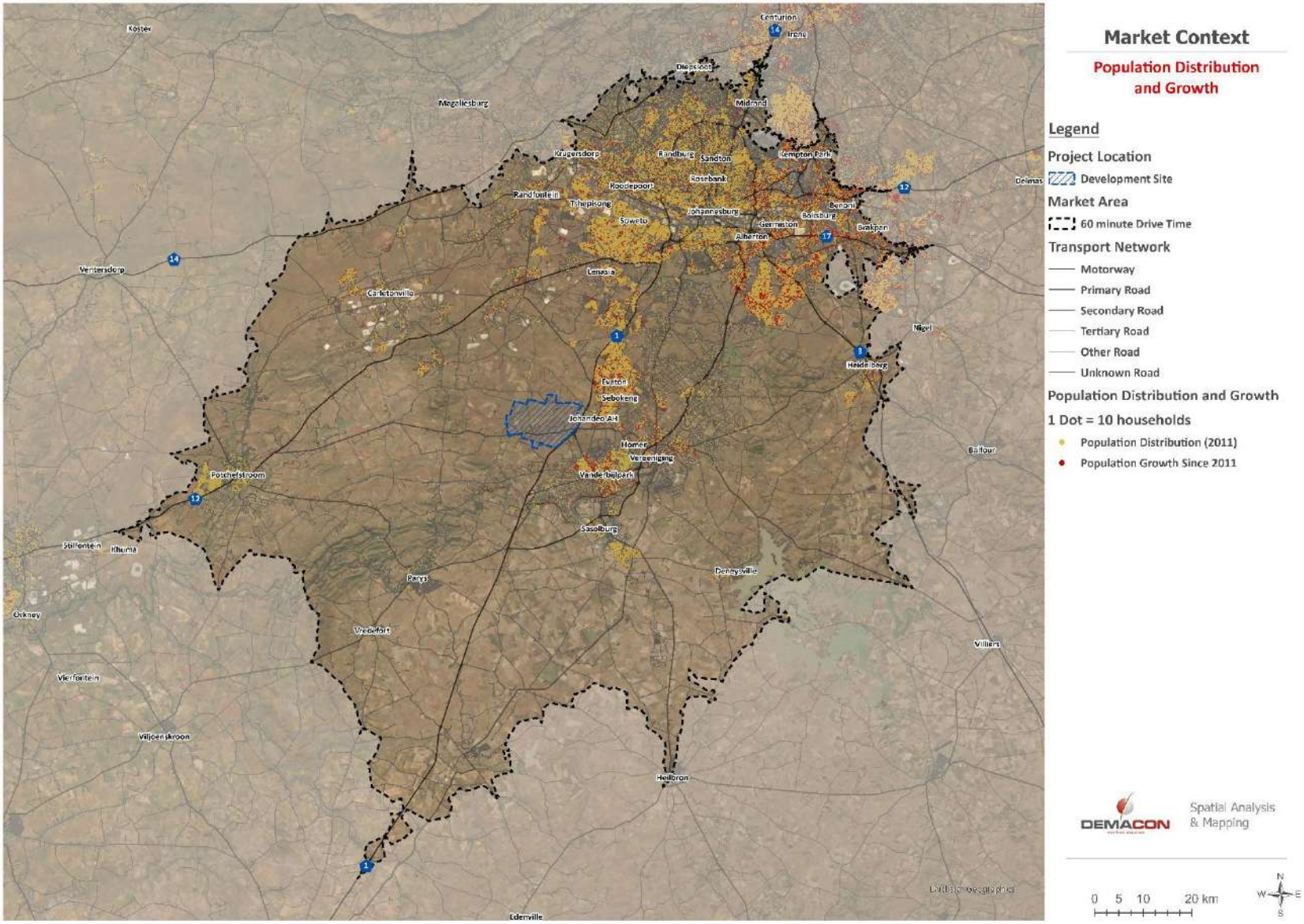
R40 744



Map 4.7: 60 Minute Drive Time Demographic Analysis



Map 4.8: 60 Minute Drive Time Demographic Analysis – Population Distribution



4.5 Gauteng City Region Demographic Analysis

Population Size

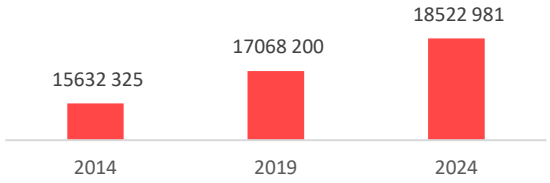
18 522 981 PEOPLE IN THE **PRIMARY** TRADE AREA

Population Average Annual **Growth Rate** **1.76%**

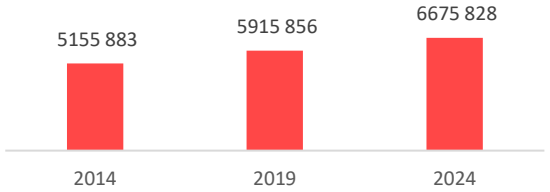
6 675 828 HOUSEHOLDS

Household Average Annual **Growth Rate** **2.74%**

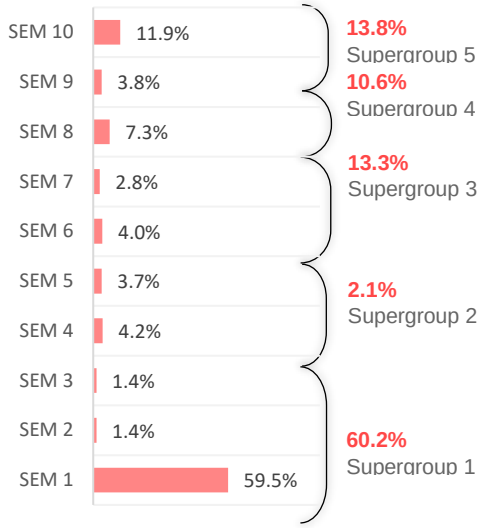
Population Growth



Household Growth



Socio-Economic Monitor



Population Group

Black African	79.6%
Coloured	2.5%
Indian / Asian	1.6%
White	16.4%

Migration Profile

Data indicates that 11.4% of people migrated to the receiving environment since 2011

Household Income Profile

Average annual household income for all SEM Groups (2024)

R140 383

Average annual household income for SEM Groups 2+ (2024)

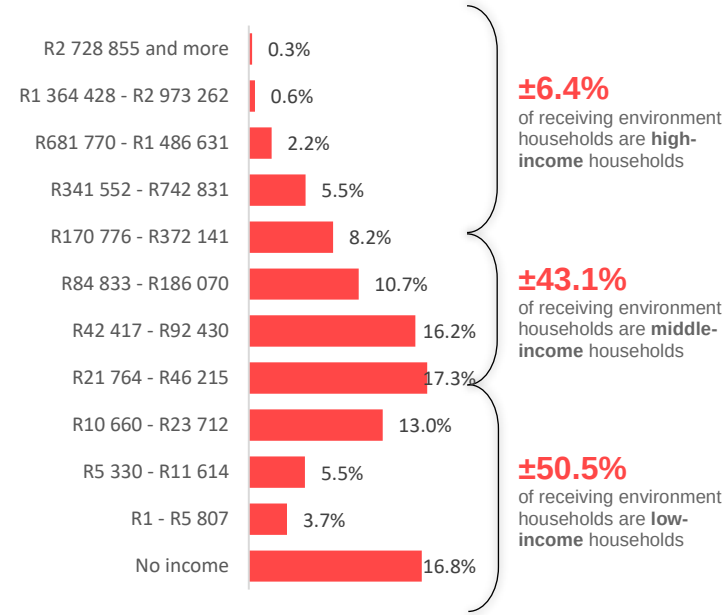
R366 213

Average monthly household income for all SEM Groups (2024)

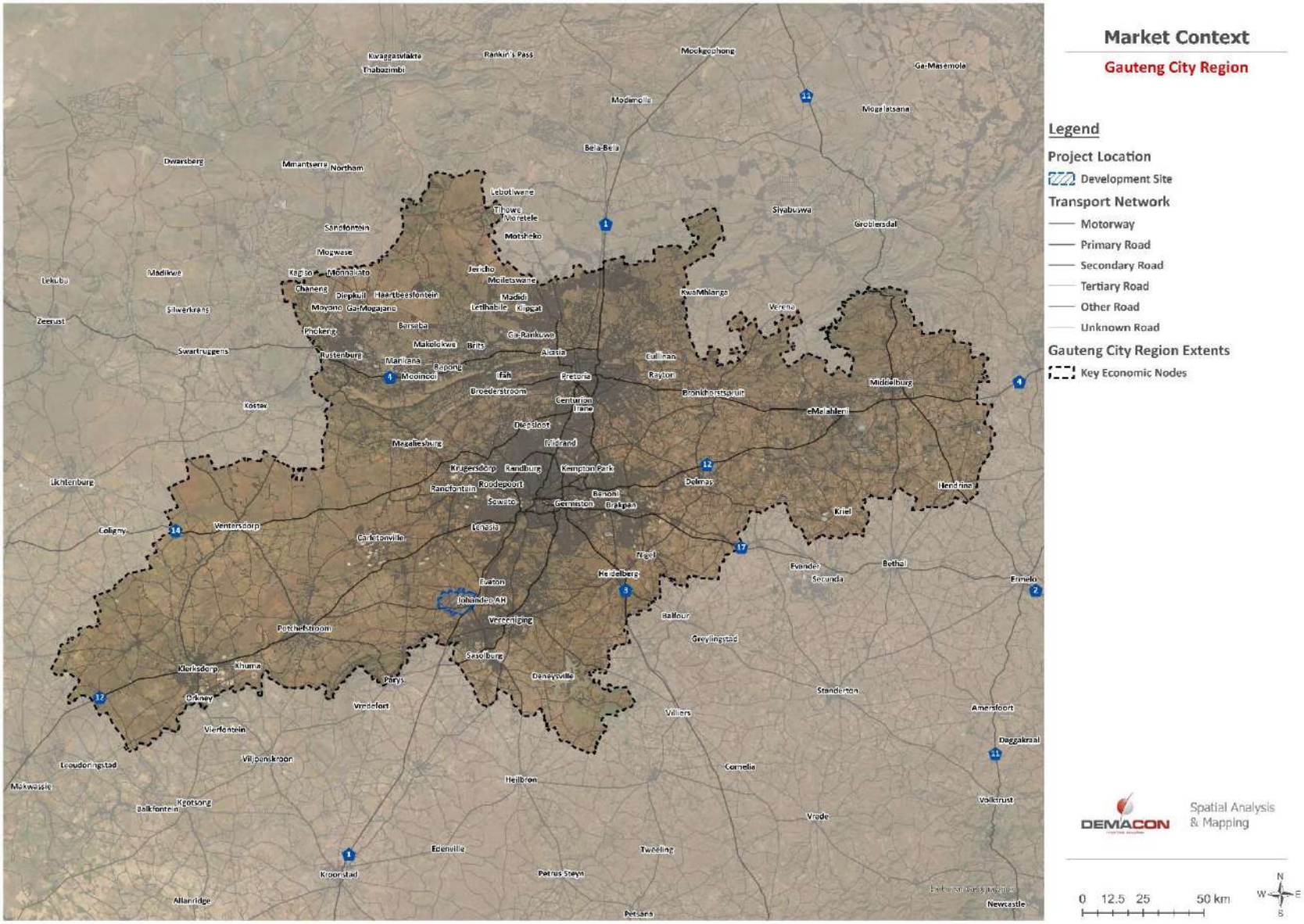
R11 699

Average monthly household income for SEM Groups 2+ (2024)

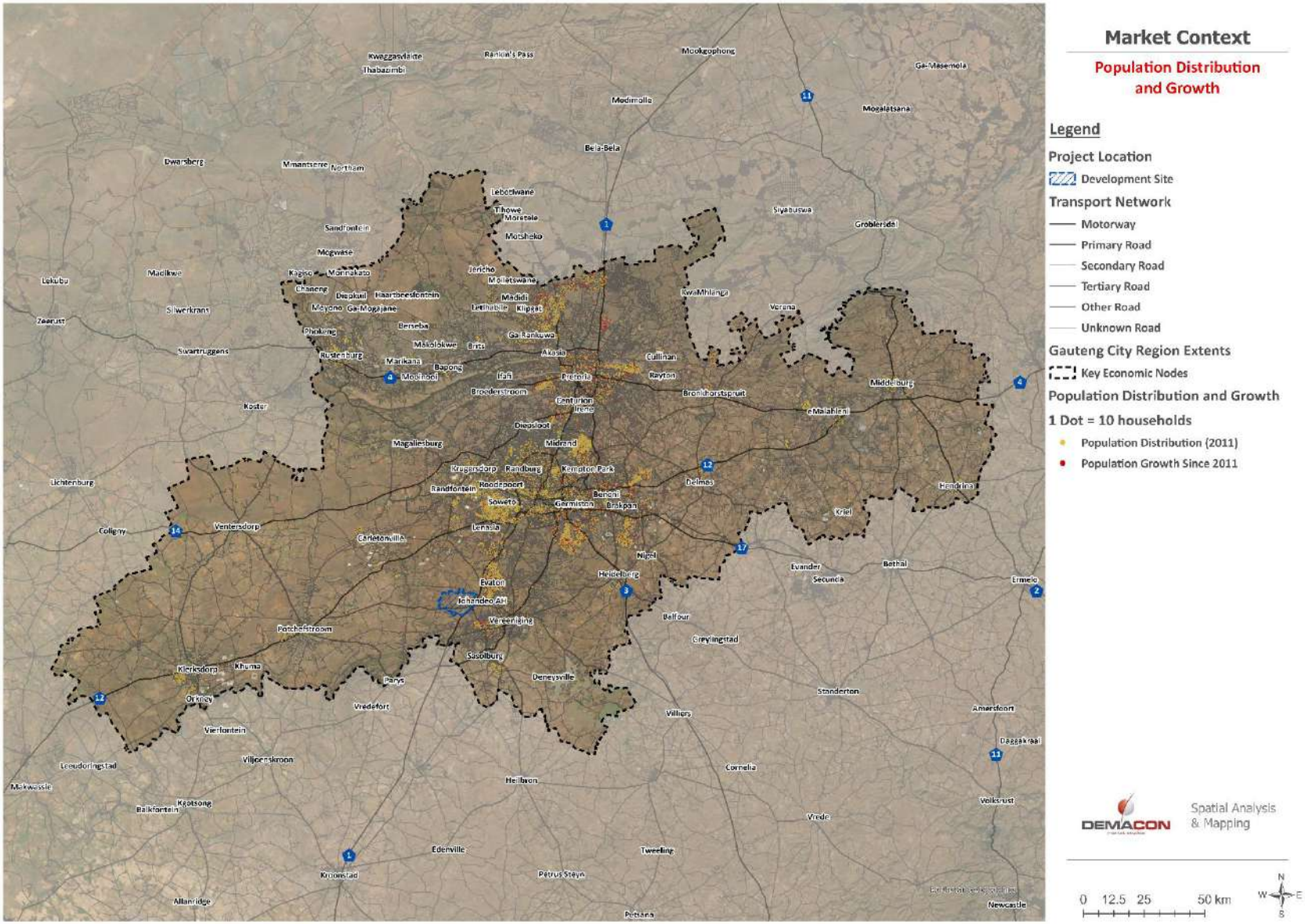
R30 518



Map 4.9: Gauteng City Region Demographic Analysis



Map 4.10: Gauteng City Region Population Distribution



AIRPORT ECONOMICS AND DEVELOPMENT TRENDS

5

5 AIRPORT ECONOMICS & DEVELOPMENT TRENDS

5.1 INTRODUCTION

The purpose of this chapter is to provide greater insight into the **key aspects of airport economics**. The chapter will provide a brief overview of key airport economic aspects together with a case study overview that will provide insight into the dynamics associated with airport development.

The chapter will include a high-level assessment of the potential for an airport development at the Vaal Aerotropolis site based on socio-economic parameter and an economic production function. It should be noted that this is only a preliminary assumption, and further investigation will be required to determine potential and feasibility.

5.2 INTRODUCTION TO AIRPORT ECONOMICS

5.2.1 INTRODUCTION

Airports are a valuable economic commodity that generates a variety of economic and social benefits. Airports cities develop over longer periods of time and requires pro-active planning to ensure sustainable and optimal airport-centric development. As such, it is vital to understand which land uses and economic clusters are deemed most suitable and beneficial given the role and function of an airport.

The term airport economics essentially refers to the economic dynamics and benefits associated with the presence of an airport on its hosting economy and community. The objective of this chapter is to provide some insight into the key dynamics associated with airports to ultimately understand which land use activities are most compatible and contribute to the highest economic impact.

5.2.2 AIRPORT LAND USE AND ECONOMIC CLUSTERS

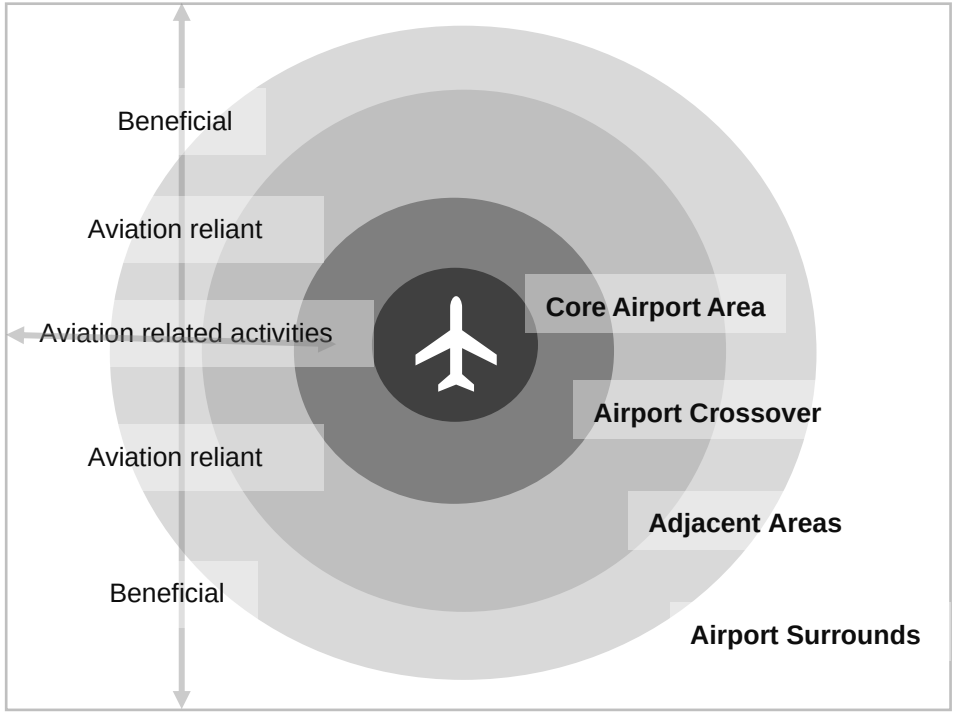
Airports and their immediate environs typically accommodate a mix of activities either directly related to aviation, activities reliant on the airport and activities that fulfil a complementary function to the aviation industry.

To understand the land use profile and related dynamics associated with airports, they are typically divided into four functional areas:

- **The core airport area** – includes runways, airside operations and passenger terminals
- **The airport crossover area** – includes land still on airport property although not necessarily directly related to the operations of the aircraft and flights
- **Areas adjacent to the airport** – referred to as the off-airport area which typically accommodates activities serving the airport or activities that are reliant to easy access to the airport.
- **Airport surrounds** – includes areas still within proximity to the airport but not on airport property and further from the core airport area itself.

As such, airports are typically associated with various economic clusters. The presence of these economic clusters is determined by the size, function and maturity of the airport and the combination of clusters may vary for different airports. Subsequent sections provide an overview of typical airport land uses and economic clusters.

AIRPORTS AND LAND USE PROFILE



The land use profile of airports and their surrounds are mixed-use in nature and fulfil different functions. Activities within the core airport area are usually dominated by uses that are directly related on aviation and the core function of the airport. This includes the runways, airside activities and passenger terminals. Activities just beyond the core of the airport typically include uses that are reliant on the aviation industry and consist largely of transportation related functions, food preparation and cargo handling.

Areas adjacent to the core airport area and crossover area, typically boasts activities that still rely on access to the aviation industry although direct runway access is not essential. Surrounding environment typically accommodate activities that still benefit from being within proximity to an airport.

Table 5.1: Typical Land Use Profile

Core Airport Area **(0 to 5 Minutes)** 	• Aviation related businesses • Cargo related businesses • Import & export agents • Fast-cycle logistics • ICT repair • Aerospace • Hospitality • Ground handling and catering • Maintenance, repair and overhaul of aircraft
Airport Crossover Area **(5 to 10 Minutes)** 	• Retail • Services • Short-stay accommodation • Conferencing and exhibition • Tourism and culture
Areas Adjacent to Airport **(10 to 15 Minutes)** 	• Logistics and distribution • Advanced manufacturing • Manufacturing • Food manufacturing • Professional services • Import & export agents • Warehousing • Logistics • Air cargo • Freight forwarding • Courier • Distribution • Transportation consultants
Airport Surrounds **(15+ Minutes)** 	• Professional services • Community services • Research & skills development • Artisan training • Trade and exhibition • Other manufacturing • Office space.

AIRPORTS AND ECONOMIC CLUSTERS

Airports and their surrounds are typically integrated with a variety of economic clusters. The presence of these economic clusters will depend on the function of the airport, its location within the greater context, the size of the airports as well as its age and the maturity of the urban fabric.

The subsequent diagram reflects the economic clusters most frequently associated with airport environments followed by Table 5.2

Table which provides a brief overview of the respective clusters.

Diagram 5.1: Economic Clusters and Airport Environments

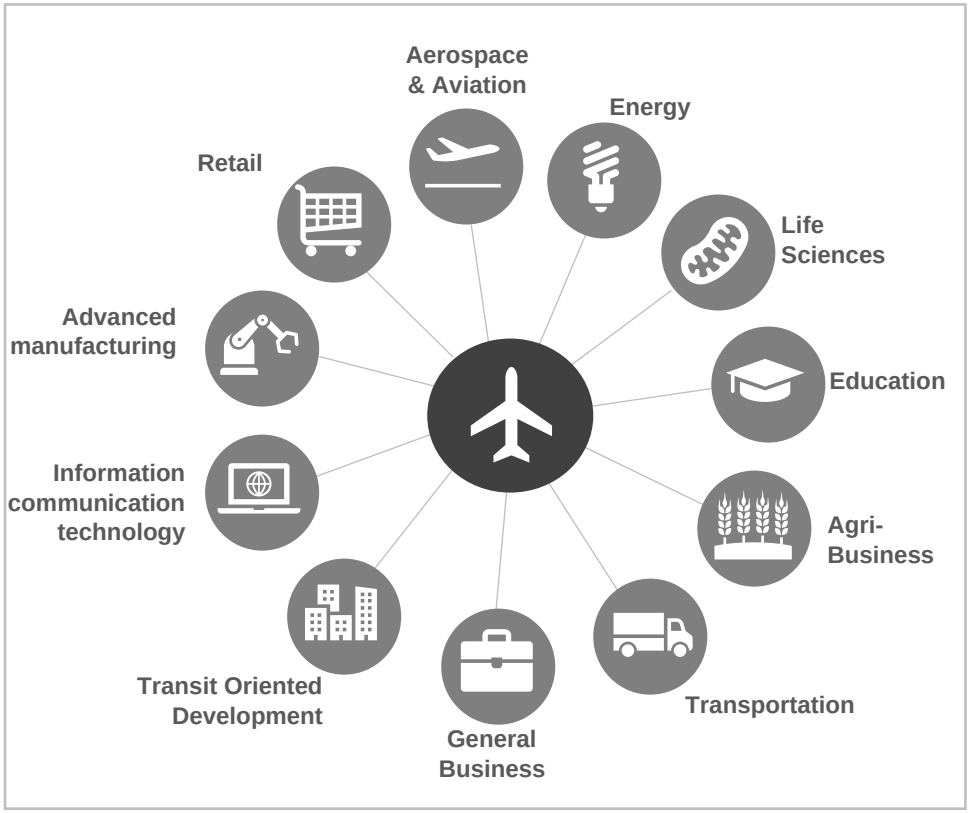


Table 5.2: Economic Clusters and the Airport Environment

Economic Cluster	Description
Aerospace & Aviation	• Research, development, design and manufacturing of aeronautical and aviation based goods
Energy	• Research, development, design and manufacturing of goods for the oil and gas and renewable energy industry
Life Sciences	• The study of living organisms, connected to agriculture, industrial bio-tech, medicine, pharmaceutical and food sciences
Education	• Post-secondary institutions and skills training based towards economic clusters present in the aerotropolis
Agri-Business	• Based around agriculture production, food processing, sales, manufacturing of related machinery and research and development
Transportation	• Transportation, logistics and distribution – focuses on the multi-modal movement and storage of goods between point and origin and consumers
General Business	• Companies and businesses that do not fall under the other economic clusters and provides supplementary business service
Transit Oriented Development	• Higher density development, typically made up of office, retail and services based around transit stations
Information Communication Technology	• Integration of communication, high-tech, software, manufacturing of tech based goods and storage of data
Advanced Manufacturing	• The use of new and advanced technologies that create efficiencies in the manufacturing process and improve the end-product
Retail	• Shopping, food and beverage, services for the local population and employees in the area.

5.2.3 Benefits And Economic Impacts Associated With Airports

Airports offer a great variety major economic and social impact to its hosting community and economy. The greater airport environment hosts a vibrant mix of land use activities which offer a multitude of opportunities. Airports and their operations have the ability to:

- Attract significant investment
- Enhance tourism
- Diversify the economy
- Creates employment opportunities – direct, indirect and induced
- Creates a tax base
- Aviation boasts high occupancy rates, more than road and rail transport
- Improved efficiency of supply chains
- Catalyst for innovation
- Facilitates world trad
- Ability to serve a large market
- Encourages densification and intensification.

The subsequent table provides a detailed overview of the economic impacts associated with airports. The table also reflects the various role-players and the associated impacts generated.

Table 5.3: Economic Impact of Airports & Their Environment

Direct Economic Impacts
Airlines • Passenger carriers • Air cargo carriers • Airline ticketing • General aviation
Airport & services • Civil airports • General aviation airports • Handling and catering • Freight services • Aircraft maintenance • Fuelling on site • Retail
Air Navigation • Service providers
Aerospace • Engines • Frames • Equipment • Off-site maintenance
Indirect/Induced Economic Impacts
Suppliers • Off-site fuel suppliers • Food and beverages • Construction
Manufacturing • Computer / electronics • Retail goods
Business services • Call centres • Accountants • Lawyers • Banks • Computer software
Induced • Food and beverages • Recreation and leisure • Transport • Clothing • Household goods
Catalytic Impacts
• Trade • Tourism • Location / investment • Labour supply • Productivity / market efficiency • Consumer welfare/social • Congestion/environmental

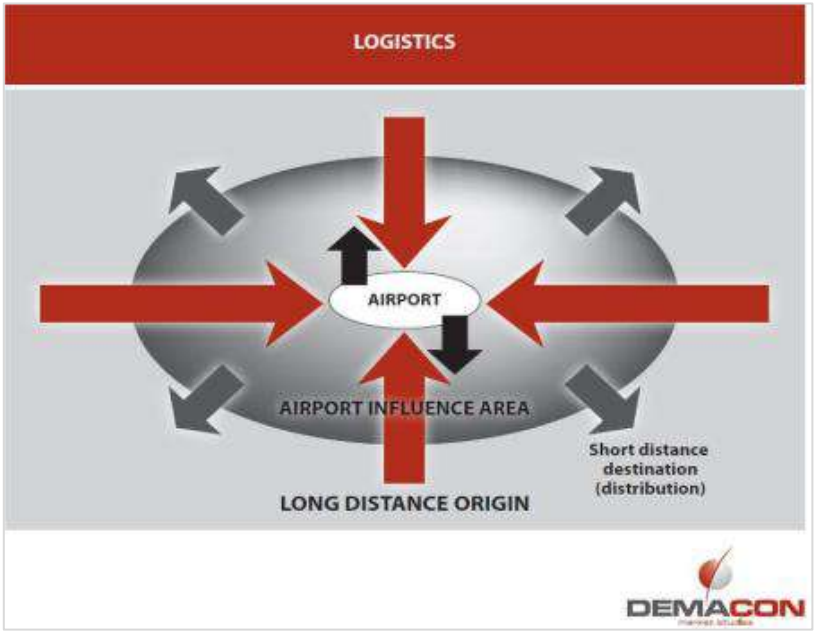
5.3 Airports And Logistics

Airports hold a direct benefit for distribution companies as it facilitates greater regional and global reach of products. A significant proportion of activity on airport grounds and its surrounds are dedicated to cargo and freight operations which includes logistics, transportation and warehousing. This sector has also experience exceptional growth in recent years given the rise of e-commerce.

Although the demand for air freight is limited by cost, which is typically 4 to 5 times that of road transport and 12 to 16 times that of sea transport, the commodities shipped by air are those that have high value per unit density. Air freight constitutes 35 per cent of world trade by value.

The subsequent diagram reflects the dynamic that exists between the logistics sector and airports. Airports are valuable importers and exporters of goods, and the immediate influence area is therefore invaluable for the distribution and logistics sector. Airports fulfil an invaluable role in the logistics field and offer strategic opportunities for warehousing and distribution companies.

Diagram 5.2: Logistics and Airport Dynamics



Aviation's speed and reliability has contributed to the market for same-day and next day delivery services and transportation of urgent or time-sensitive goods, giving it an advantage over other modes of transport.

Global e-commerce sales amounted to USD25.3 trillion in 2015. Active e-commerce development has a significant impact on air transport demand as e-commerce transitions depend fundamentally on the speed of air transport which connects manufacturers and retailers to the world's cities and regions. Around 90 per cent of business to consumer (B2C) e-commerce parcels are currently carried by air

Given the cost of air cargo services, this shipping method is typically reserved for higher value goods These include:

- **Perishable goods** – fresh produce, cut flowers, fresh fish, pharmaceuticals
- **High-value goods** – electronics, precision manufactured goods, pharmaceuticals (not sensitive to temperature), medical devices, jewellery, diamonds etc.
- **Time sensitive goods** – commodities involved in just-in-time manufacturing processes, replacement parts and other goods with urgent customer requirements.

Typical logistics sector activities found in airport environments include:]

- Fast-cycle logistics
- Cargo handling
- Freight forwarding
- Courier companies
- Import and export agents
- Warehousing.

5.4 List Of Busiest Airports In Africa Handling Cargo

The annual Africa airport traffic report 2021 released by Airports Council International (ACI) Africa showed that 2.15 million metric tons of cargo transited through African airports. During the period under review, cargo traffic growth increased by 11.6 per cent compared to 2020.

ACI Africa noted that JKIA handled 363 204 tons of cargo in 2021, leading other airlines in the continent in total cargo traffic.

The annual Africa airport traffic report 2021 released by Airports Council International (ACI) Africa on Monday, August 8, 2022, showed that **2.15 million metric tons of cargo transited through African airports**. This represented around 1.7 per cent of the global cargo volume.

During the period under review, cargo traffic growth increased by 11.6% compared to 2020. This came after airlines resumed operations following the devastating COVID-19 pandemic that had led to the grounding of planes.

The ten busiest cargo airports in Africa are:

Table 5.4: Busiest Cargo Airports in Africa

Airport	Location	Cargo
1. Jomo Kenyatta International Airport	Kenia	363 204 tonnes
2. Cairo International Airport	Egypt	333 536 tonnes
3. O R Tambo International Airport	South Africa	304 018 tonnes
4. Addis Ababa Bole International Airport	Ethiopia	226 417 tonnes
5. Murtala Muhammed Airport Two	Nigeria	204 649 tonnes
6. Entebbe International Airport	Uganda	65 115 tonnes
7. Aeroport Mohammed V	Morocco	64 373 tonnes
8. Kotoka International Airport	Ghana	46 699 tonnes
9. Blaise Diagne International Airport	Senegal	37 225 tonnes
10. Cape Town International Airport	South Africa	

From the table above it can be observed that 2 of the busiest cargo airports in Africa is situated in South Africa – O R Tambo International Airport and Cape Town International Airport.

5.5 South Africa Intra-African Trade And Tariff Profile 2022[3]

TRADING ARRANGEMENTS

African Continental Free Trade Area

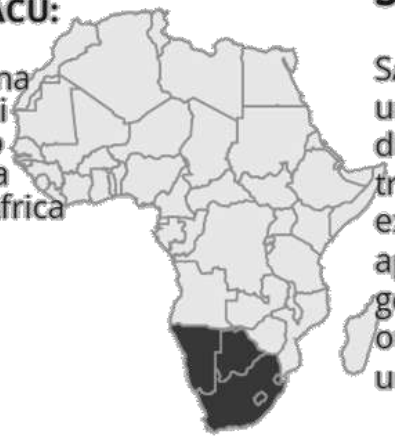
South Africa signed and ratified the AfCFTA Agreement. South Africa's tariff offer was adopted by the Assembly of the Heads of State and Government of the African Union (AU Assembly). South Africa submitted its Schedule of Specific Commitments in the five (5) priority services sectors (i.e. financial, tourism, business, communication & transport services) which is going through a verification process by the AfCFTA Secretariat.

Regional Economic Communities

South Africa is a member of the Southern African Customs Union (SACU) and the Southern African Development Community (SADC).

Members of the SACU:

Botswana
Eswatini
Lesotho
Namibia
South Africa



SACU

SACU is a customs union with a duty-free intra-SACU trade and a common external tariff (CET) applicable to all goods coming from outside the customs union.

Members of the SADC FTA:

✔ Botswana
Eswatini
Lesotho
Madagascar
Malawi
Mauritius
Mozambique
Namibia
Seychelles
South Africa
Tanzania
Zambia
Zimbabwe

✘ Comoros
DRC
Angola

SADC

SADC has 16 Member States including all the SACU countries, Angola, the Democratic Republic of Congo (DRC), Comoros, Madagascar, Malawi, Mauritius, Mozambique, Seychelles, Tanzania, Zambia and Zimbabwe. 13 SADC Member States are part of the SADC FTA. Comoros and DRC are yet to join the SADC FTA. Angola has submitted its tariff offer to join the SADC FTA.

[3] Intra-Africa trade by REC: 2021 update - tralac trade law centre

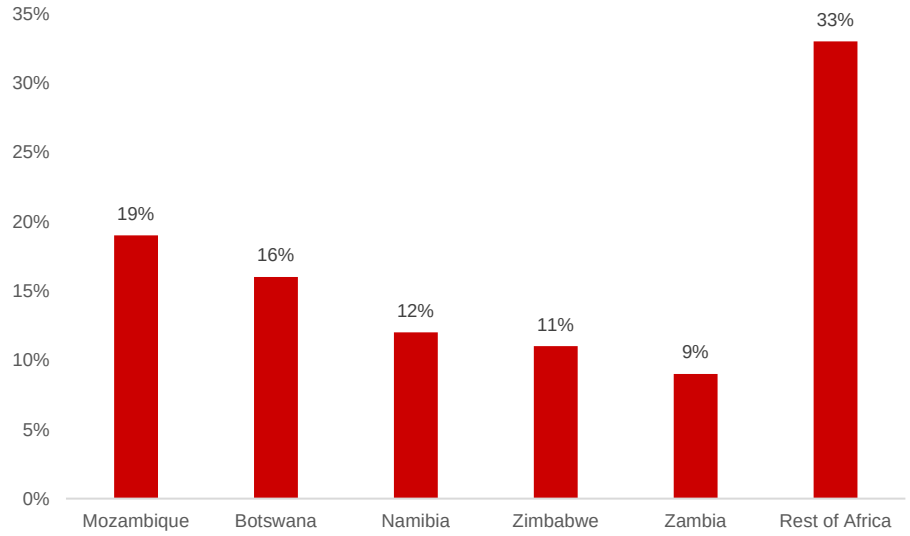
5.5.1 INTRA-AFRICAN TRADE

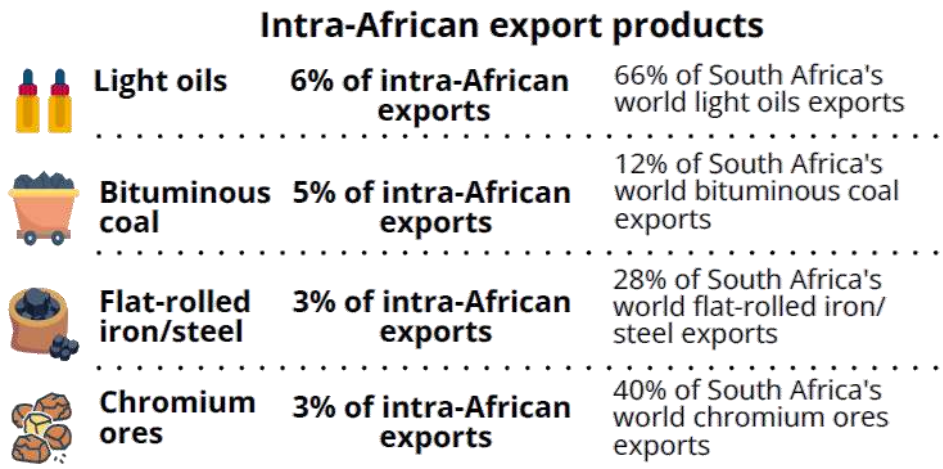
In 2022, South Africa's intra-African merchandise trade was valued at approximately US$40 billion, accounting for only 17% of the country's total merchandise trade. South Africa's intra-African merchandise trade increased by 13% between 2021 and 2022. Mozambique, Botswana, Namibia and Zimbabwe are South Africa's main trading partners in Africa. These four countries account for 51% of South Africa's intra-African merchandise trade. South Africa's main intra-African trading partners are SACU and SADC members, expect for Nigeria.

5.5.2 INTRA-AFRICAN EXPORTS

For 2022, the value of South Africa's intra-African exports totalled US30 billion, accounting for 24% of South Africa's total exports. Between 2021 and 2022, South Africa's intra-African exports increased by 14%. South Africa's main intra-African exports are light oils, bituminous coal, ferro-chromium, chromium ores, electrical energy, goods vehicles and non-agglomerated iron ores. Mozambique, Botswana, Namibia, Zimbabwe and Zambia are the main destination markets for South Africa's intra-African exports, importing 67% of South Africa's intra-African exports.

Figure 5.2: Main Destinations

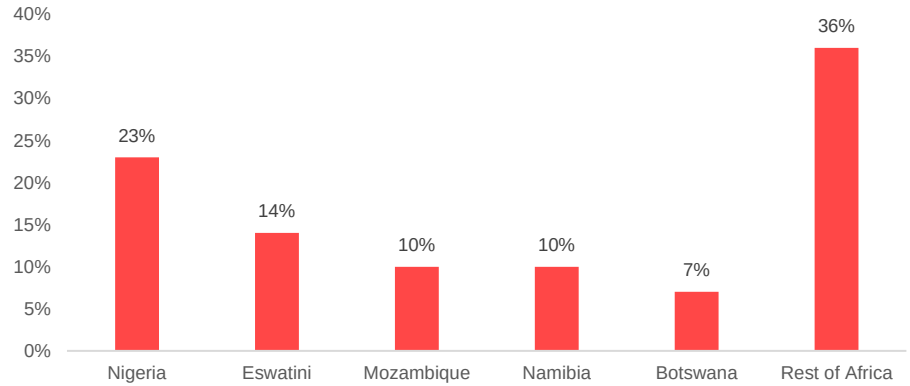


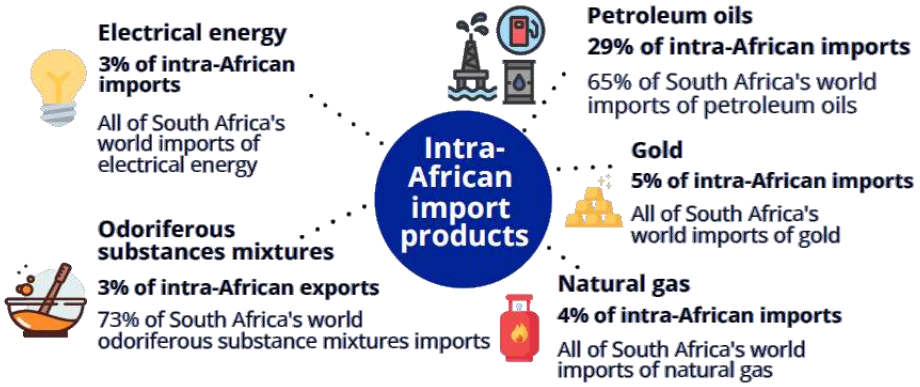


5.5.3 INTRA-AFRICAN IMPORTS

The value of South Africa's intra-African imports in 2022 was about US$10 billion, accounting for only 9% of the country's total imports. Sout Africa's intra-African imports surged by 7% between 2021 and 2022. The main intra-African imports for South Africa include petroleum oils, gold, natural gas, mixtures of odoriferous substances, electrical energy and non-industrial diamonds. The bulk (64%) of South Africa's intra-African imports are sourced from Nigeria, Eswatini, Mozambique, Namibia and Botswana.

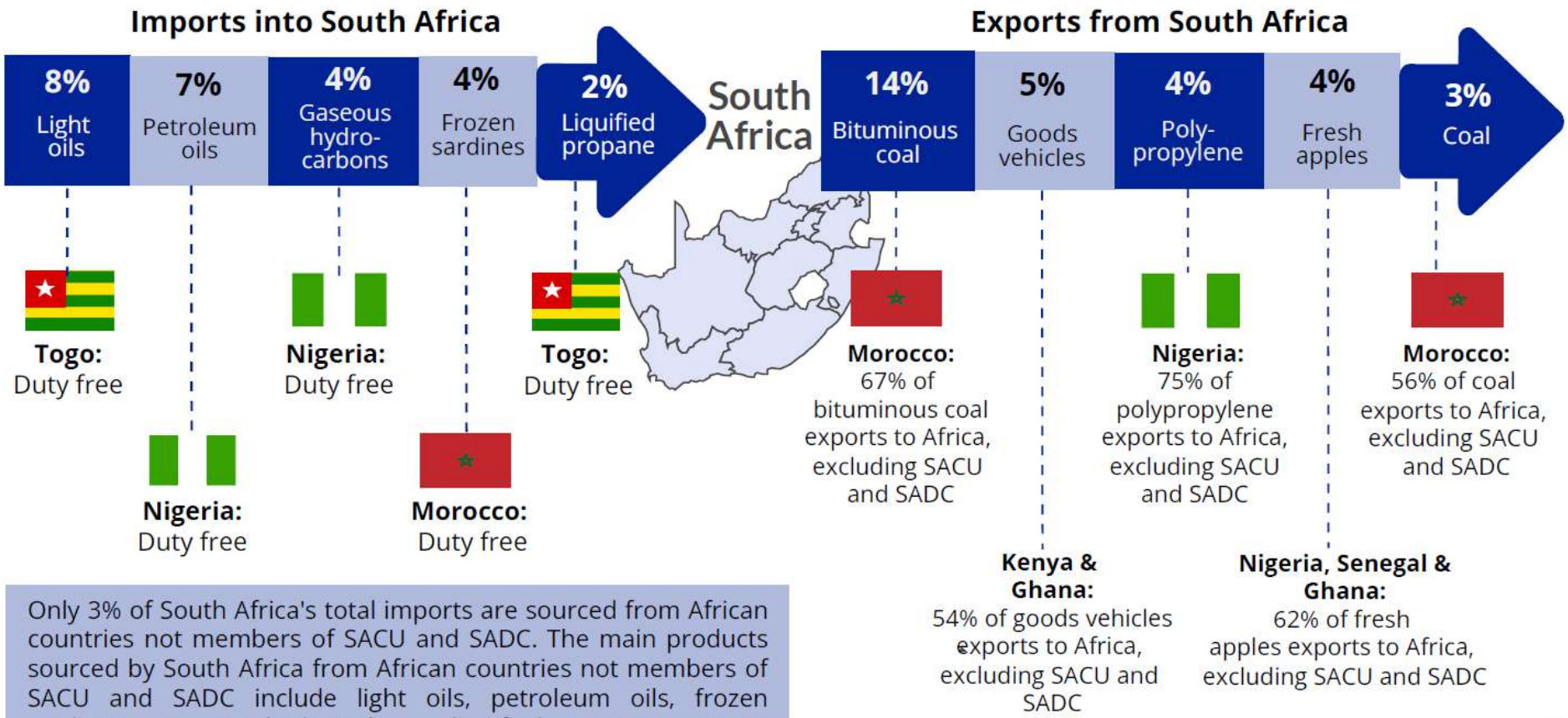
Figure 5.3: Main Source Markets





5.5.4 Trade With African Countries Outside SACU And SADC

In 2022, 16% of South Africa's intra-African merchandise trade and 3% of South Africa's total merchandise trade was with African countries that are not members of SACU and SADC. 42% of South Africa's merchandise trade with African countries outside SACU and SADC is with Nigeria, and 9% is with Kenya. Ghana and Morocco account for 8% (each) of South Africa's trade with African countries not members of SACU and SADC. 34% of South Africa's intra-African imports were sourced from African countries outside SACU and SADC. The main imports products sourced by South Africa from African countries not members of SACU and SADC include light oils, petroleum oils, gaseous hydrocarbons, frozen sardines and liquified propane. 11% of South Africa's intra-African exports were exported to African countries outside SACU and SADC.

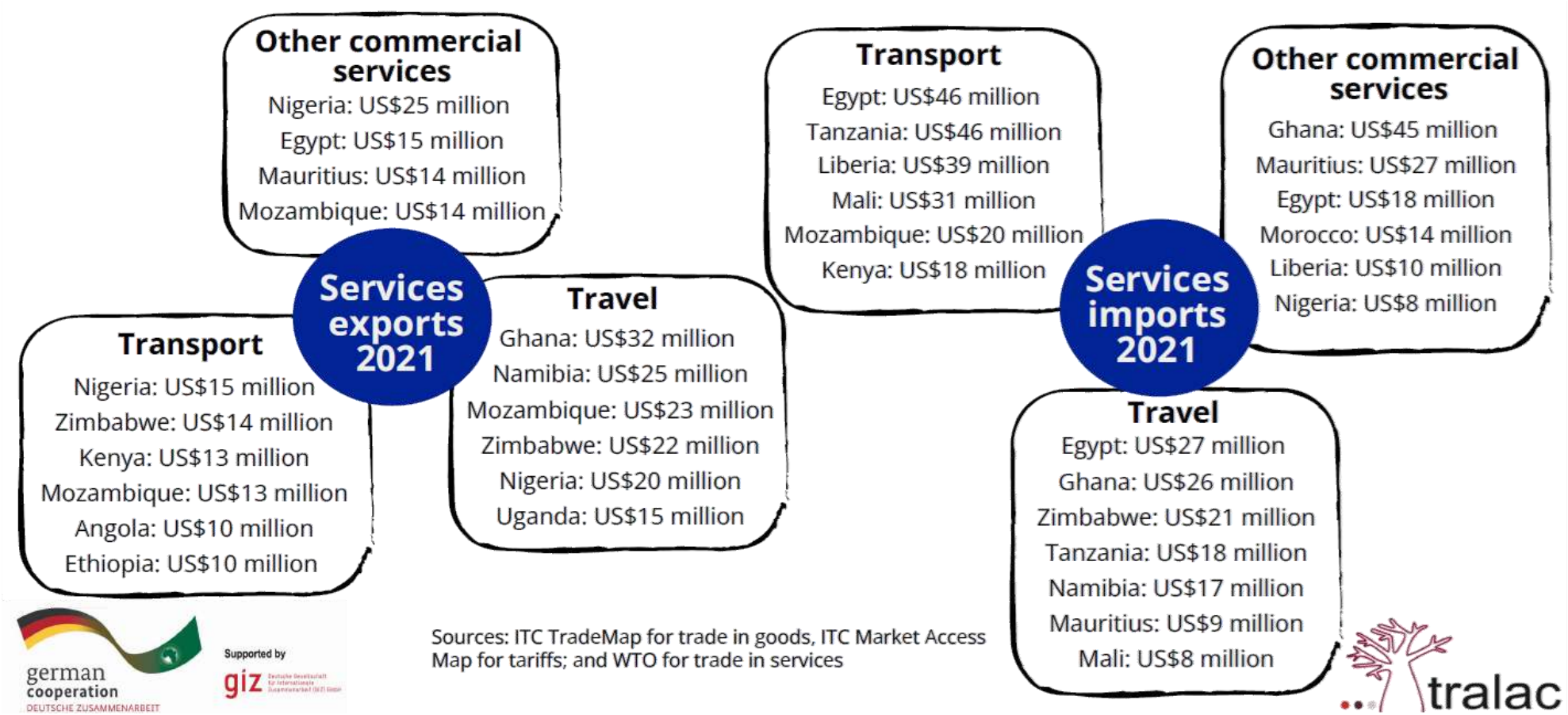


Only 3% of South Africa's total imports are sourced from African countries not members of SACU and SADC. The main products sourced by South Africa from African countries not members of SACU and SADC include light oils, petroleum oils, frozen sardines, gaseous hydrocarbons, liquified propane, copper waste and scrap and anhydrous ammonia. The products from African countries not members of SACU and SADC into South Africa face MFN-applied tariffs, which is the SACU CET. Most of the top 20 products imported by South Africa from African countries not members of SACU and SADC are imported duty free. However, glass bottles or flasks imports into South Africa face a 10% duty. Imports of disodium carbonate are levied a 5.5% duty in South Africa. Imports of light oils are imported duty free or levied a duty of 0.183c per litre in South Africa.

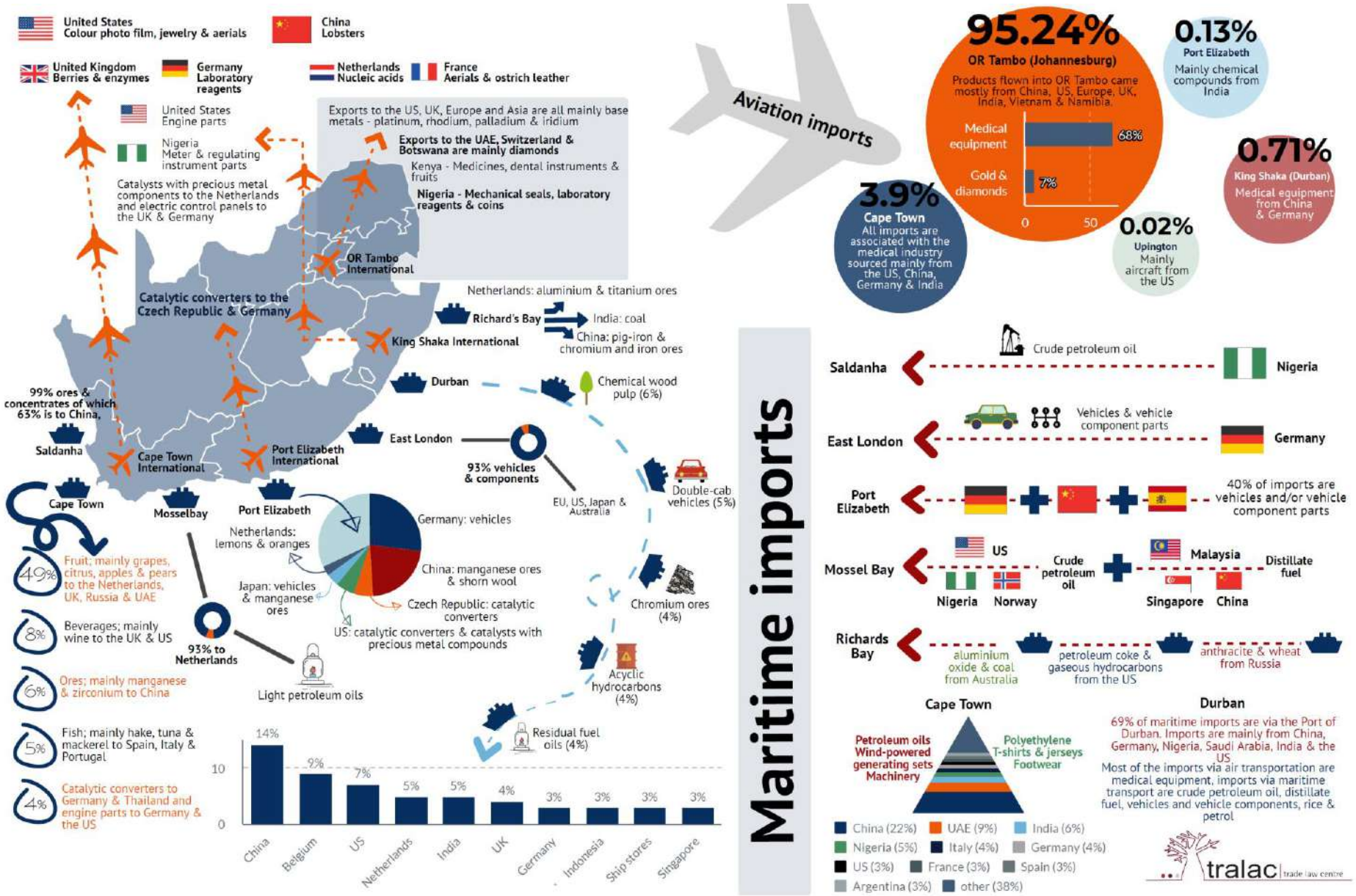
In 2022, only 3% of South Africa's total exports were destined for African countries not members of SACU and SADC. South Africa mainly exports bituminous coal, goods vehicles, poly-propylene, fresh apples, coal, and semi-finished iron or non-alloy steel to African countries that are not members of SACU and SADC. Kenya is the main destination market for South African exports to African countries outside SACU and SADC. Kenya imported 17% of South Africa's exports outside SACU and SADC, followed by Nigeria (15%), Ghana and Morocco (13% each), and Senegal (5%) and Cote d'Ivoire (4%).

5.5.5 INTRA-AFRICAN TRADE IN SERVICES

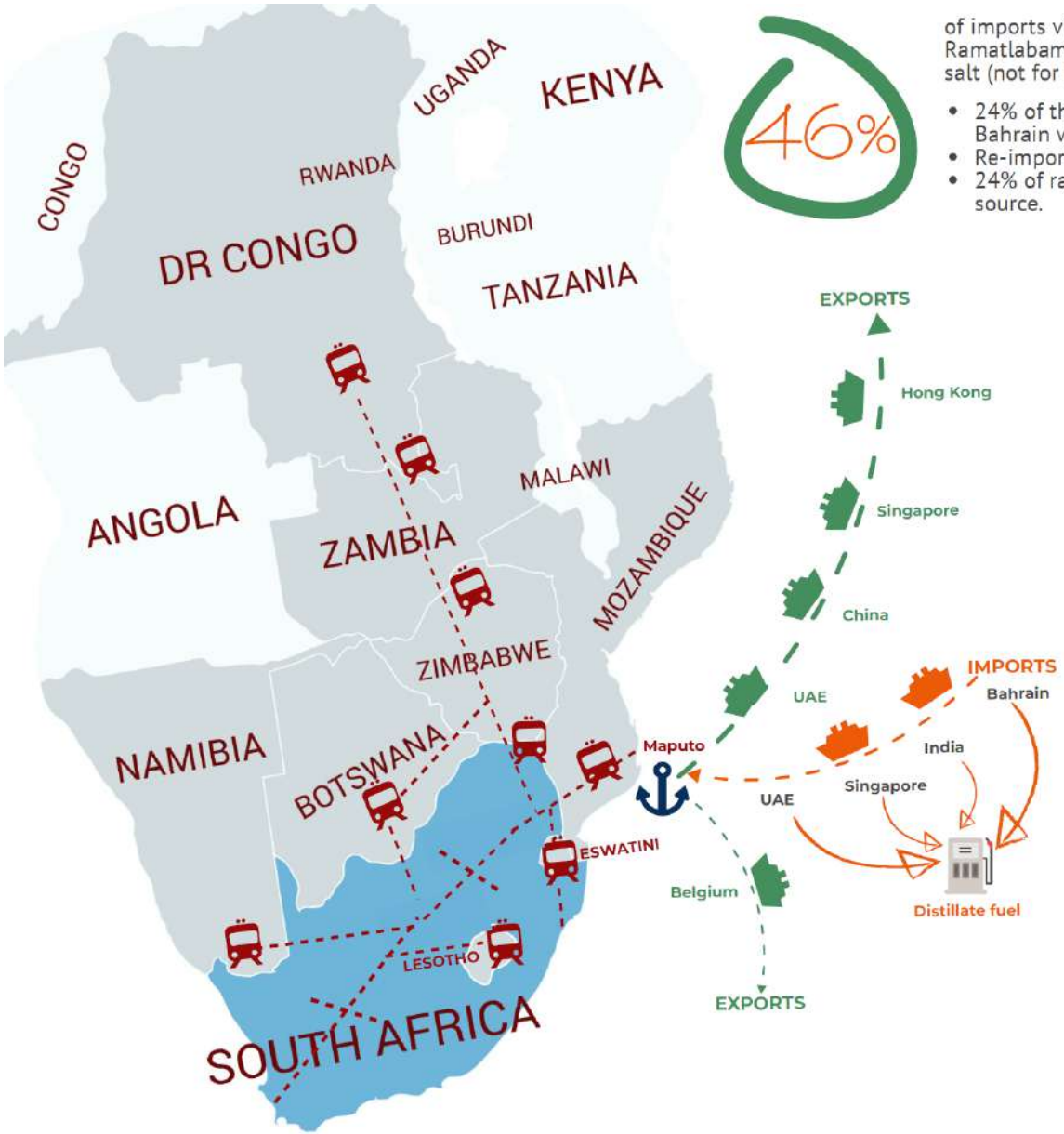
The WTO-OECD Balanced Trade in Services Dataset (BaTiS) is an experimental dataset that contains a complete, consistent and balanced matrix of international trade in services. Statistics cover the period 2005-2021, for over 200 reporters and partners, and 12 EBOPS 2010 categories in addition to total services.



5.5.6 SOUTH AFRICA'S TRANSPORT ROUTES: AIR AND MARITIME TRADE



5.5.7 SOUTH AFRICA'S TRANSPORT ROUTES: RAIL



46%

of imports via rail transportation are from Botswana through the Ramatlabama border post and are mainly imports of dissodium carbonate, salt (not for human consumption) & coal.

- 24% of the imports are distillate fuel from the UAE, Singapore, India & Bahrain which enter South Africa via Mozambique
- Re-imports of diesel locomotives also re-enter South Africa via Beitbridge
- 24% of rail imports are ships' derricks which entered from an unspecified source.

88% of South Africa's rail exports cross into Mozambique and more than half of these exports are shipped to Asia and Belgium. Exports via the Port of Maputo to China are iron ores, chromium ores & ferro-chromium. Exports to Singapore are iron ores, to Hong Kong chromium ores, to Belgium ferro-chromium and to the UAE also chromium ores and ferro-chromium.

The bulk of intra-Africa rail exports are to neighbouring countries Namibia (Nakop/Narogas border), Botswana (Ramatlabama), Zimbabwe (Beitbrdige), Mozambique (Komatipoort/Lebombo), Eswatini (Golela) and Lesotho (Maseru Bridge). However, some products are transported further afield - fertiliser and sulphur destined for Zambia go via Zimbabwe, while fuel exported to DRC goes via Zimbabwe and Zambia. Wheat exports to Zimbabwe and Zambia travel via Ramatlabama (Botswana) to Zimbabwe and then Zambia.

39% of rail exports are ores & concentrates and 38% are iron & steel. Exports are mainly iron ores, chromium ores & ferro-chromium which cross into Mozambique at the Lebombo border post and are then shipped to destinations in Asia & Belgium via the Port of Maputo. Intra-Africa exports are mainly fuel, iron ores & sulphates. Refined sugar is also exported to Mozambique via rail link, also cement clinkers to Lesotho via Maseru Bridge and ammonia to Namibia via Nakop/Narogas.

tralac trade law centre

5.5.8 THE AGRIBUSINESS VALUE CHAIN IN AFRICA

WHICH

The agribusiness/agro-processing sector was chosen by the AfCFTA Secretariat as a priority sector for value chain development

WHY

This choice is based on the availability of source materials in Africa as well as the sector's labour intensity and potential to create jobs, including jobs for female workers

MAIN CHALLENGE

Agricultural production in Africa is low-productivity, except for the few countries with dominant commercial agricultural sectors

- The chart overleaf shows that the agribusiness value chain trade in Africa is dominated (71%) by flow between countries for which there is no FTA in place.
- All of Egypt's considerable value flows are not under free trade, nor are much of Nigeria's and Cote d'Ivoire's.
- This implies considerable potential to expand and deepen agribusiness value chain flows with the expected liberalisation under the AfCFTA.
- South Africa is a 'hub' country and is by far the most important single player in the sector, and the most important exporter. Most of South Africa's and Tanzania's value flows traded under the SADC FTA.
- Egypt is more of an originator than an exporter of value.
- Tanzania is an important originator, with links to both SAD and non-SADC countries.

QUICK WINS

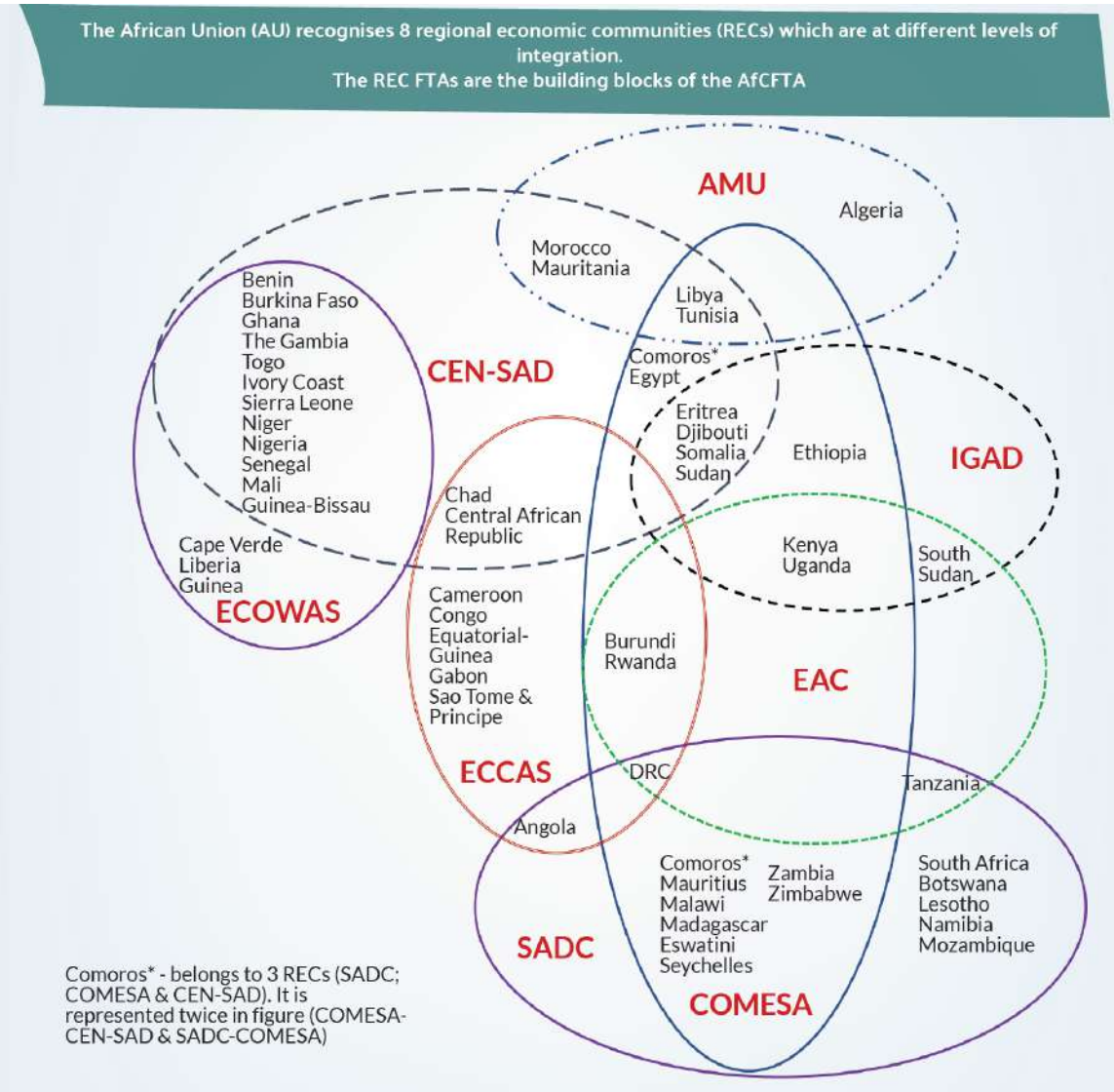
The 'quick wins' for further value chain development will between larger markets, such as between Nigeria and South Africa, Egypt and South Africa and Egypt and Tunisia

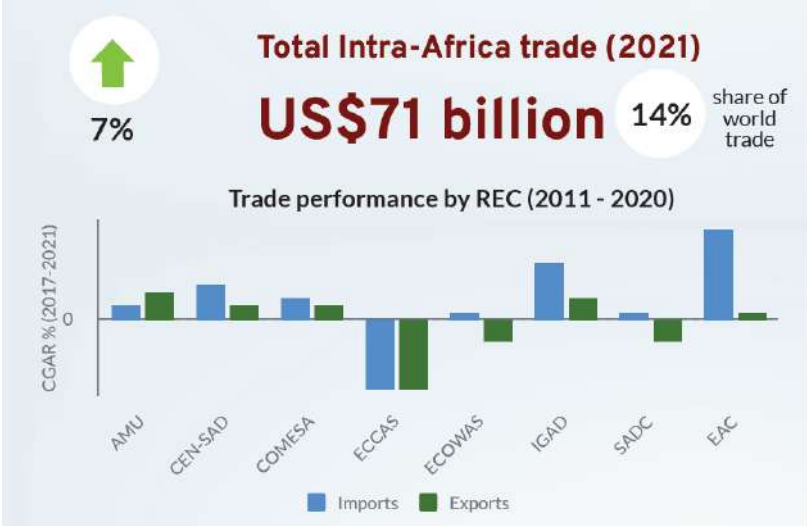
LONGER TERM

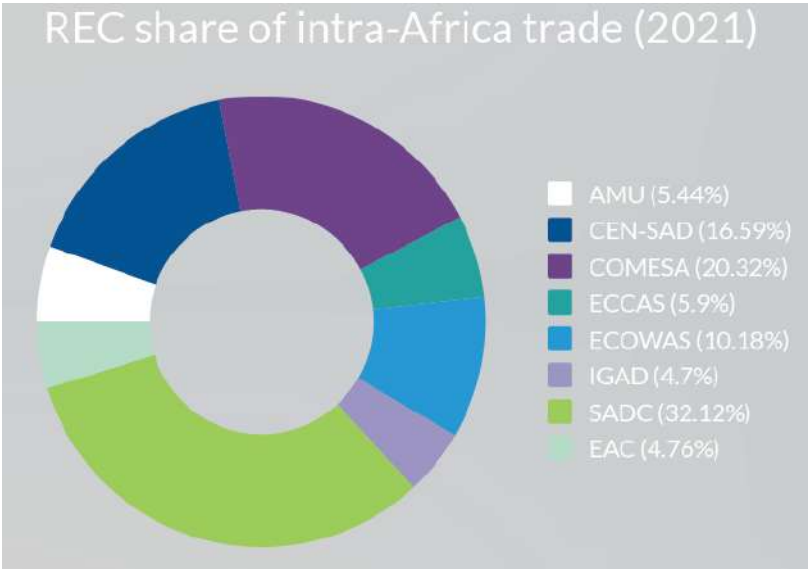
For value chain development to contribute to the upliftment of economies with weaker value chain connections, attention will need to be paid to country value chains among smaller countries, or between smaller countries and larger ones

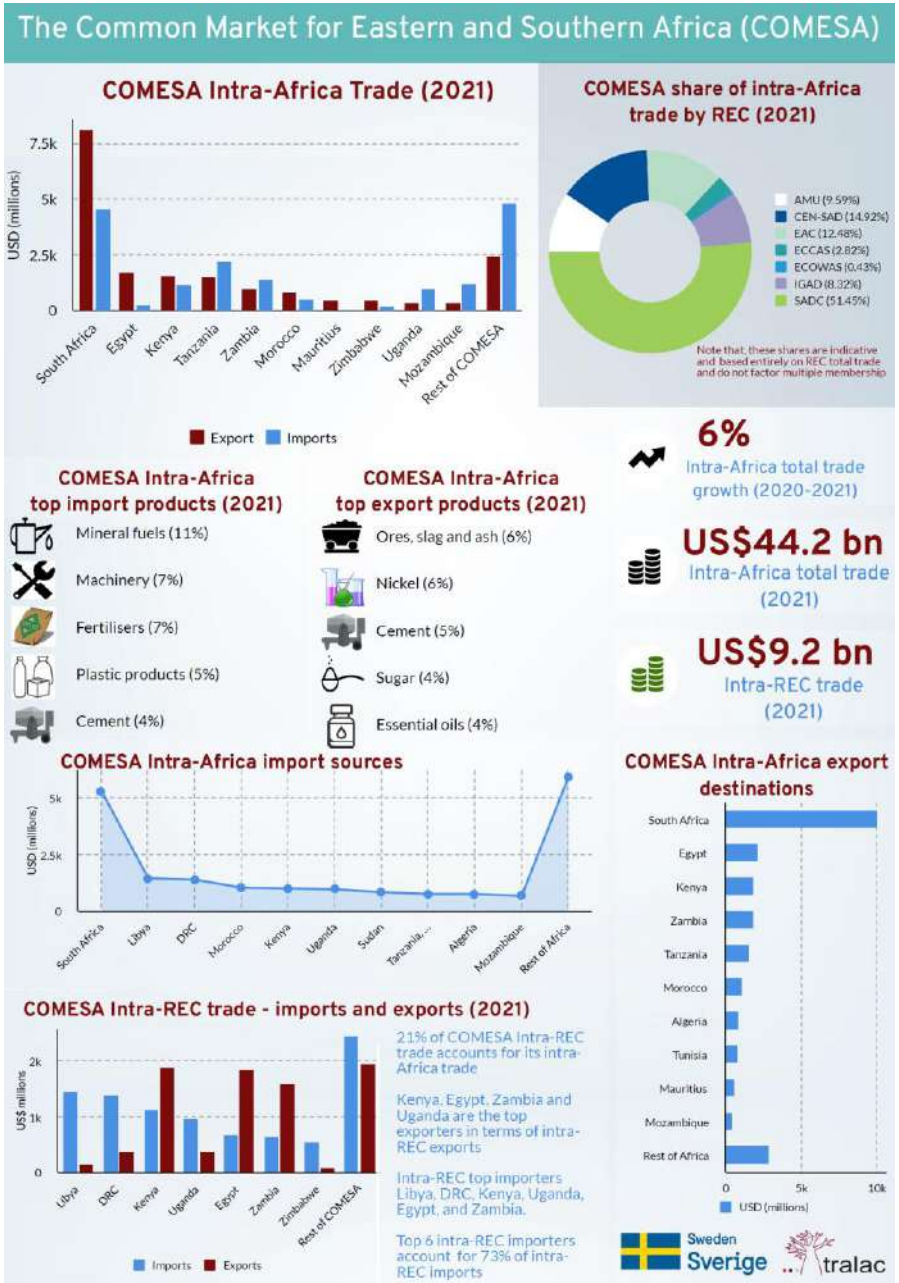
Diagram 5.4: Agri-business Value Chain Trade Flows, Africa to Africa flows by FTA, main flows only

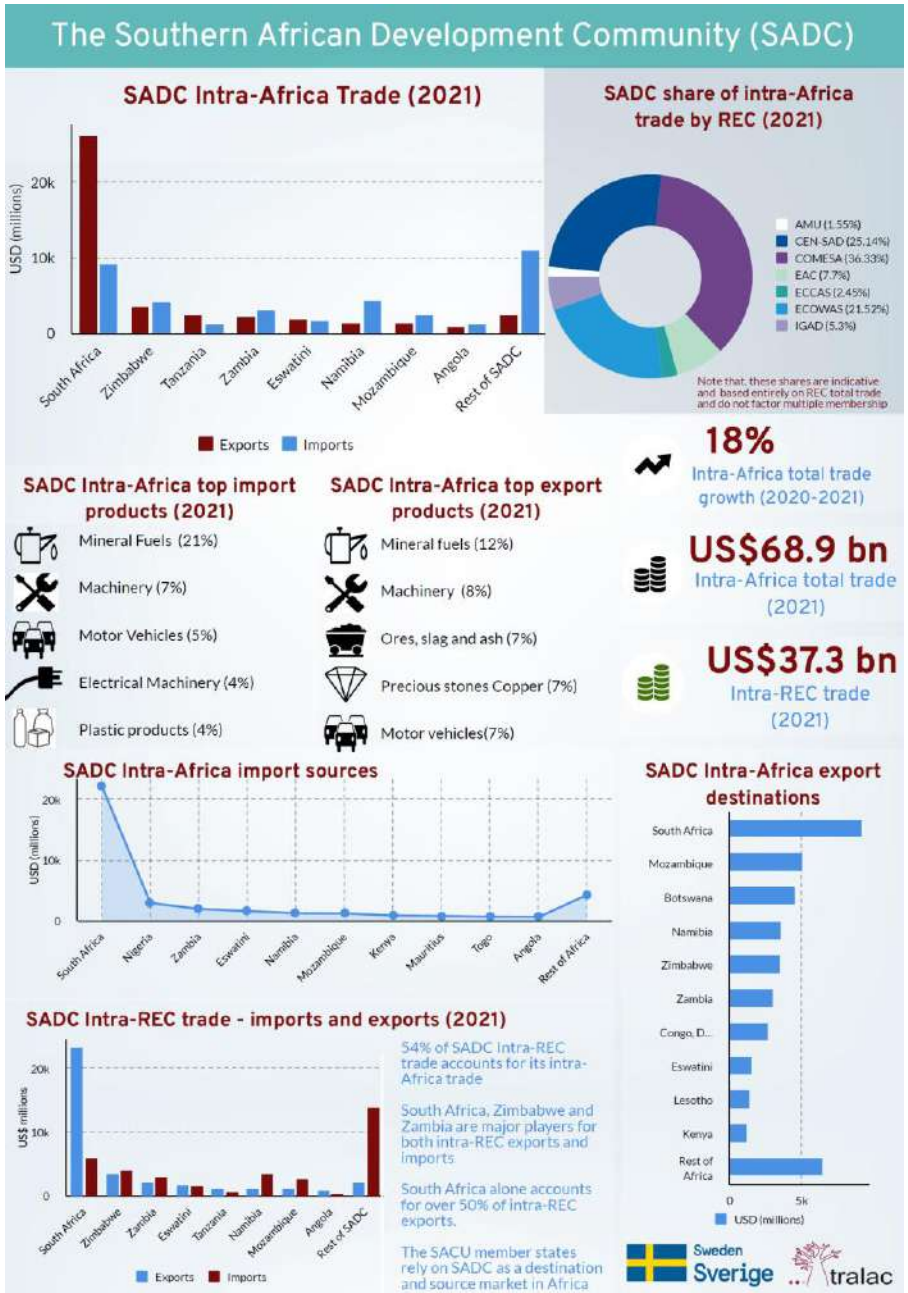
5.5.9 INTRA-AFRICA TRADE BY REGIONAL ECONOMIC COMMUNITIES, 2021








The Common Market for Eastern and Southern Africa (COMESA)
COMESA Intra-Africa Trade (2021)
USD (millions)
7.5k
5k
2.5k
0
South Africa
Egypt
Kenya
Tanzania
Zambia
Morocco
Mauritius
Zimbabwe
Uganda
Mozambique
Rest of COMESA
Export
Imports
COMESA share of intra-Africa trade by REC (2021)
AMU (9.59%)
CEN-SAD (14.92%)
EAC (12.48%)
ECCAS (2.82%)
ECOWAS (0.43%)
IGAD (8.32%)
SADC (51.45%)
Note that, these shares are indicative and based entirely on REC total trade and do not factor multiple membership
6%
Intra-Africa total trade growth (2020-2021)
US$44.2 bn
Intra-Africa total trade (2021)
US$9.2 bn
Intra-REC trade (2021)
COMESA Intra-Africa top import products (2021)
Mineral fuels (11%)
Machinery (7%)
Fertilisers (7%)
Plastic products (5%)
Cement (4%)
COMESA Intra-Africa top export products (2021)
Ores, slag and ash (6%)
Nickel (6%)
Cement (5%)
Sugar (4%)
Essential oils (4%)
COMESA Intra-Africa import sources
USD (millions)
5k
2.5k
0
South Africa
Libya
DRC
Morocco
Kenya
Uganda
Sudan
Tanzania...
Algeria
Mozambique
Rest of Africa
COMESA Intra-Africa export destinations
South Africa
Egypt
Kenya
Zambia
Tanzania
Morocco
Algeria
Tunisia
Mauritius
Mozambique
Rest of Africa
0
5k
10k
USD (millions)
COMESA Intra-REC trade - imports and exports (2021)
US$ millions
2k
1k
0
Libya
DRC
Kenya
Uganda
Egypt
Zambia
Zimbabwe
Rest of COMESA
Imports
Exports
21% of COMESA Intra-REC trade accounts for its intra-Africa trade
Kenya, Egypt, Zambia and Uganda are the top exporters in terms of intra-REC exports
Intra-REC top importers Libya, DRC, Kenya, Uganda, Egypt, and Zambia.
Top 6 intra-REC importers account for 73% of intra-REC imports
Sweden
Sverige
tralac


The Southern African Development Community (SADC)
SADC Intra-Africa Trade (2021)
USD (millions)
20k
10k
0
South Africa
Zimbabwe
Tanzania
Zambia
Eswatini
Namibia
Mozambique
Angola
Rest of SADC
Exports
Imports
SADC share of intra-Africa trade by REC (2021)
AMU (1.55%)
CEN-SAD (25.14%)
COMESA (36.33%)
EAC (7.7%)
ECCAS (2.45%)
ECOWAS (21.52%)
IGAD (5.3%)
Note that, these shares are indicative and based entirely on REC total trade and do not factor multiple membership
18%
Intra-Africa total trade growth (2020-2021)
US$68.9 bn
Intra-Africa total trade (2021)
US$37.3 bn
Intra-REC trade (2021)
SADC Intra-Africa top import products (2021)
Mineral Fuels (21%)
Machinery (7%)
Motor Vehicles (5%)
Electrical Machinery (4%)
Plastic products (4%)
SADC Intra-Africa top export products (2021)
Mineral fuels (12%)
Machinery (8%)
Ores, slag and ash (7%)
Precious stones Copper (7%)
Motor vehicles(7%)
SADC Intra-Africa import sources
USD (millions)
20k
10k
0
South Africa
Nigeria
Zambia
Eswatini
Namibia
Mozambique
Kenya
Mauritius
Togo
Angola
Rest of Africa
SADC Intra-Africa export destinations
South Africa
Mozambique
Botswana
Namibia
Zimbabwe
Zambia
Congo, D...
Eswatini
Lesotho
Kenya
Rest of Africa
0
5k
USD (millions)
SADC Intra-REC trade - imports and exports (2021)
US$ millions
20k
10k
0
South Africa
Zimbabwe
Zambia
Eswatini
Tanzania
Namibia
Mozambique
Angola
Rest of SADC
Exports
Imports
54% of SADC Intra-REC trade accounts for its intra-Africa trade
South Africa, Zimbabwe and Zambia are major players for both intra-REC exports and imports
South Africa alone accounts for over 50% of intra-REC exports.
The SACU member states rely on SADC as a destination and source market in Africa
Sweden
Sverige
tralac

5.6 Airports And Industrial Development

5.6.1 Airport Land Use Profile

Traditionally, property in the immediate vicinity of airports accommodated aeronautic activities in direct support of aviation activities of the airport. As economies evolved, land around airport became increasingly vital locations for commercial and industrial activities. As economies and cities grew more complex and dynamic, so has the demand and land use profiles of property near airports.

Land uses typically associated with airports in a modern day context include:

- Industrial including light manufacturing and warehousing
- Commercial
- Hotels
- Entertainment
- Conferencing and convention centres.

The mentioned mix of activities is driven by the need for international and local businesses to be located in environment with convenience, accessible office space together with the necessary, complementary facilities and activities including accommodation and entertainment.

Airports are set to become the new centres of future development in the form of aerotropolis. Aerotropolis is a new city layout in response to the needs of 21st century businesses. Generally, an aerotropolis refers to a fusion of airport and metropolitan where a city has at its centre, an airport development, just like the traditional CBD of cities. This layout encourages the moving of goods and people with minimum inconvenience and optimum efficiency. For businesses that rely on time-sensitive air freighting, operate as distribution centres, need warehousing or that have executives who travel frequently, having commercial premises close to an airport is a necessity.

5.6.2 Changing Demand

In recent years, industrial space around airports have transitioned to offer a greater variety of space options. In particular, the demand for larger warehousing space – often referred to as maxi-units – has emerged as a new driving force for industrial space demand. This demand for large warehousing space is driven primarily by the needs of logistics companies, in turn supported by retail and trade activities.

The South African economy has transformed in such a way that the moving of raw material is no longer the only driving force behind major logistic activities. There has been a greater demand for the distribution of manufactured goods which results in the increased demand for warehousing and logistics space.

Imports have come to play a greater role in the South African economy, accounting for 30% of GDP from 2008 to 2017, from 24% from 1996 to 1997. This has contributed to a growing demand for logistics and warehousing which continues to expand.

The demand for warehousing space is underpinned by the transpiration of perishables (food and beverages, specialised agricultural produce, flowers etc) that requires warehousing space in close proximity to airports and major transport routes. In addition, the popularity of online retailing also contributes significantly to the increased demand for warehousing space in strategic locations.

5.6.3 Warehousing And Distribution Space

Key design considerations for warehousing and distribution space include:

- Ease of access to major road networks and airports
- Exposure / high frontage associated with major transportation routes
- Large warehouse space (maxi-units) – especially for distribution and logistics use
- Modern space and finishing
- Energy efficient
    - Reduce water wastage
    - Optimise the use of natural light
    - Energy efficient lighting (Solar and LED installations)
- Hyperflat, hyper hard floors
- Internet connectivity – preferably fibre
- High ceilings to enable better cubic metre usage
- Covered loading areas
- Sprinkler systems
- Good security
- Larger yards with manoeuvring space for interlink
- Highway frontage allowing for outdoor marketing
- Small office component as part of the warehouse – typically a warehouse will accommodate an office component of 10% to 20% of total space

- High tech cold-storage facilities including frozen and super frozen storage offering long term and short term storage.

5.6.4 Appeal Of The Development Site For Industrial/Warehousing Development

The demands associated with the logistics sector has resulted in a high demand for well-located warehousing space with key influencing factors including the following:

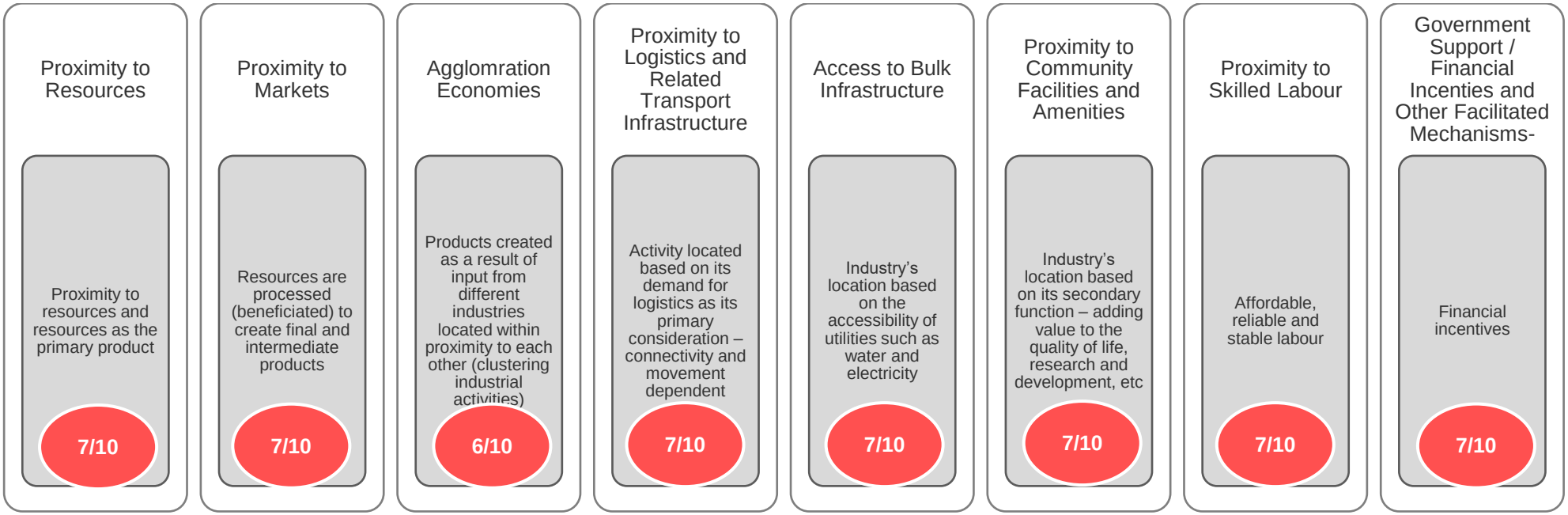
- Proximity to major consumption centres
- Access to global and local trade
- Changing demographics and increasing levels of value-added services enhanced by the importance of proximity to all spheres of the labour market – skilled and unskilled.
- Transport infrastructure
- Total cost to value as investors and tenants is increasingly considering total supply chain costs.

5.7 Industrial Location Factors

Industrial location factors consider the location of industrial activity based on several factors that allow industrial activity to exist, operate and sustain itself. The industrial location factors are important in the sense that the proposed development will hinge on manufacturing. The environment enabling such a developmental activity should be conducive to industrial related manufacturing or logistics.

The following indicates industrial location factors were considered.

Industrial Location Factors



5.8 Components Of A Successful Cluster

Components of a successful cluster focus on the availability of the key components that allow clusters to be successful, sustainable and able to drive economic growth. The components of a successful cluster are important because the availability and access to clusters provide forward and backward linkages to suppliers of targeted industries and consumers of target industry products. Clusters also speak to agglomerating economies therefore the presence of industry clusters within a local or regional economy indicate that economic functions are agglomerating.

The following components are required for a successful cluster.

Diagram 5.6: Component of a Successful Cluster

Core Firms	Specialised Support	Soft Infrastructure	Hard Infrastructure
• Businesses of an industry that drive a cluster development and typically source inputs and other elements for the development of products and services sold or exported. These core firms are typically associated with an industry or economic sector	• Businesses that directly or indirectly support core firms, i.e. these businesses provide inputs and intermediate products and services throughout the value chain of a core firm.	• Businesses that provide services and support functions to core firms and specialised support businesses, these typically include skills developers such as educational institutions and training academies, R&D development firms, financial services, insurance services, etc.	• Physical infrastructure such as bulk services (electricity, water, sanitation, etc.) and transportation and related infrastructure (roads, railways, airports, etc.)

5.9 Innovative Industrial Development Trends[4]

Innovative industrial development is driven by the following aspects:

❖ ARTIFICIAL INTELLIGENCE (AI)

AI describes computers that can "think" like humans. They can recognize complex patterns, process information, draw conclusions, and make recommendations. AI is used in many ways, from spotting patterns in huge piles of unstructured data to powering the autocorrect on your phone.

❖ WEB3

Web3 is the third iteration of the internet. Web1 allowed people to access and read information on websites, like Yahoo. In Web2, blogs, wikis, and social media like Twitter and YouTube got introduced, giving people more control over the information they created and shared. In Web3, the decentralized world puts ownership into the hands of the community. Web3 comprises blockchain technology, cryptocurrencies, and token-based economics, like NFTs.

❖ BLOCKCHAIN

Blockchain is a secure, decentralized, and transparent way of recording and sharing data, with no need to rely on third-party intermediaries. The digital currency Bitcoin is the best known blockchain application. However, the technology can be used in other ways, including making supply chains traceable, securing sensitive medical data anonymously, and combating voter fraud.

❖ FASTER COMPUTER PROCESSING

New computational technologies are making computers smarter. They enable computers to process vast amounts of data faster than ever before, while the advent of the cloud has allowed businesses to safely store and access their information from anywhere with internet access. Quantum computing technologies now in development will eventually make computers millions of times more powerful. These computers will have the potential to supercharge AI, create highly complex data models in seconds, and speed up the discovery of new materials.

[4] What Is the Fourth Industrial Revolution? | Salesforce

❖ VIRTUAL REALITY (VR) AND AUGMENTED REALITY (AR)

What's the difference? VR offers immersive digital experiences (using a VR headset) that simulate the real world, while augmented reality (AR) merges the digital and physical worlds. Examples include L'Oréal's AI-powered virtual try-on tool, which allows users to digitally experiment with makeup products before buying them, and the Google Translate phone app, which allows users to scan and instantly translate street signs, menus, and other text.

❖ BIOTECHNOLOGY

Biotechnology harnesses cellular and biomolecular processes to develop new technologies and products for a range of uses, including developing new pharmaceuticals and materials, more efficient industrial manufacturing processes, and cleaner, more efficient energy sources. Researchers in Stockholm, for example, are working on what is being touted as the strongest biomaterial ever produced.

❖ ROBOTICS

Robotics refers to the design, manufacture, and use of robots for personal and commercial use. While we're yet to see robot assistants in every home, technological advances have made robots increasingly complex and sophisticated. They are used in fields as wide-ranging as manufacturing, health and safety, and human assistance.

❖ THE INTERNET OF THINGS

The IoT describes everyday items — from medical wearables that monitor users' physical condition, to cars and tracking devices inserted into parcels — connected to the internet and identifiable by other devices. A big plus for businesses is they can collect customer data from constantly connected products, allowing them to better gauge how customers use products and tailor marketing campaigns accordingly. There are also many industrial applications, such as farmers putting IoT sensors into fields to monitor soil attributes and inform decisions such as when to fertilize.

❖ 3D PRINTING

3D printing allows manufacturing businesses to print their own parts, with less tooling, at a lower cost, and faster than via traditional processes. Plus, designs can be customized to ensure a perfect fit.

❖ AND MORE

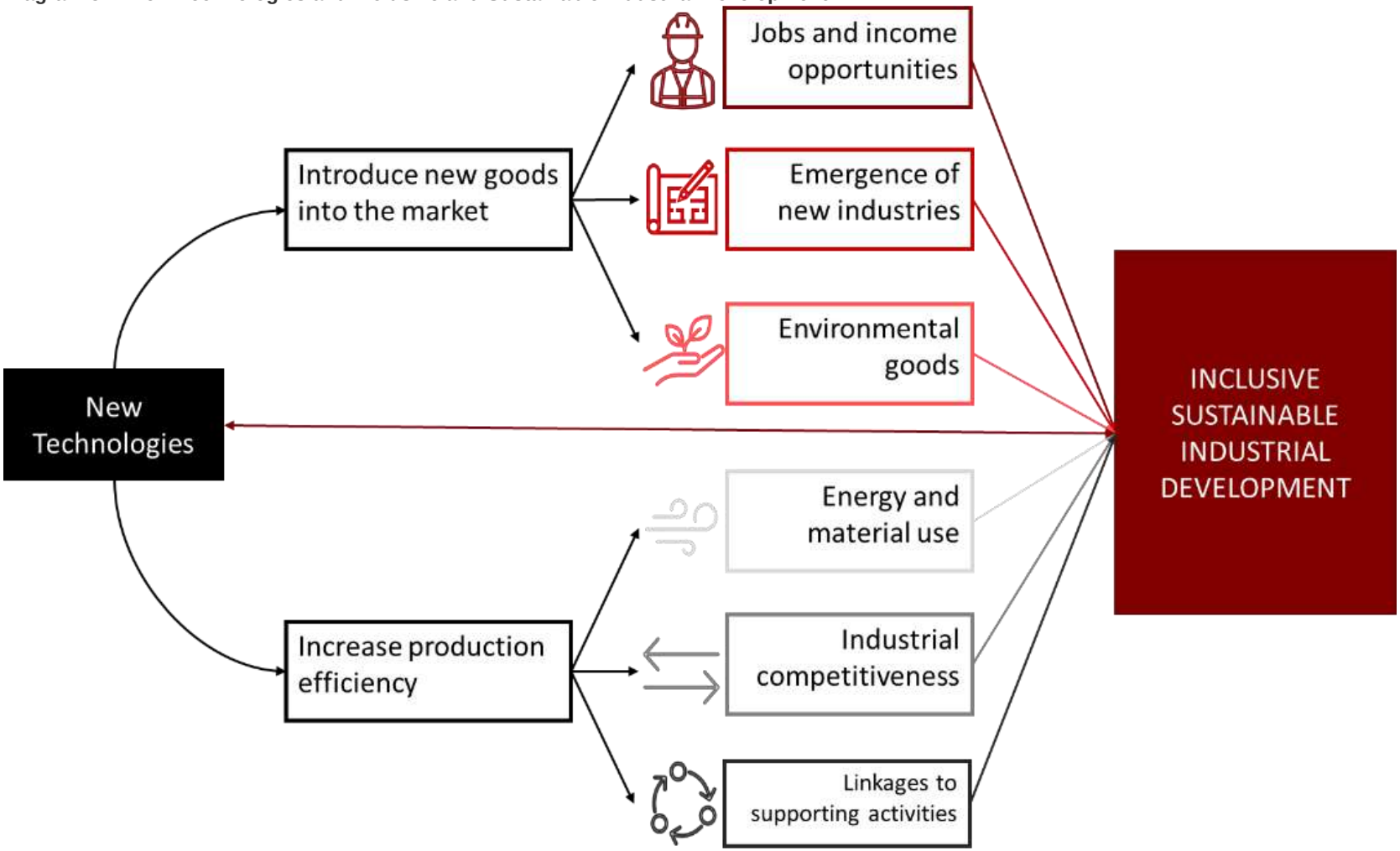
Innovative materials — including plastics, metal alloys, and biomaterials — promise to shake up sectors including manufacturing, renewable energy, construction, and healthcare.

Energy capture, storage, and transmission represent a growing market sector, spurred by the falling cost of renewable energy technologies and improvements in battery storage capacity.

Technological process innovations are key to sustaining and fostering industrial competitiveness and, through this channel, expanding manufacturing production. In many cases, the application of new technologies requires additional inputs and services from other sectors of the economy, thus increasing the multiplier effects of industrial development outside factory boundaries. Greater efficiency is typically associated with reductions in pollutant emissions and material and energy consumption per unit of production, which can make the production process more environmentally sustainable.

The following figure provides an overview of new technologies and the impact on inclusive and sustainable development. The upper part of the figure shows how new technologies drive inclusive and sustainable industrial development (ISID) by introducing new goods into the market. The lower part shows how new production technologies also contribute to ISID by increasing production efficiency. As industrialization evolves, the innovative potential of countries also increases. This is shown by the straight arrow going from right to left.

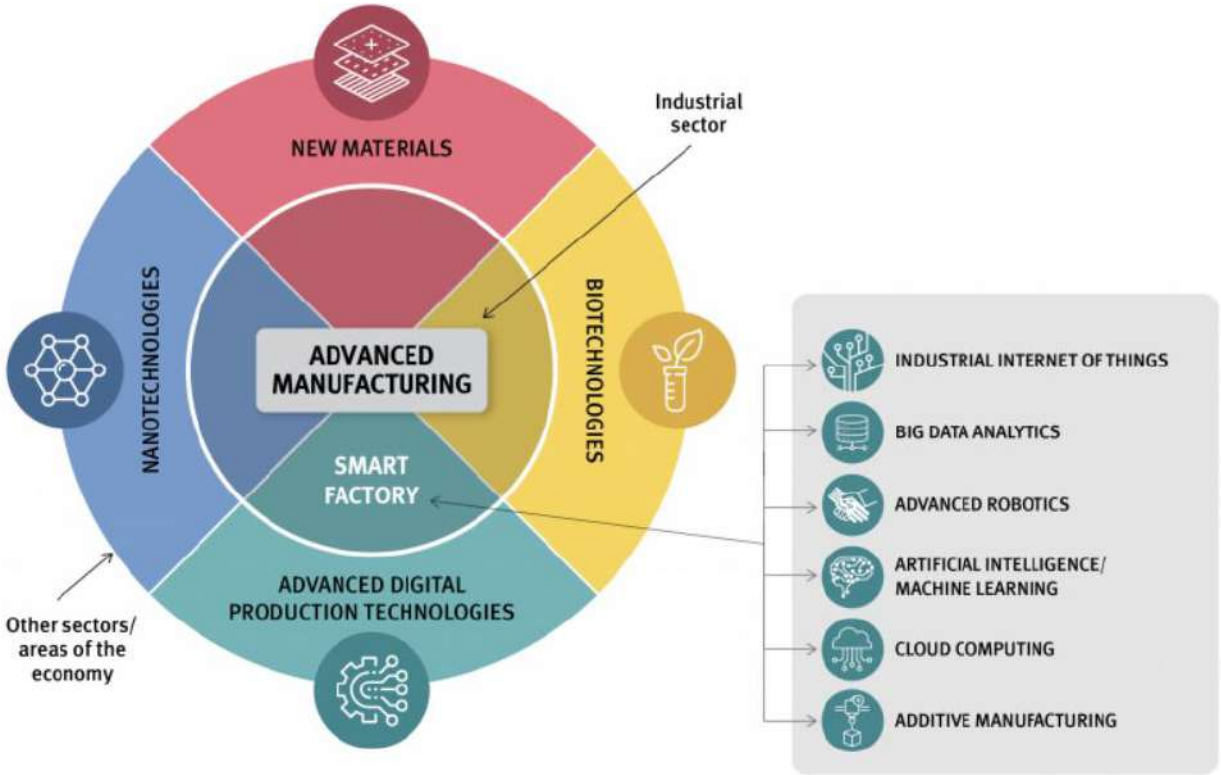
Diagram 5.7: New Technologies and Inclusive and Sustainable Industrial Development



Source: DEMACON ex UNIDO Industrial Development Report 2020

Most of the emerging technologies have applications in all sectors of the economy. When applied to industrial production, these technologies give rise to advanced manufacturing systems (Diagram 7.6). A key component of these systems is smart production (or smart factory), which results from the application of advanced digital technologies to manufacturing production.

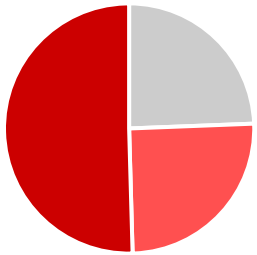
Diagram 5.8: Broad Technological Domains of the Fourth Industrial Revolution



Source: UNIDO Industrial Development Report 2020

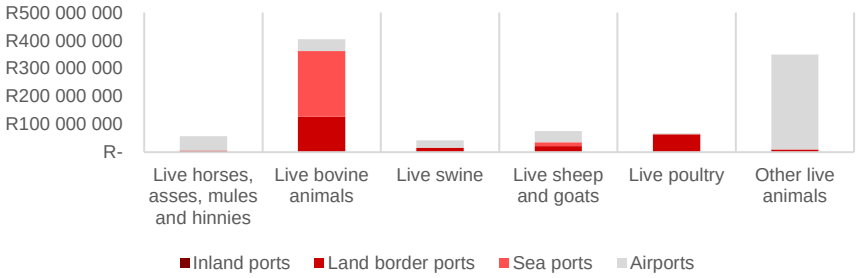
5.10 South African Exports of Live Animals

Type of port used for export of live animals (based on Rand value)

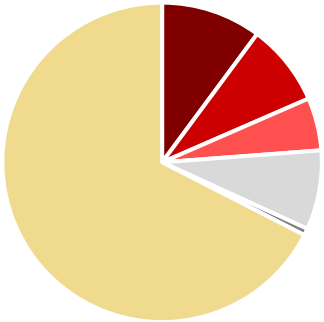


Airports	50.4%
Land border posts	24.4%
Sea ports	25.2%

Means by which live animals are exported

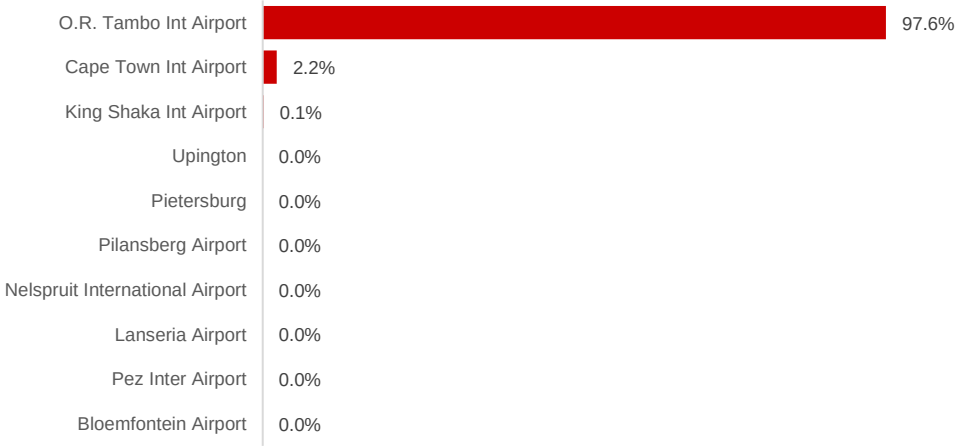


Type of live animals exported through airports

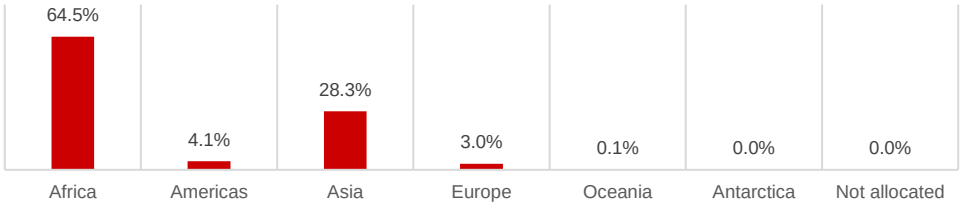


Live horses, asses, mules and hinnies	10.1%
Live bovine animals	8.3%
Live swine	5.3%
Live sheep and goats	8.0%
Live poultry	0.7%
Other live animals	67.5%

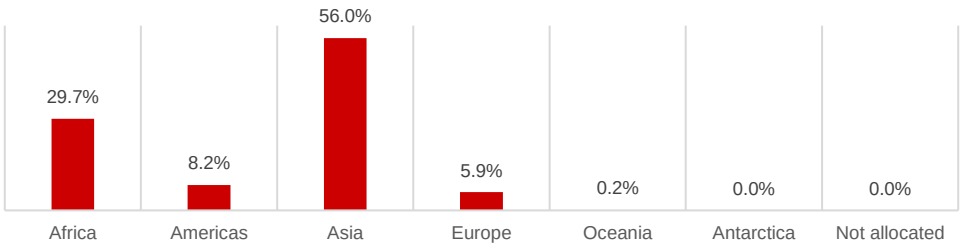
Airports live animals are exported by



Export markets via all ports



Export markets via airports



The following tables provide an overview of the main countries live animals are exported to.

Table 5.5: Top 20 Live Animals Export Countries (All ports)

	Country	Rand Value	Contribution
1	Mauritius	R284 714 552	28.6%
2	United Arab Emirates	R125 703 532	12.6%
3	Zimbabwe	R90 137 668	9.0%
4	Mozambique	R46 632 769	4.7%
5	Lesotho	R43 411 077	4.4%
6	United States	R37 826 750	3.8%
7	Kuwait	R34 986 346	3.5%
8	Angola	R25 965 457	2.6%
9	Lebanon	R25 902 360	2.6%
10	Uganda	R25 318 427	2.5%
11	United Republic of Tanzania	R22 059 051	2.2%
12	Kenya	R20 501 514	2.1%
13	Iraq	R18 937 983	1.9%
14	Zambia	R16 970 672	1.7%
15	Ghana	R15 530 596	1.6%
16	Nigeria	R14 131 843	1.4%
17	Democratic Republic of the Congo	R13 959 259	1.4%
18	Malaysia	R13 563 058	1.4%
19	Saudi Arabia	R13 284 177	1.3%
20	Spain	R11 837 925	1.2%

Table 5.6: Top 20 Live Animals Export Countries (Airports)

	Country	Rand Value	Contribution
1	United Arab Emirates	R125 703 532	25.0%
2	United States	R37 826 750	7.5%
3	Mauritius	R35 798 408	7.1%
4	Kuwait	R34 786 574	6.9%
5	Lebanon	R25 902 360	5.2%
6	Angola	R25 763 349	5.1%
7	Uganda	R25 318 427	5.0%
8	Kenya	R20 286 514	4.0%
9	Iraq	R18 937 983	3.8%
10	Ghana	R15 530 596	3.1%
11	Nigeria	R14 131 843	2.8%
12	Malaysia	R13 563 058	2.7%
13	Saudi Arabia	R13 284 177	2.6%
14	Spain	R11 837 925	2.4%
15	India	R10 512 510	2.1%
16	Thailand	R9 767 635	1.9%
17	Netherlands	R9 420 651	1.9%
18	Qatar	R6 441 106	1.3%
19	Maldives	R5 674 997	1.1%
20	Japan	R4 501 248	0.9%

Between 2013 and 2023, South Africa officially exported more than 16 million live wild creatures, which included:

- 3 366 796 birds, mostly parrots;
- 23 803 mammals, including a huge number of marmosets and many lions, lechwes, tamarins, servals, cheetahs, tigers and grey wolves;
- 12 951 599 fish, dominated by sturgeon and including 252 000 seahorses; and
- 1 420 reptiles, mainly crocodiles and -tortoises.

The following table provides detail on the type of live animals exported via airports over the past year (2023:Q4 – 2024:Q3)

Table 5.7: Type of Live Animals Exported via Airports

Type of Live Animal	Rand value	Contribution
Live horses, asses, mules and hinnies	**R50 995 730**	**10.1%**
Pure-bred breeding animals	R0	0.0%
Pure-bred breeding animals	R0	0.0%
Other (-2001)	R0	0.0%
Asses, mules and hinnies	R0	0.0%
Pure-bred breeding animals	R40 813 220	8.1%
Other	R10 181 317	2.0%
Asses	R0	0.0%
Other	R1 193	0.0%
Live bovine animals	**R41 833 693**	**8.3%**
Pure-bred breeding animals	R0	0.0%
Pure-bred breeding animals	R1 427 700	0.3%
Other	R29 005 639	5.8%
Pure-bred breeding animals	R0	0.0%
Other	R1 200	0.0%
Other	R11 399 154	2.3%
Live swine	**R26 842 697**	**5.3%**
Pure-bred breeding animals	R3 238 122	0.6%
Weighing less than 50 kg	R2 722 295	0.5%
Weighing 50 kg or more	R20 882 280	4.2%
Live sheep and goats	**R40 418 323**	**8.0%**
Sheep	R19 811 791	3.9%
Goats	R20 606 532	4.1%
Live poultry, that is to say, fowls of the species Gallus domesticus, ducks, geese, turkeys and guinea fowls	**R3 477 552**	**0.7%**
Fowls of the species Gallus domesticus	R3 312 220	0.7%
Turkeys (1996-)	R0	0.0%
Ducks (2012-)	R0	0.0%
Geese	R0	0.0%
Guinea fowls	R0	0.0%
Other	R0	0.0%
Fowls of the species Gallus domesticus	R0	0.0%
Fowls of the species Gallus domesticus, weighing not more than 2 000 g	R0	0.0%
Fowls of the species Gallus domesticus, weighing more than 2 000 g	R0	0.0%
Fowls of the species Gallus domesticus	R0	0.0%
Other	R165 332	0.0%
Other live animals	**R339 292 982**	**67.5%**
Other live animals	R0	0.0%
Primates	R8 376 760	1.7%
Whales, dolphins and porpoises (mammals of the order Cetacea); manatees and dugongs (mammals of the order Sirenia); seals, sea lions and walruses (mammals of the suborder Pinnipedia)	R0	0.0%
Camels and other camelids (Camelidae)	R0	0.0%
Rabbits and hares	R0	0.0%
Other	R105 259 970	20.9%
Reptiles (including snakes and turtles)	R11 851 941	2.4%
Birds of prey	R1 011 757	0.2%
Psittaciformes (including parrots, parakeets, macaws and cockatoos) (2002-)	R184 728 573	36.7%
Ostriches; emus (Dromaius novaehollandiae)	R2 132 963	0.4%
Other	R8 354 436	1.7%
Bees	R0	0.0%
Other	R8 631 515	1.7%
Other	R8 945 067	1.8%
Total	**R502 860 977**	**100.0%**

5.11 AIRPORT GROWTH POTENTIAL

The International Air Transport Association (IATA) has urged South Africa's new Government of National Unity to continue prioritizing the development of its aviation sector as a critical driver for economic growth and job creation.

"South Africa's aviation industry is poised for significant growth over the next 20 years, adding 345 million additional passenger journeys by 2043. With aviation generating $6 in economic activity for every $1 spent, this expansion will inject billions into South Africa's GDP and create thousands of new jobs. It is important for the new government to keep this as a strategic focus. The economic and social benefits of aviation will be maximized with a sharp policy focus on keeping costs low, providing sufficient capacity to grow, monitoring the cost-effectiveness of regulations, and achieving net zero carbon emissions by 2050," said Kamil Alawadhi, IATA's Regional Vice President for Africa and the Middle East.

5.12 Vaal Aerotropolis High Level Demand Assessment

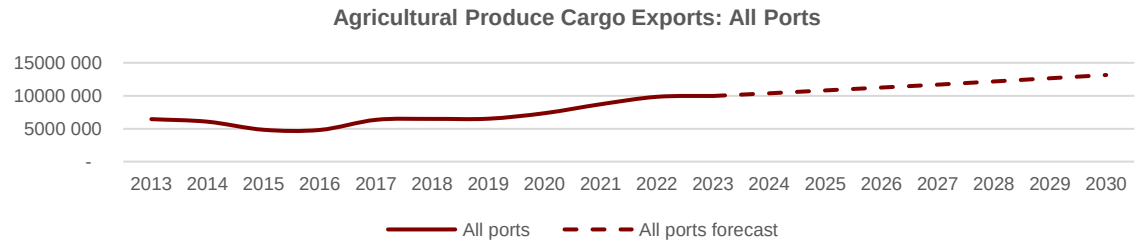
Method 1 – Socio-Economic Quantums And The Economic Production Function

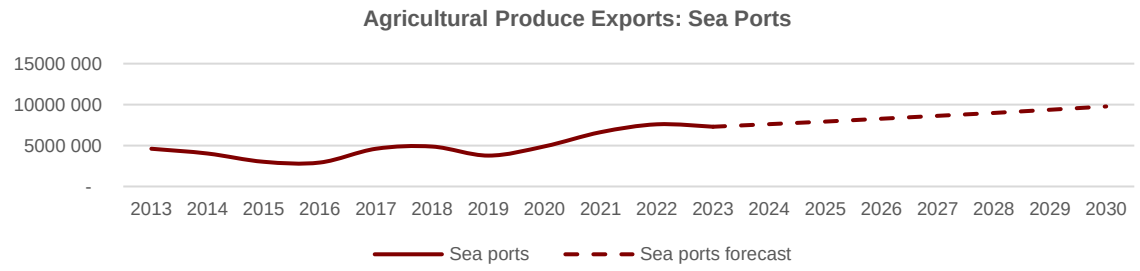
The following table provides a high-level initial demand assessment for an airport in the Vaal Region.

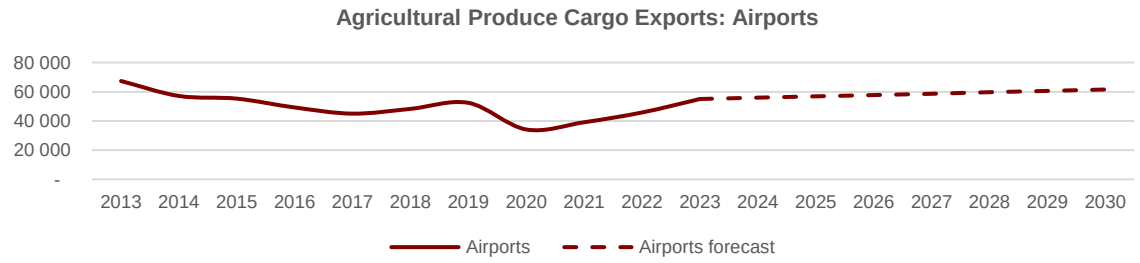
		OR Tambo International Airport	Cape Town International Airport	King Shaka International Airport	Vaal Aerotropolis Trade Area	
					Low Scenario	High Scenario
Socio-Economic Profile (Delineated by a 50km radius)	Population 2024	11 034 194	5 211 503	4 115 006	4 090 852	
	Population growth rate	1.66%	2.17%	1.59%	1.8%	
	Households	4 128 907	1 619 666	1 111 825	1 346 059	
	Households growth rate	2.75%	2.85%	1.24%	2.0%	
	SEM 4-5	30.10%	34.2%	24.20%	19.9%	
	SEM 4-5 population	3 321 292	1 779 955	995 831	814 080	
Passengers	International	7 054 616	2 754 405	274 882	1 252 066	1 407 439
	Regional	707 178	169 961	2 514	109 222	122 776
	Domestic	10 005 667	7 093 292	4 706 511	2 707 473	3 043 451
	Unscheduled	85 108	16 694	3 754	13 106	14 733
	Total	17 852 569	10 034 352	4 994 178	4 082 677	4 589 307
	Ratio Passengers per SEM 4-5	**5.38**	**5.64**	**5.02**		
Cargo	Import (tonne)	3 072 697	14 882	2 995	11 331	3 649
	Export (tonne)	71 342	36 129	2 800	404	11 518
	Total (tonne)	3 144 039	51 011	5 794	11 736	15 167
Economic Analysis (Sub-Regional Economy)	Total Provincial GVA (R' million)	2 088 550	874 038	1 031 171		
	Economic Production Function	1.51	0.06	0.01		

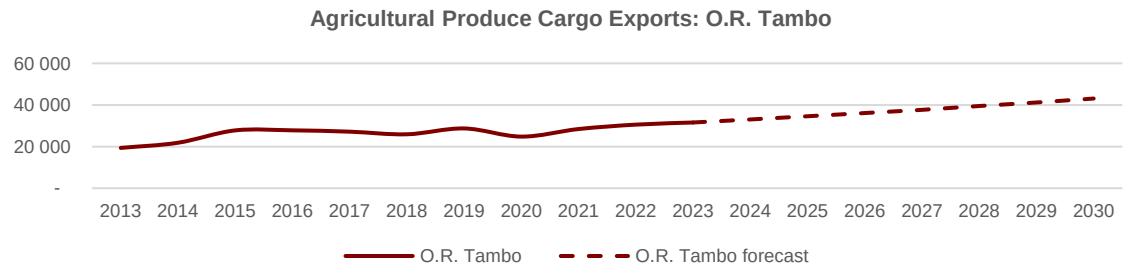
The above is a high-level demand assessment for an airport development at the Vaal Aerotropolis site. Initial findings indicate that the airport could potentially generate demand upwards of **4.5 million annual passengers** and **15 167 ton of cargo, 5+ years after becoming operational.** This would be subject to marketing, management and related considerations, as well as the ability to secure critical contracts. (It is worthy to note that Lanseria (with 9.5 million people within a 50km radius) commenced with commercial flights in 2006. Following various restructurings of flights, destinations and service providers, the airport currently accommodates ±2.5 million passengers per annum.)

METHOD 2 – AGRICULTURAL PRODUCE CARGO EXPORT POTENTIAL









Source: DEMACON ex StatsSA, 2025

Agricultural Produce Cargo Export Average Annual Growth Rate (2013 – 2023)

All Ports	4.0%
Sea Ports	4.3%
Airports	-1.8% (17.3% 2020-2023)
O.R. Tambo Int Airport	4.5%

Agricultural produce cargo exports from South Africa increased by 4.0% per annum over the last ten years, indicating high positive growth.

Even though a seemingly negative long term trend can be observed at airports, it is worthy to note that the post-2020 annual growth exceeded 15% (17.3%). This resonates with the international trend in terms of which exponential increase in e-commerce post COVID 19 is being observed.

O.R. Tambo Int Airport experienced a long term growth rate of 4.5% in agricultural produce cargo, outperforming national trends over the corresponding period.

Given the above trends, agricultural produce cargo is set to increase with approximately 454 129 ton per annum. Agricultural produce cargo export from O.R. Tambo is set to increase with approximately 1 654 ton per annum.

The potential VAAL Aerotropolis cargo volume will be a combination of new growth as well as a share of existing exports, resulting in potential exports of between 11 000 and 15 000 ton at 2032 (potential operational date), increasing to between 25 000 and 30 000 ton over the long term.

Vaal Aerotropolis Export Potential

Year	2032	2037	2042
Cargo Export	11 000 – 15 000 ton	15 000 – 20 000 ton	25 000 – 30 000 ton

The Vaal Aerotropolis location is ideally suited to provide enough space for holding areas for various animals, adhering to veterinary and quarantine requirements and creating a more humane option.

AIRPORT PASSENGER TRENDS

Passenger Arrivals

	18/19	23/24	29/30 estimate
O.R. Tambo			
International	4 531 711	3 502 027	3 647 398
Regional	445 388	356 824	365 425
Domestic	5 612 691	4 996 859	5 823 136
Unscheduled	37 240	43 065	39 809
Total	**10 627 030**	**8 898 775**	**9 817 518**
Cape Town International			
International	1 193 628	1 356 966	2 190 993
Regional	101 683	86 524	107 843
Domestic	4 087 310	3 549 727	4 052 577
Unscheduled	3 821	7 199	5 869
Total	**5 386 442**	**5 000 416**	**6 096 844**
King Shaka International			
International	178 965	132 320	206 518
Regional	7 898	1 304	13 025
Domestic	2 794 623	2 352 482	2 916 210
Unscheduled	4 102	5 450	3 550
Total	**2 985 588**	**2 491 556**	**3 129 934**
Grand Total	**18 999 060**	**16 390 747**	**19 044 296**

Source: DEMACON ex StatsSA, 2025

Passenger Departures

	18/19	23/24	29/30 estimate
O.R. Tambo			
International	4 624 806	3 552 589	3 700 059
Regional	446 338	350 354	358 799
Domestic	5 580 820	5 008 808	5 837 061
Unscheduled	34 949	42 043	38 864
Total	**10 686 913**	**8 953 794**	**9 878 217**
Cape Town International			
International	1 212 966	1 397 439	2 319 770
Regional	93 934	83 437	101 682
Domestic	4 122 300	3 543 565	4 065 778
Unscheduled	8 095	9 495	8 408
Total	**5 437 295**	**5 033 936**	**6 195 993**
King Shaka International			
International	188 742	142 562	222 199
Regional	7 775	1 210	11 447
Domestic	2 807 053	2 354 029	2 923 810
Unscheduled	4 003	4 821	3 579
Total	**3 007 573**	**2 502 622**	**3 150 703**
Grand Total	**19 131 781**	**16 490 352**	**19 224 913**

Source: DEMACON ex StatsSA, 2025

Arriving Passenger Growth Rates

	O.R. Tambo		Cape Town		King Shaka	
	Long term	Short term	Long term	Short term	Long term	Short term
International	-1.5%	-2.3%	6.7%	1.2%	1.5%	-2.7%
Regional	-1.3%	-2.0%	1.6%	-1.5%	-5.6%	-15.1%
Domestic	0.5%	-1.1%	0.2%	-1.3%	0.6%	-1.6%
Unscheduled	0.5%	1.3%	1.9%	5.9%	-0.1%	2.6%
Total	**-0.4%**	**-1.6%**	**1.6%**	**-0.7%**	**0.6%**	**-1.6%**

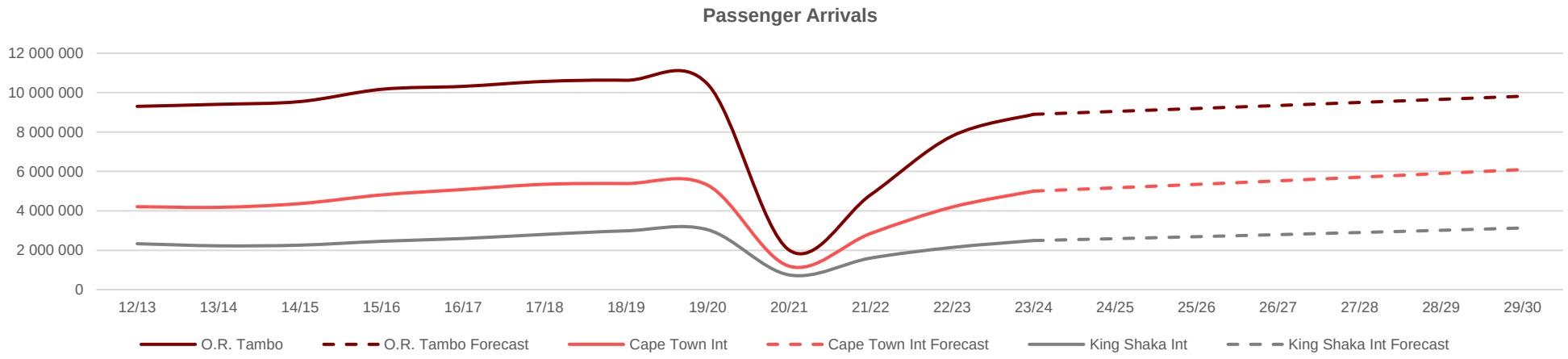
Source: DEMACON ex StatsSA, 2025

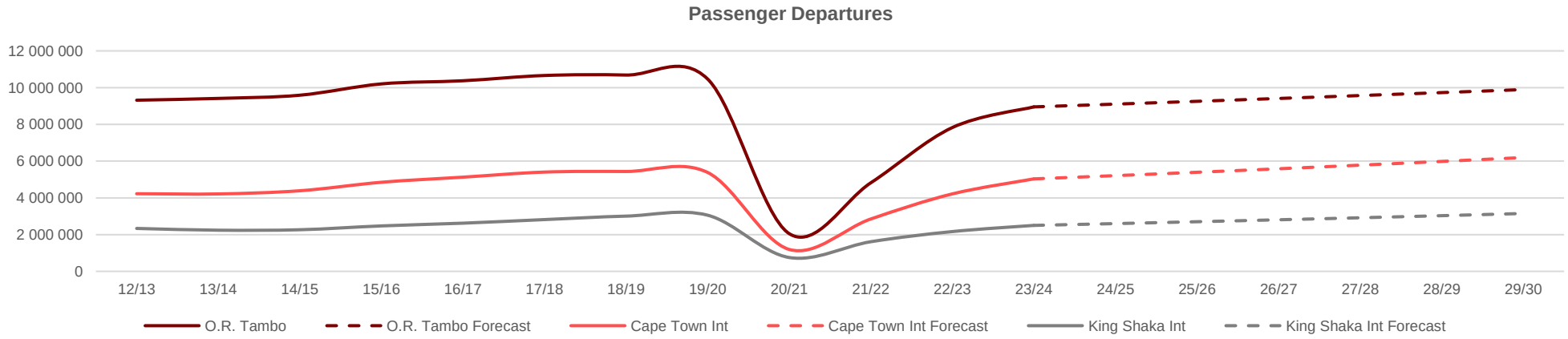
Departing Passenger Growth Rates

	O.R. Tambo		Cape Town		King Shaka	
	Long term	Short term	Long term	Short term	Long term	Short term
International	-1.4%	-2.4%	7.0%	1.3%	2.0%	-2.5%
Regional	-1.6%	-2.2%	1.5%	-1.1%	-7.1%	-15.6%
Domestic	0.5%	-1.0%	0.2%	-1.4%	0.5%	-1.6%
Unscheduled	0.5%	1.7%	1.9%	1.5%	-1.2%	1.7%
Total	**-0.4%**	**-1.6%**	**1.6%**	**-0.7%**	**0.6%**	**-1.7%**

Source: DEMACON ex StatsSA, 2025

PASSENGER GROWTH FORECAST





Source: DEMACON ex StatsSA, 2025

Over the next 5 years, passenger volumes (arriving and departing) at O.R. Tambo are predicted to increase be approximately 1.8 million (±307 194 passengers annually). Passenger volumes at Cape Town International are predicted to increase by approximately 2.3 million over the next five years (±376 414 passengers annually) and passenger volumes at King Shaka International by approximately 1.3 million (±214 410 passengers annually). This would translate into increase of approximately 5.4 million additional passengers at the above airports over the next 5 years. The Vaal Airport could potentially make inroads into the market share of existing airports and also stands to benefit from a steady increase in demand over time.

RESIDENTIAL LAND USE DEMAND ASSESSMENT

6

6 Residential Land Use Demand Assessment

6.1 Introduction

Chapter 6 of the report provides an overview of the demand assessment for residential land uses that can support the residential land use opportunities identified for the Vaal Aerotropolis.

The purpose of the chapter is to estimate the development potential for residential land use at the Vaal Aerotropolis with the aim of measuring the potential market share of additional residential units that the Vaal Aerotropolis could provide given potential residential real estate market growth in the market area. The chapter ultimately seeks to establish whether a market gap exists that the harbour can utilise as part of its long-term development opportunities and potential.

Subsequent iterations of the report will also incorporate a supply side perspective of the residential real estate market, in order to frame and highlight the residential market demand in counter to the supply side considerations of the residential market.

The remainder of the chapter is discussed under the following main topics:

- Defining residential real estate demand
- Modelling the medium- to long-term demand for additional residential real estate
- Reporting the space demand results and identifying the potential market share the harbour could capture
- Providing an indication of the residential market demand gap and development prospects.

6.2 Residential Sales Trends in the Surrounding Suburbs (Time Series Format)

The following paragraphs reflect on the residential sales trends (between 2015 and October 2024) in the surrounding suburbs, referring specifically to the following areas:

Vanderbijlpark

Sasolburg

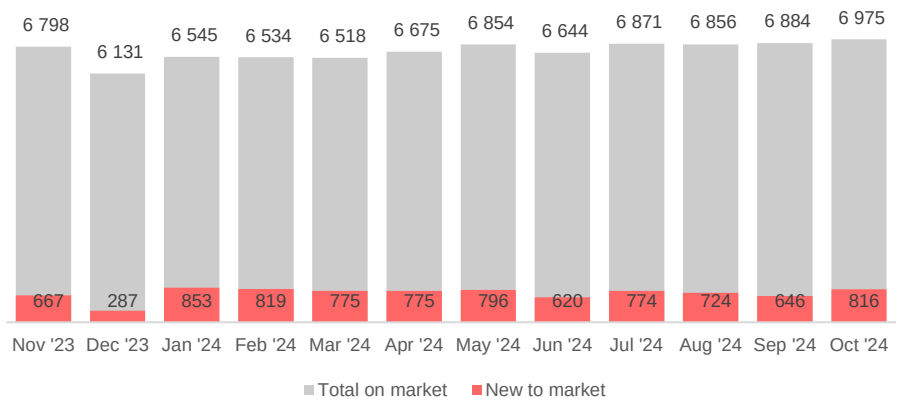
Vereeniging

Sebokeng

6.2.1 VANDERBIJLPARK RESIDENTIAL MARKET ACTIVITY

The following section is focused on providing an overview of residential market activity, i.e. property transactions that have taken place in the market area between 2015 and 2024 (to date). The data provides a comparison between average asking and sales prices of properties and seeks to highlight any property pricing growth trends present in the market area.

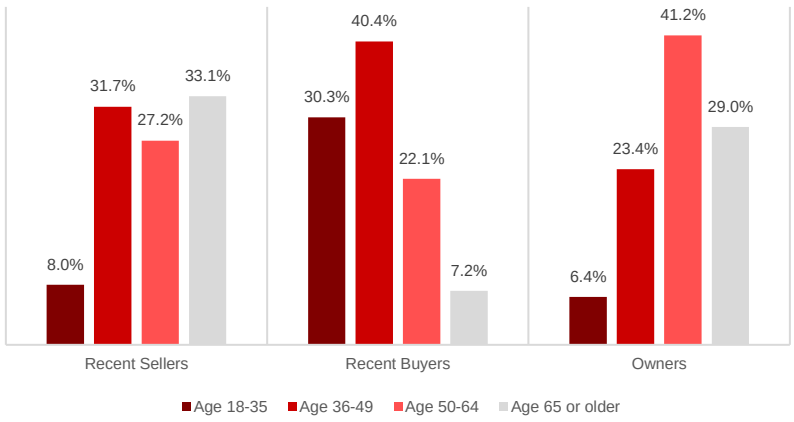
Monthly Property Listing Trend (1-Year Perspective)



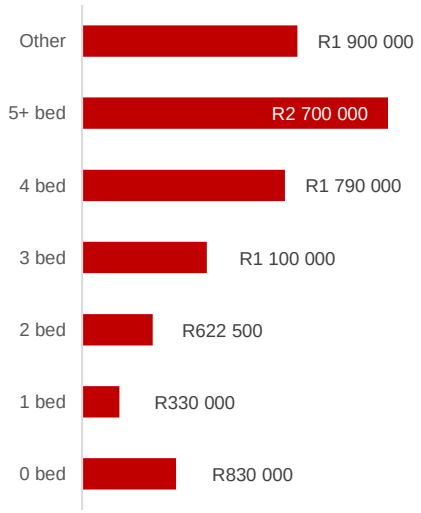
On Average Approximately **6 690** Properties Are Listed **For Sale** Per Month

10.7% of properties are **new listings**

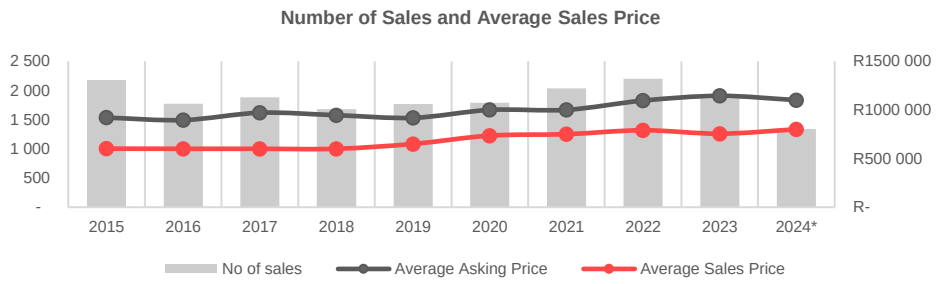
Age Profile of Property Owners

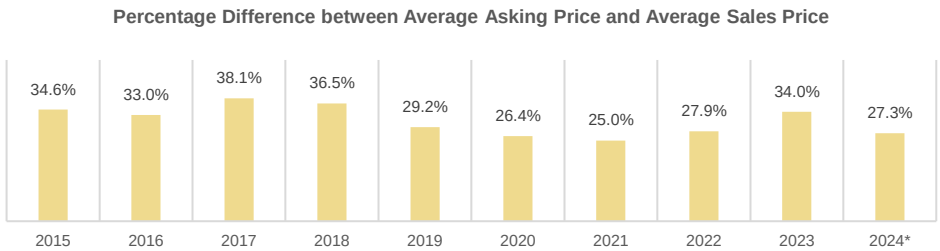


Average Asking Price



Property Sales Trend (2014 to 2023)





In 2024*, **1 340 properties** were **sold**

Average **sales price** of **R800 000**

Average **asking price** was **R1 100 000**

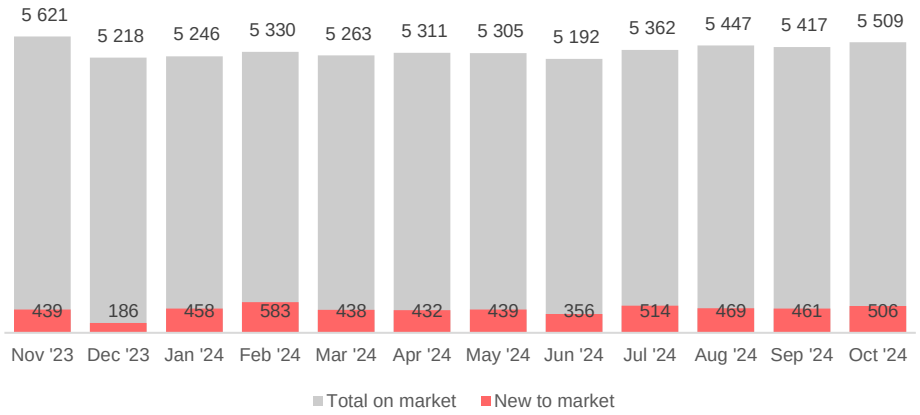
The average sales price for properties achieved is on average **31.2% lower** than the average asking price.

*Up to Oct 2024

6.2.2 Vereeniging Residential Market Activity

The following section is focused on providing an overview of residential market activity, i.e. property transactions that have taken place in the market area between 2015 and 2024 (to date). The data provides a comparison between average asking and sales prices of properties and seeks to highlight any property pricing growth trends present in the market area.

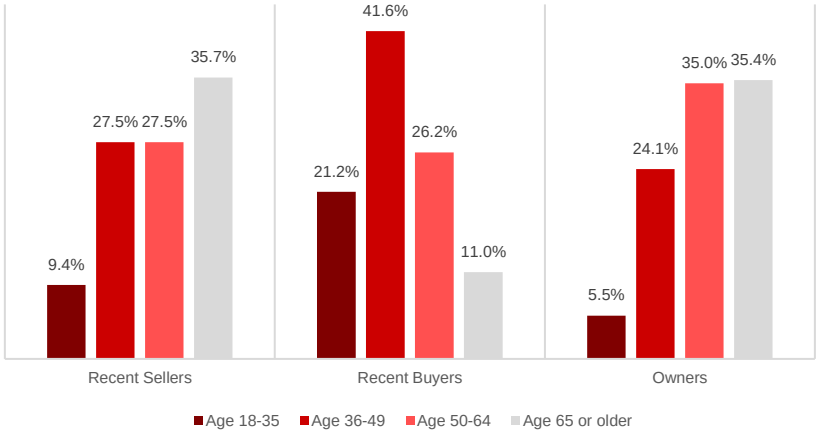
Monthly Property Listing Trend (1-Year Perspective)



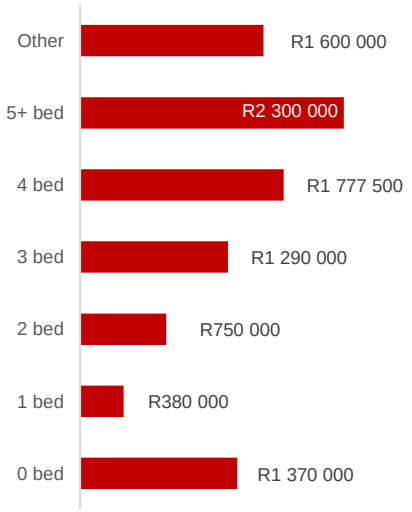
On Average Approximately **5 352** Properties Are Listed **For Sale** Per Month

8.2% of properties are **new listings**

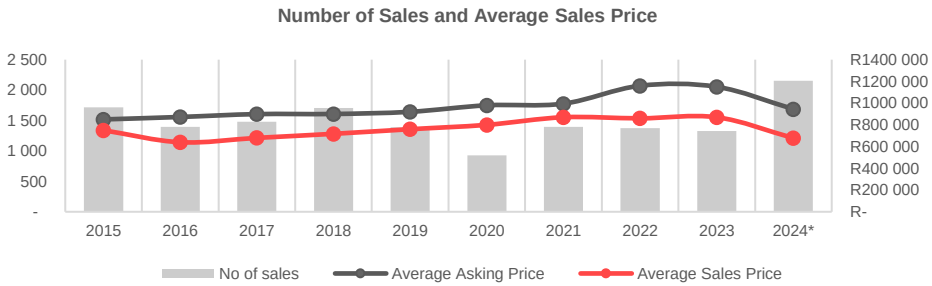
Age Profile of Property Owners

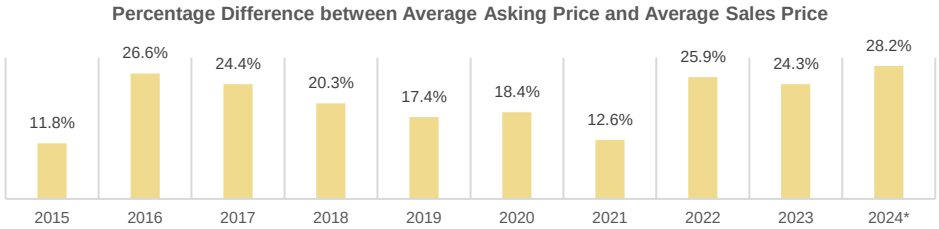


Average Asking Price



Property Sales Trend (2014 to 2023)





In 2024*, **2 152 properties** were **sold**

Average **sales price** of **R678 070**

Average **asking price** was **R945 000**

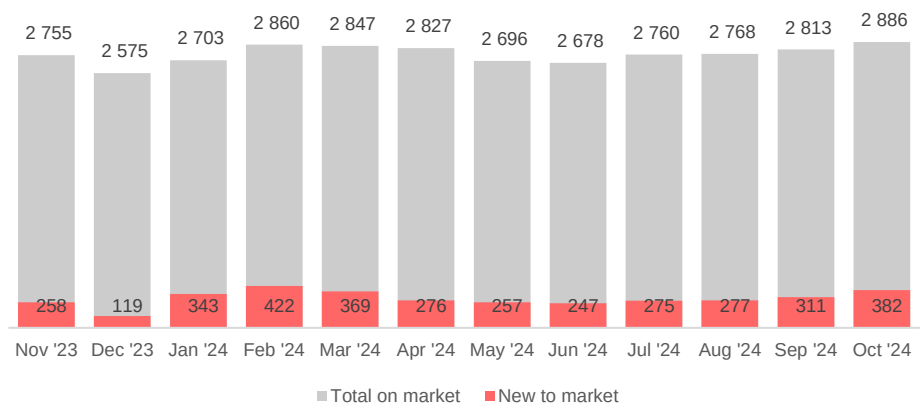
The average sales price for properties achieved is on average **21.0% lower** than the average asking price.

*Up to Oct 2024

6.2.3 SASOLBURG RESIDENTIAL MARKET ACTIVITY

The following section is focused on providing an overview of residential market activity, i.e. property transactions that have taken place in the market area between 2015 and 2024 (to date). The data provides a comparison between average asking and sales prices of properties and seeks to highlight any property pricing growth trends present in the market area.

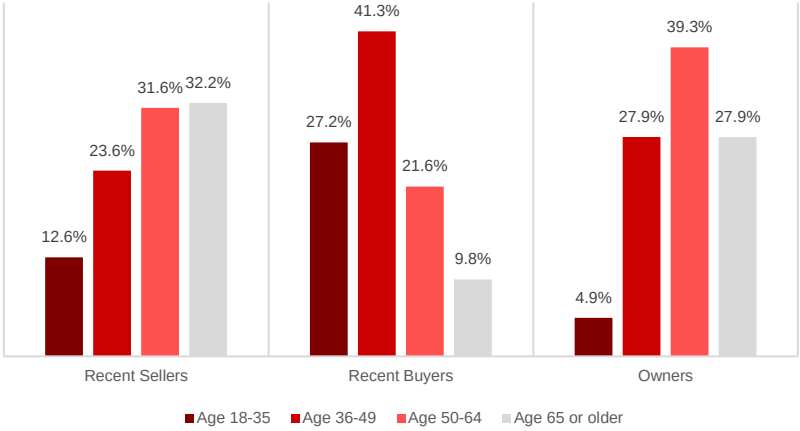
Monthly Property Listing Trend (1-Year Perspective)



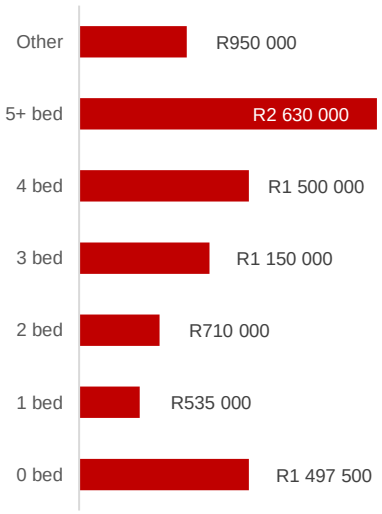
On Average Approximately **5 352** Properties Are Listed **For Sale** Per Month

8.2% of properties are **new listings**

Age Profile of Property Owners

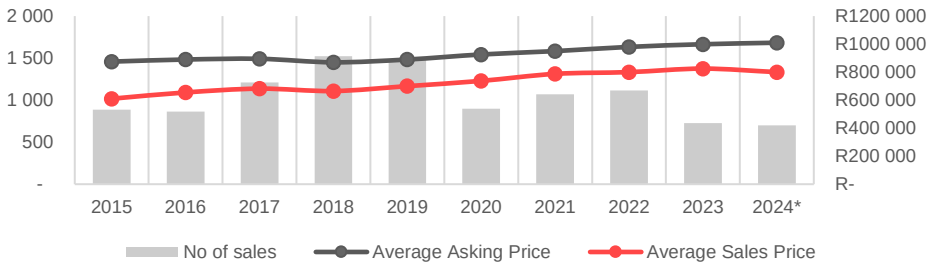


Average Asking Price

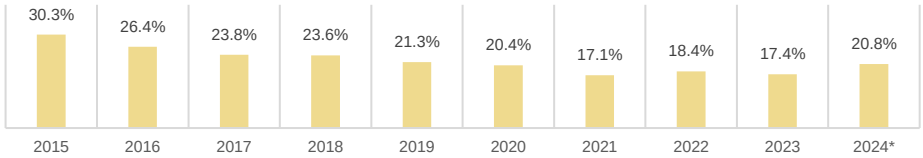


Property Sales Trend (2014 to 2023)

Number of Sales and Average Sales Price



Percentage Difference between Average Asking Price and Average Sales Price



In 2024*, **699 properties** were **sold**

Average **sales price** of **R800 000**

Average **asking price** was **R1 010 000**

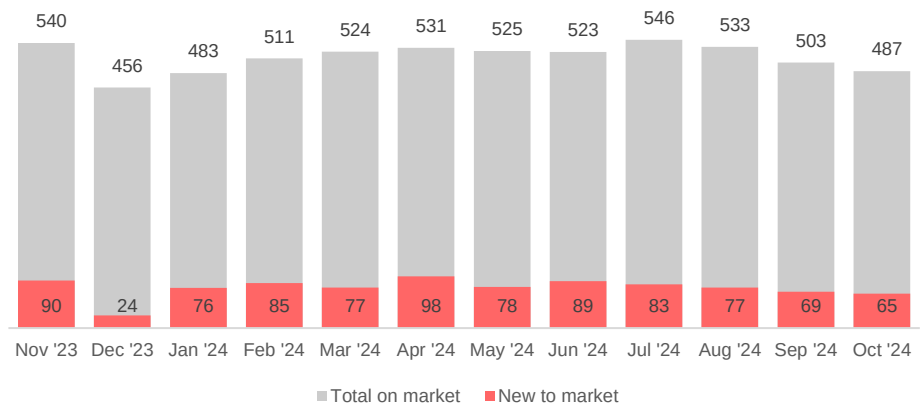
The average sales price for properties achieved is on average **21.9% lower** than the average asking price.

*Up to Oct 2024

6.2.4 Sebokeng Residential Market Activity

The following section is focused on providing an overview of residential market activity, i.e. property transactions that have taken place in the market area between 2015 and 2024 (to date). The data provides a comparison between average asking and sales prices of properties and seeks to highlight any property pricing growth trends present in the market area.

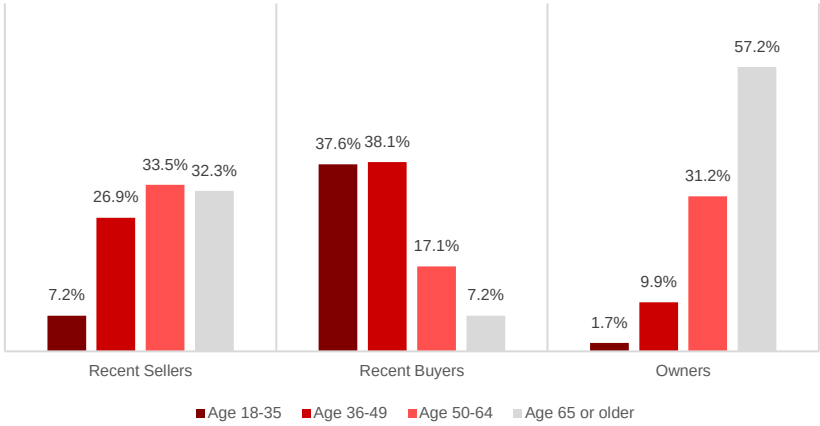
Monthly Property Listing Trend (1-Year Perspective)



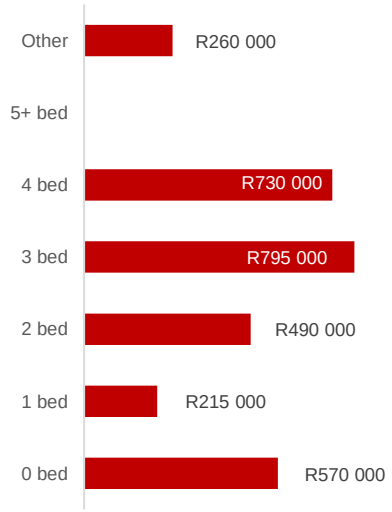
On Average Approximately **514** Properties Are Listed **For Sale** Per Month

14.8% of properties are **new listings**

Age Profile of Property Owners

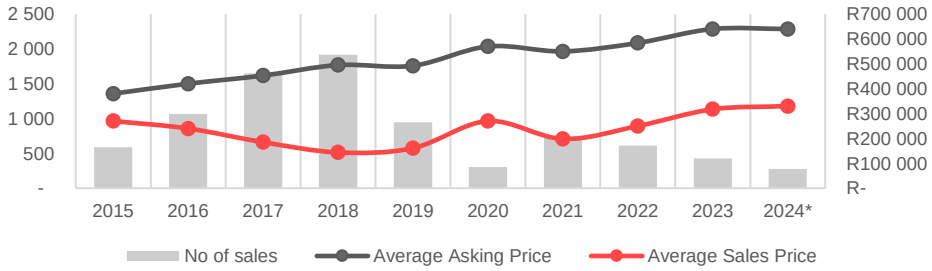


Average Asking Price

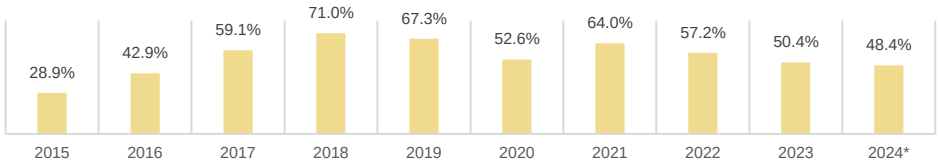


Property Sales Trend (2014 to 2023)

Number of Sales and Average Sales Price



Percentage Difference between Average Asking Price and Average Sales Price



In 2024*, **278 properties** were **sold**

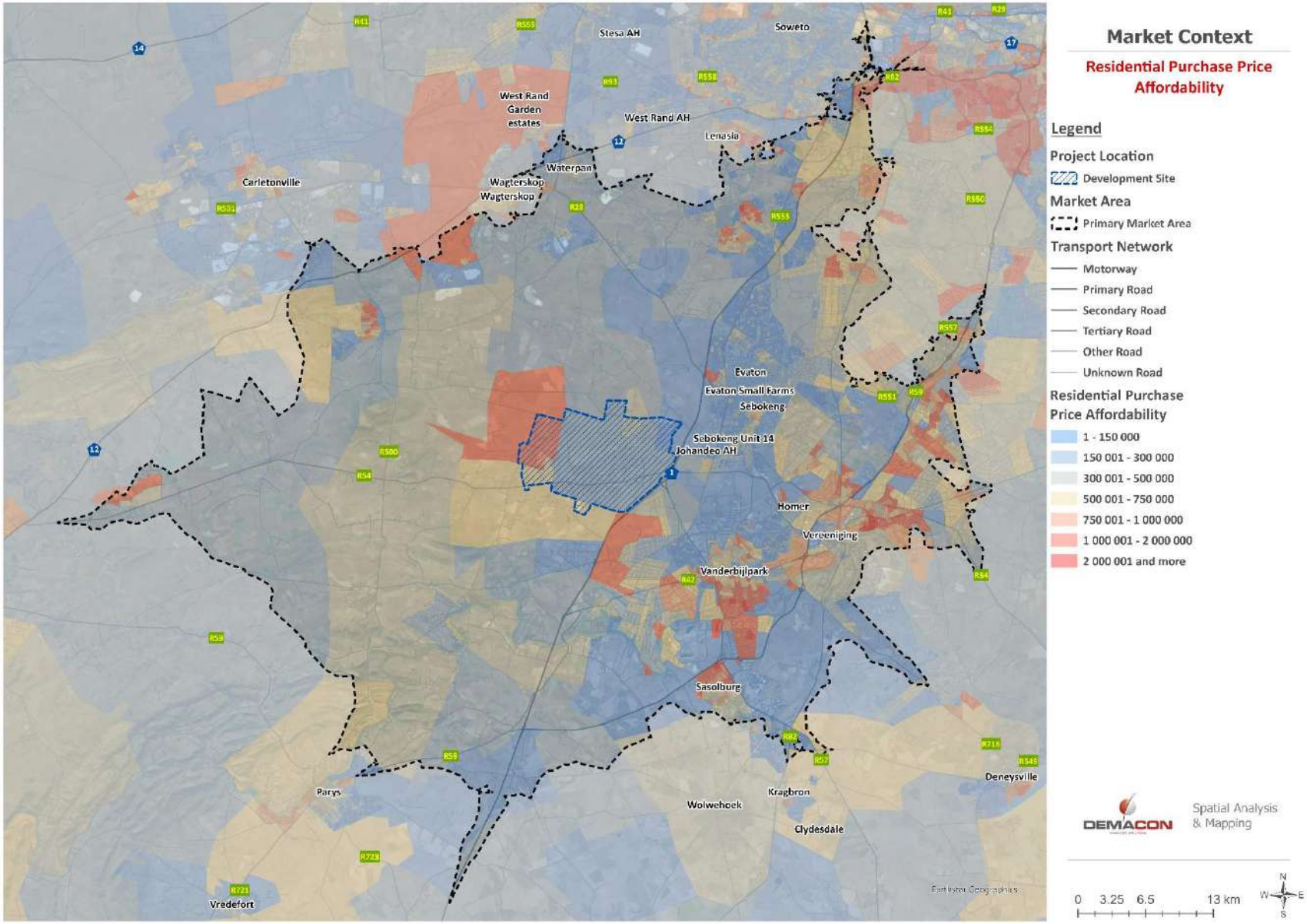
Average **sales price** of **R330 000**

Average **asking price** was **R640 000**

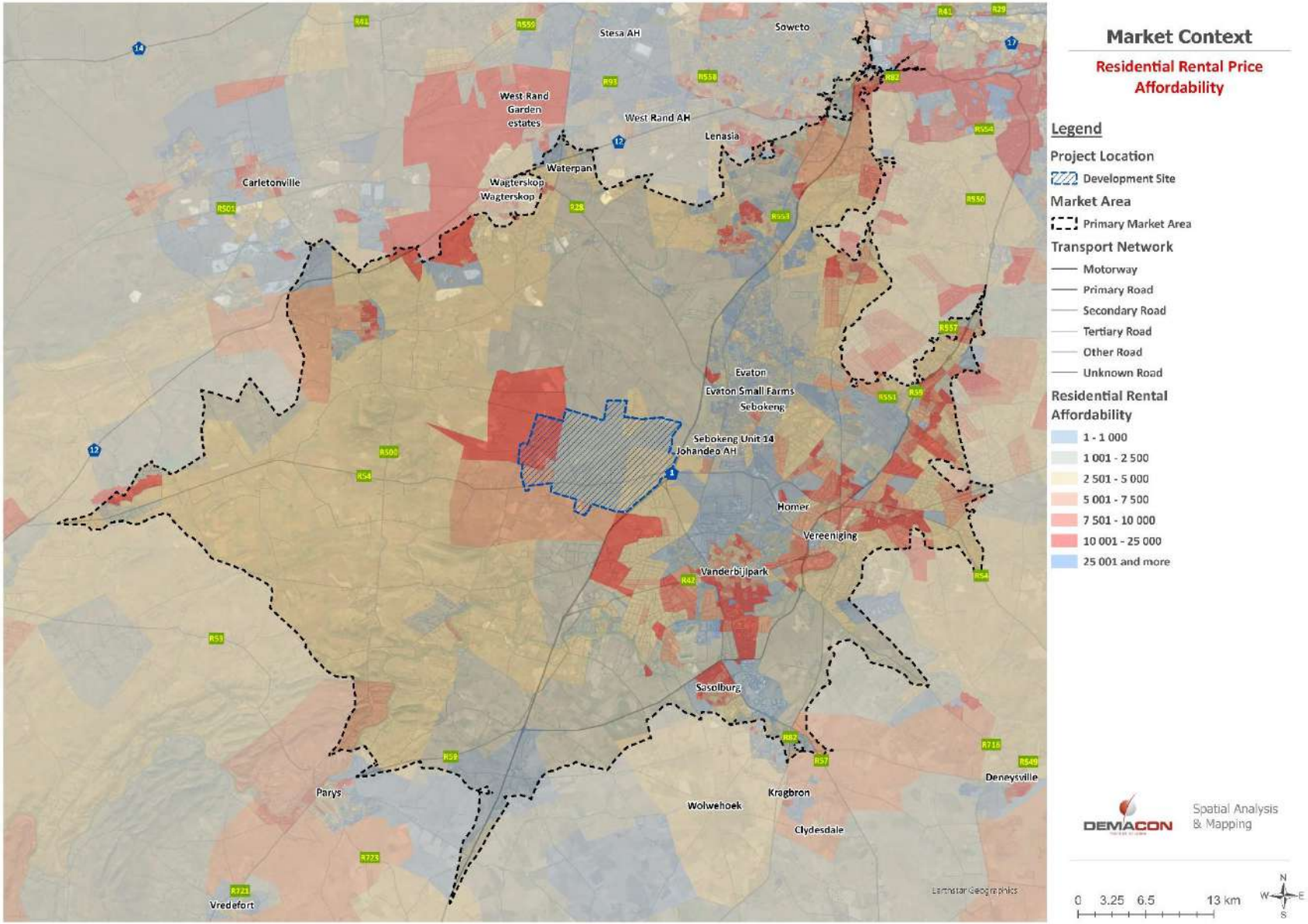
The average sales price for properties achieved is on average **54.2% lower** than the average asking price.

*Up to Oct 2024

Map 6.1: Primary Market Area Residential Purchase Price Affordability



Map 6.2: Primary Market Area Residential Rental Price Affordability



6.3 Residential Real Estate Market Demand Side Indicators

The following section is focused on estimating the market demand for the residential market within the market area of the harbour, given the growth trends and drivers that influence household and population growth in the demographic market area of the harbour.

The purpose of the section is to highlight the key elements that inform market demand modelling, estimating the market demand for residential land uses, and provide an indication of market gap and development potential of residential real estate in line with possible market entry periods for residential land use development.

6.3.1 Defining Residential Market Demand

Definition

The residential market refers to land uses associated with human habitation such as housing or dwelling units. Residential use can vary in typology, density, tenure, structure, layout, and affordability. 'Residential' does not include hotels or guesthouses, which are defined as being 'short stay' accommodation.

Defining demand

Residential demand depends on a variety of factors. In this context, residential demand can be conceptualised as follows:

$$\text{Dres.} = f\{P_o; P_{\%}; Q; P_r; P_{r\%}, ROI, I, T_x; Y; H_h; R; C_i; H_s; H_p\}$$

Where:

P_o	= Population Size
$P_{\%}$	= Population growth rate
Q	= Existing quality of residential environment
P_r	= House prices
$P_{r\%}$	= Growth in house prices
ROI	= Return on investment
I	= Interest rates
T_x	= Rates and Taxes
Y	= Household income
H_h	= Household size
R	= Rent
C_i	= Cap Rates
H_s	= Housing shortage
H_p	= Housing preferences

In essence, market demand for housing is a function of:

- Socio-economic characteristics – size, distribution, etc
- Socio-economic growth trends – distribution, rate of change, etc
- Household annual income profiles
- Current subsidised housing demand and backlogs
- Urban development trends
- Real estate market indicators – rental rates, supply, etc

In order to purposefully estimate demand for social housing, a multi-layer data analysis is undertaken – the purpose is to define the target market and its trends based on various data sources at designated points in time. This is done to understand the possible future direction of growth and market demand based on credible and substantiated historic data (such as Statistics South Africa) and considering any potential trends that influence beneficiaries of the social housing product (market rental trends, development influencers and economic climate).

The multi-layered approach allows for estimating medium- to long-term sustainable demand. Sustainable demand refers to demand that may exist within the market area that would enable social housing institutions and projects to become sustainable over a medium- to long-term period, i.e., capacity of a market area and its associated economy to generate employment that in turn provides the target market with the capability to rent a social housing unit.

Economic factors influence the sustainability of semi-subsidised housing schemes, i.e. social housing. Social housing projects are dependent on a target market that has the ability to pay rental rates. Without income generated from rental rates, social housing projects would become financially unfeasible due to not having operational capital. It is thus important to consider the effects that economic factors such as economy size and growth trends; and labour absorption trends have on the social housing target market within market area.

In the context of the preceding, the growth of the housing market demand is calibrated by considering, not only long-term demographic growth attributes, but also considering economic growth trends and labour absorption capabilities of the local economy. The calibration ensures that demand estimations generated for housing is sustained demand and not short-term high growth with medium- to long-term under performance.

Diagram 6.1: Sustainable Long-Term Demand Principle

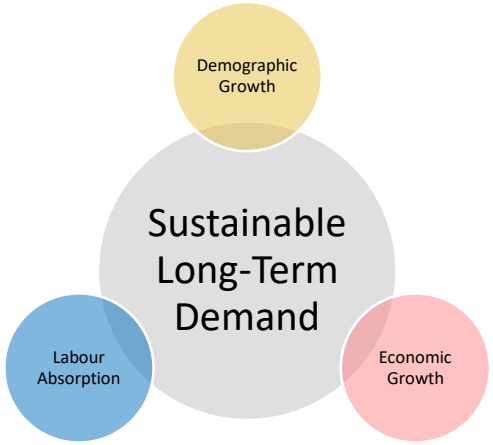
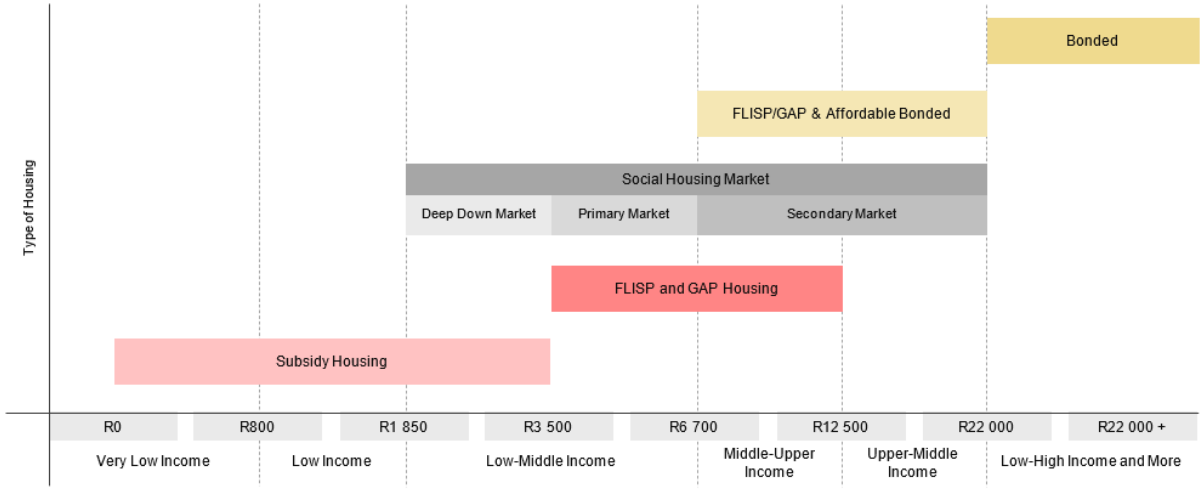


Diagram 6.2: Housing Income Categories



Source: DEMACON, 2024

6.3.2 MARKET DEMAND MODELLING

The following table and figures provide an overview of the annual housing income range of the source market area. The data also provides an overview of the house price midpoints attainable by the source market area based on their average annual household income.

Table 6.1: Residential Affordability Profile

Income Midpoint (2024)	House Price (Midpoint)	Generic Indicative Unit Size	Distribution of New Household Growth (2014 to 2024)		Classification
			%	New Growth	
R0	R0	40m² - 50m²	17.7%	2 408	Subsidy / Social
R3 245	R9 130	40m² - 50m²	4.9%	668	Subsidy / Social
R9 734	R27 387	40m² - 50m²	7.3%	994	Subsidy / Social
R19 737	R55 532	40m² - 50m²	15.2%	2 069	Subsidy / Social
R39 068	R109 921	50m² - 60m²	18.0%	2 446	Subsidy / Social
R76 784	R216 037	60m² - 70m²	13.8%	1 881	FLISP / GAP
R154 920	R435 875	80m² - 90m²	9.8%	1 325	FLISP / GAP
R311 866	R877 454	120m² - 140m²	7.4%	1 000	Middle Income
R622 920	R1 752 624	140m² - 400m²	4.2%	572	Middle to Higher Income
R1 245 570	R3 504 485	420m² - 750m²	1.2%	159	Higher Income
R2 491 679	R7 010 489	780m² - 1 000m²	0.3%	40	Top End
R4 983 359	R14 020 978	1 000m² +	0.2%	23	Top End

Key Outcomes and Considerations

- The core target market of the bonded segment is households earning on average between R154 920 and R1.3 million per year
- This segment can afford residential properties that cost between R435 875 and R3.5 million
- New growth over the next 5-years amounts to approximately 13 584 units

Source: DEMACON Demand Modelling, 2024

Figure 6.2: Primary Market Area Bonded Housing Affordability Profile

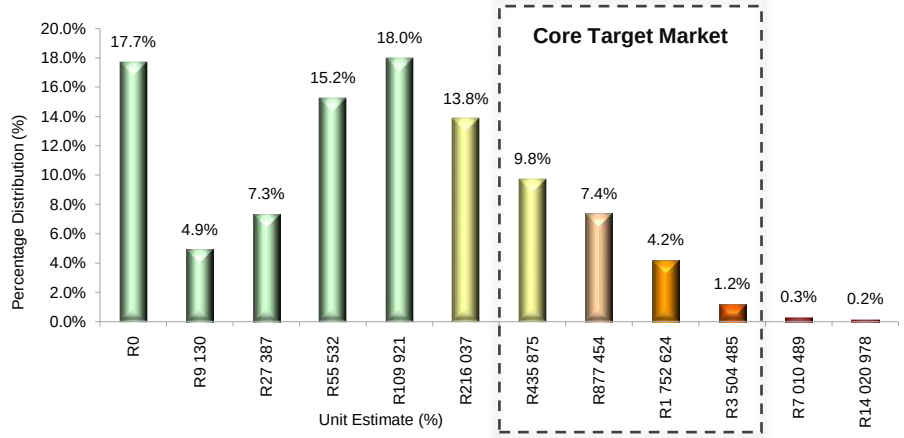
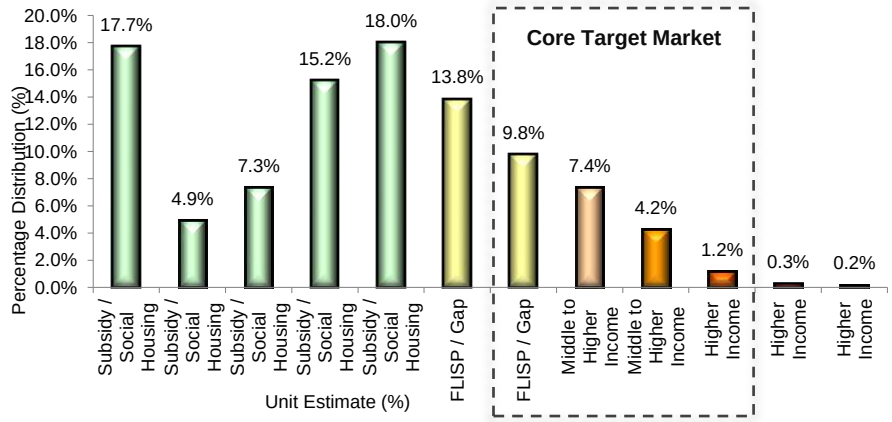


Figure 6.3: Market Optimum Unit Typology (%)



6.3.3 MARKET DEMAND MODELLING OUTCOME

The following section provides an overview of the market demand modelling outcome for market based residential demand. The section provides information regarding the market demand modelled, forecast price and rental rates and unit typology profiles.

Market Based Residential Demand

The following table provides an overview of the market based residential demand modelling outcomes for the proposed development.

Table 6.2: Market Based Residential Demand

Total Market		
Additional Households: Base Year +5 Years		13 584
Annualised Market Growth (Full Housing Spectrum)		2 717
FLISP & Bonded Housing Segment		36.8%
FLISP & Bonded Housing Demand per Annum		1 000
Annual Secondary Market Contribution (Units/Annum)	Min	1 358
	Max	2 715
Total Annual FLISP & Bonded Housing Market Take-Up	Min	2 358
	Max	3 715
Project Specific FLISP & Bonded Housing Units		
Project Specific FLISP & Bonded Units		5 000
Forecast Market Share of Total Market Sales	Min	10%
	Max	20%
Project Forecast Total Annual Take-Up Rate (Units / Annum)	Min	236
	Max	743
Years to 80% Take-Up (FLISP & Bonded Housing Units)	Min	6.7
	Max	21.2
	Avg	14.0
Optimum Point of Market Entry		2027+

Source: DEMACON Demand Modelling, 2024

Demand Modelling Findings

- Modelling portrays demand and take-up based on prevailing (historic short and long term) market trends. As such, it can be expected that demand conditions may continue to improve.
- The table shows two sections, 1) total market and 2) project specific. Between 2024 and 2029 an estimated 13 584 new households will seek accommodation in the target geographic market area, resulting in an annual growth in demand of approximately 2 717 units (across the full housing spectrum, including informal and subsidy).
- Under present market conditions, the finance-linked and bonded segment (36.8%) will yield a take-up rate of between 2 358 and 3 715 units per annum (including new households and resales).
- A total of 5 000 units could be developed and taken-up within approximately 14 years (80% take-up).
- The optimum point of market entry is 2027+.
- A first phase of up to 1 000 units is recommended.

Figure 6.4: Project Optimum Unit Typology (Units)

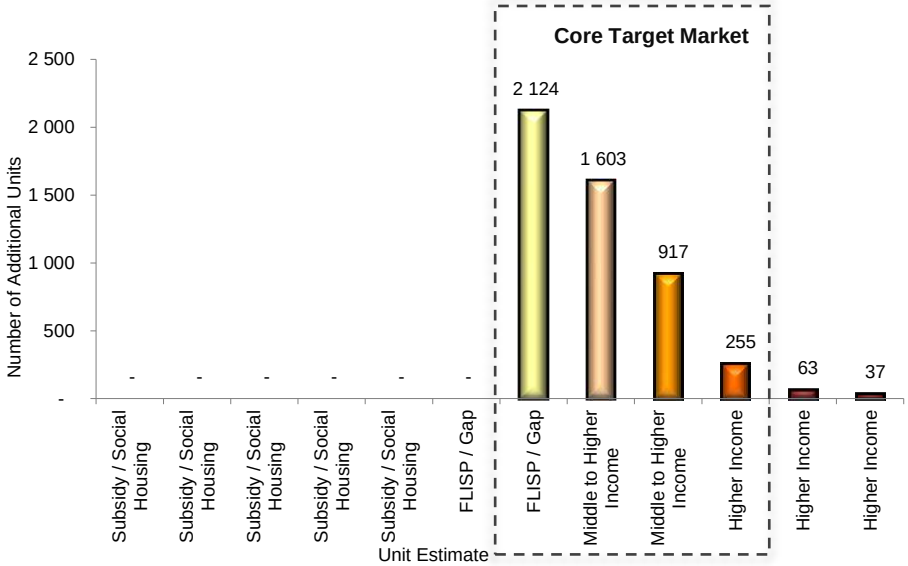


Figure 6.5: Unit Price Estimate (Median Portfolio Values)

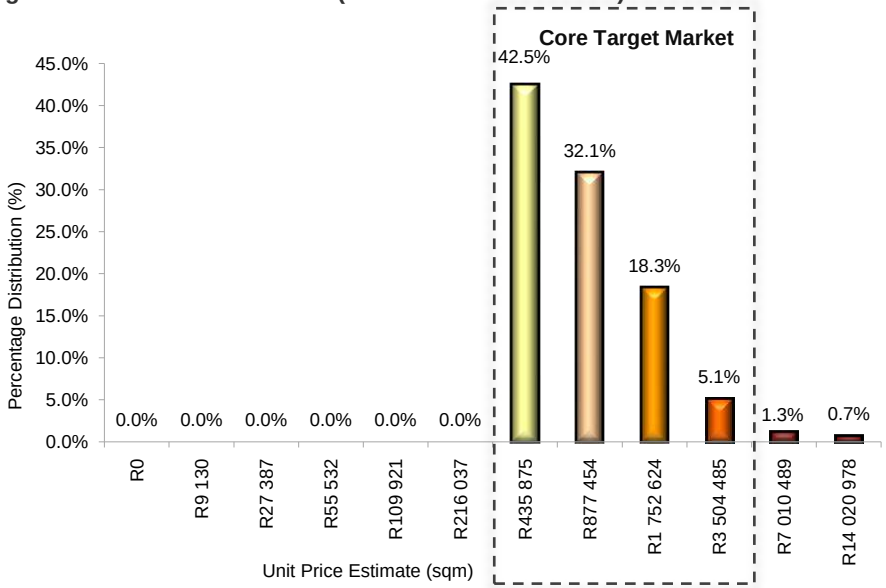


Figure 6.6: Project Potential Rental Stock per Product Type (Units)

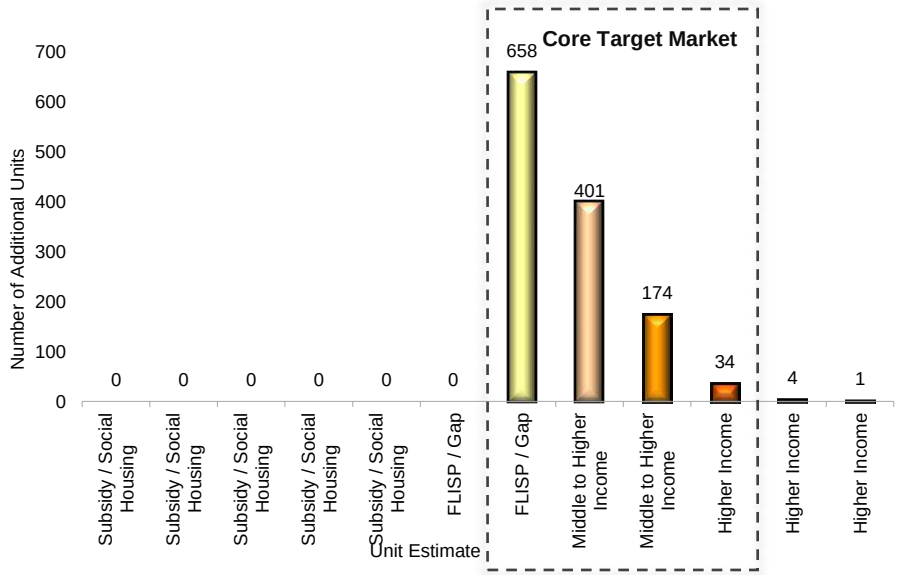
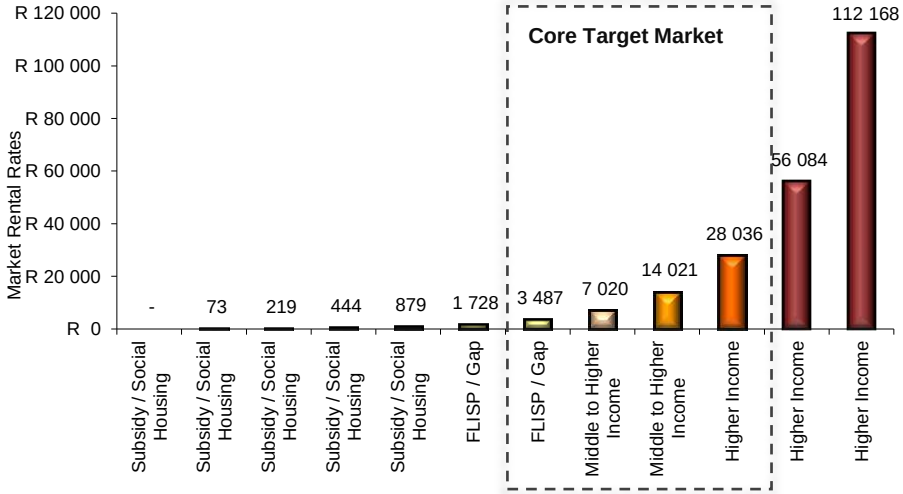


Figure 6.7: Market Forecast Rental Rates



6.3.4 Gap Analysis and High-Level Recommendations

This Chapter of the report focused on a demand assessment of residential land uses at the Vaal Aerotropolis.

A gap analysis for the residential real estate market shows that a gap exists within the demographic market area for additional residential units over the medium- to long-term. This market gap is the result of the continued growth of households in the primary demographic market area and their concomitant demand for additional accommodation. Market entry for residential land uses could be from 2027 onwards.

Development Type	Effective Market Gap	Development Propsect
Residential Units	Yes	Moderate to High

The following summarises the demand potential of market-based residential as part of the proposed development. The purpose is to highlight the opportunities and potential configurations that could be considered as development opportunities for the project.

Table 6.3: Market Based Residential Market Demand Analysis Summary and High-Level Recommendations

Land Use	Location Analysis Outcome	Market Gap Assessment and Development Prospects		Demand Modelling Results
Residential Units	**71.5%** A rating above 70% is considered high, indicating that most of the important fundamentals for a successful residential development is in place.	Market Gap	**Yes**	**5 000 Units** • Modelling portrays demand and take-up based on prevailing (historic short and long term) market trends. As such, it can be expected that demand conditions may continue to improve. • The model shows two sections, 1) total market and 2) project specific. Between 2024 and 2029 an estimated 13 584 new households will seek accommodation in the target geographic market area, resulting in an annual growth in demand of approximately 2 717 units (across the full housing spectrum, including informal and subsidy). • Under present market conditions, the finance-linked and bonded segment (36.8%) will yield a take-up rate of between 2 358 and 3 715 units per annum (including new households and resales). • A total of 5 000 units could be developed and taken-up within approximately 14 years (80% take-up). • The optimum point of market entry is 2027+. • A first phase of up to 1 000 units is recommended.
		Development Prospects	**Moderate to High**	

Source: DEMACON Demand Modelling, 2024

Optimum Distribution Range Configuration (based on market demand profile)

Residential Typology	Percentage	Nr of Units	Price Range	Composition	Unit Sizes
Apartments	17.0%	850	R410 000 - R450 000	0.5 bedroom, 1 bathroom	45-55
	25.5%	1 274	R500 000 – R650 000	1 bedroom, 1 bathroom	55-70
Freestanding houses	19.2%	962	R680 000 - R780 000	1.5 bedrooms, 1 bathroom	60 - 70
	12.8%	641	R800 000 - R1.1 million	2 bedrooms, 2 bathroom	80 - 90
	11.0%	550	R1.2 million - R1.5 million	3 bedrooms, 2 bathrooms	110-130
	7.3%	367	R1.6 million - R2.3 million	4 bedrooms, 3 bathrooms	130-160
	7.1%	356	R2.4 million+	4+ bedrooms, 3+ bathroom	160-200
Total	**100.0%**	**5 000**			

SOCIAL HOUSING LAND USE DEMAND ASSESSMENT

7

7 SOCIAL HOUSING LAND USE DEMAND ASSESSMENT

7.1 INTRODUCTION

This section of the report focuses on the social housing market, with the objective of estimating the development potential within the designated area. In order to reach this objective, the supply and demand for social housing residential facilities within the market area should be identified and assessed in terms of current trends. Subsequent paragraphs highlight the following main headings in order to determine the social housing development potential:

7.2 SOCIAL HOUSING IN SOUTH AFRICA

As part of reviewing affordable housing in a South African context, reference is made to the comprehensive plan for the development of sustainable human settlements, the diversity of housing programmes and instruments, and a focus on social housing.

This information is aimed at providing a concise and short overview of affordable housing in order to contextualise the background and concept of affordable and social housing and the implementation of affordable / social housing in South Africa.

7.2.1 COMPREHENSIVE PLAN FOR THE DEVELOPMENT OF SUSTAINABLE HUMAN SETTLEMENTS

The Comprehensive Plan for the Development of Sustainable Human Settlements has been adopted and implemented as a framework to allow for a shift in perspective and implementation of housing. Historical policies and plans sought to implement housing without considering factors such as sustainability, economic development and socio-economic conditions which, in the context of the new plan, is directed towards creating a sustainable environment in which housing, security of tenure, access to services and infrastructure and future economic prosperity can be achieved.

Based on the medium-term vision of the plan, the following objectives are sought to be achieved:

- Accelerating the delivery of housing as a key strategy for poverty alleviation
- Utilising the provision of housing as a major job creation strategy
- Ensuring that land and housing can be accessed by all as an asset of wealth creation and empowerment
- Leveraging growth in the economy
- Combating crime, promoting social cohesion and improving the quality of life for the poor
- Supporting the functioning of the entire single residential property market to reduce duality within the sector by breaking the barriers between the first economy residential property boom and the second economy's property slump and
- Using housing delivery as an instrument for the development of sustainable human settlements, in support of spatial restructuring.

The plan seeks to have a comprehensive approach to housing delivery in South Africa and has sought to support the entire residential housing market by covering the entire market, providing individual housing solutions, increasing private sector participation, effectively and efficiently provide housing financing and creating links between the primary and secondary residential property market.

Apart from housing programmes in action pre-2004, additional programmes have been introduced and includes the upgrading of informal settlements, enhanced

range of housing typologies, better located housing projects, focusing on inner city areas, including social and economic infrastructure, and improving housing amenities.

The plan has also set out to improve the role and functions of local government in housing and the instruments, communication and financing of projects. The streamlining of governments role along with good governance, limiting maladministration, and improved planning and implementation are core elements which seek to enhance how housing delivery is done.

7.2.2 HOUSING PROGRAMMES AND INSTRUMENTS

The following table outlines current housing programmes and instruments utilised in the delivery of sustainable human settlements.

Table 7.1: Housing Programmes and Instruments

	Housing Programme	Description
	Integrated Residential Development Programme	The IRD programme facilitates the development of integrated human settlements in well-located areas that provide convenient access to urban amenities, including places of employment. The programme also aims to create social cohesion
	Upgrading of Informal Settlements	The programme seeks to upgrade the living conditions of millions of poor people by providing secure tenure and access to basic services and housing
	Provision of Social and Economic Facilities	The funding mechanism seeks to providing funding for primary social and economic facilities in housing projects where funding is not available
	Housing assistance in Emergency Circumstances	The provision of emergency housing in the event of emergency or disaster situations. The housing provided is temporary
	Social Housing Programme	The programme seeks to address spatial inequalities by allowing secure tenure to households that prefer mobility because of rental accommodation. The programme is applicable to restructuring zones which are identified as areas of economic opportunity and where urban renewal / restructuring impacts can best be achieved
	Institutional Subsidies	The social housing programme is isolated to restructuring zones, whereas the institutional subsidy is aimed at providing affordable rental units in areas not part of restructuring zones
	Community Residential Units Programme	The CRU programme is aimed at affordable rental stock not covered by the social housing and institutional subsidies programmes. The programme considers the poorest market segment and provides residential options in government owned hostel facilities
	Individual Subsidy Programme	This Programme provides access to state assistance where qualifying households wish to acquire an existing house or a vacant serviced residential stand, linked to a house construction contract through an approved mortgage loan. These properties are available in the normal secondary housing market or have been developed, as part of projects not financed through one of the National Housing Programmes
	Rural Subsidy: Communal Land Rights	The Programme thus deals with the rules for housing subsidies for housing development on communal land registered in the name of the state or which will be held by community members subject to the rules or custom of that community
	Consolidation Subsidy Programme	The programme provides for the completion of houses on the serviced sites
	Enhanced Extended Discount Benefit Scheme	To support decisions made regarding the transfer of pre-1994 housing stock and is intended to stimulate and facilitate the transfer of public housing stock to qualifying occupants

	Housing Programme	Description
	Enhanced People's Housing Process	Assists households who wish to enhance their houses by actively contributing towards the building of their own homes. The process allows beneficiaries to establish a housing support organisation that will provide them with organisational, technical and administrative assistance. Training and guidance on how to build houses are also supplied
	Farm Residents Housing Assistance Programme	Provides capital subsidies for the development of engineering services- where no other funding is available, and adequate houses for farm workers and occupiers in a variety of development scenarios. The Programme attempts to address the wide variety of housing needs of people working and residing on farms by providing a flexible package of housing models to suit the local context

Source: National Housing Policy and Subsidy Programmes, Department of Human Settlements, 2010

7.2.3 SOCIAL HOUSING – STATUS OF THE SECTOR REPORT

The following section is aimed at providing a concise overview of the extent to which social housing has impacted on the affordable and government sponsored housing context in South Africa. The information aims to provide background and a trend analysis of social housing as an active role-player in housing.

❖ BROAD OVERVIEW AND DIRECTION

The importance of social housing as an active role-player in the context of South Africa's subsidised housing market has grown in recent history. The perception that social housing can be an active agent to address South Africa's ability to deal with urbanisation challenges is gaining traction. The idea that social housing can also contribute to resolving issues related to growing inequality, urban poverty and spatial fragmentation is key and cornerstone to the concept.

Within the context of other housing programmes in the country, social housing is the only delivery agent that can directly provide housing options at desired densities that enhance spatial transformation, public transport efficiency and urban inclusivity.

According to the SHRA State of the Sector Report 17/18, a demand shift is occurring in the country's urban areas whereby rental accommodation is sought after by market participants such as youth, the aged, single woman, migrant workers, foreigners, non-qualifiers of RDP and people on RDP waiting lists.

The shift, according to the report, is in part driven by factors such as: the country's low economic growth; city in-migration; inadequate supply of affordable housing; the cost of transport and an expanding youthful population.

❖ POLICY CHANGES

According to the State of the Sector Report, two policy developments have arisen that impact on the role and function of social housing in South Africa. The first being the Integrated Urban Development Framework which identifies that affordable rental housing, specifically social housing, is important in terms of integrated investment into well-located areas to increase urban amenity access by low- and moderate-income households.

Inner-city investment thus becomes an important role-player, and by extension social housing as an affordable rental housing option.

In close collaboration with the IUDF, the New Africa Agenda focuses on the planning of cities and settlements so that they can be areas where inequality is reduced, inclusive and sustainable economic development is achieved, and protection of the environment is promoted.

Additionally, the South African housing programme is shifting towards a focus on informal settlement eradication, affordable housing and social housing. The purpose is to closely align to the principles of SPLUMA which considers well-located, integrated and sustainable developments linked to bulk and connector services and main transport arteries, and sound urban management.

The use of spatial development frameworks is thus also essential in urban management and the promotion of well-located land and areas that can support social housing activities. It thus becomes essential for local authorities to develop

SDF's in line with the guidelines and principles of SPLUMA in order to effect greater change in affordable housing provision.

Other important policy and legislative changes include:

Rental Housing Amendment Act 35 of 2014	The amendment further elaborated on the responsibilities of landlord and tenant. It also required each province to establish a Rental Housing Tribunal, to adjudicate complaints between landlords and tenants relating to alleged unfair practices
Rules made by the SHRA	The transfer of social housing stock is guided by the following principles: ✓ The need to retain social housing stock to meet the current needs and the reasonably foreseeable needs for social housing. ✓ The rights and interests of the tenants must not be prejudiced by a transfer of social housing stock or rights and they should not be in a less favourable position as a result of the transfer and ✓ A suitable SHI willing and able to take over the social housing stock must be identified. The disposal of social housing stock will only be permitted if: ✓ There is sufficient alternative social housing stock within a reasonable distance from the social housing stock to be disposed to meet the needs of the community, including qualifying tenants of social housing stock proposed to be disposed of ✓ The economic rationale for the proposed disposal is that it is no longer economically viable for the social housing stock to be retained and maintained as such. Entities applying to become a social housing institution will be accredited according to two levels, full or conditional accreditation
Adjustment of Restructuring Capital Grant (RCG) parameters and Income Bands	The RCG has been increased to R155 000 per unit. The primary market income band has been raised to R5 500 household monthly income and the secondary market income band has been raised to R15 000 household monthly income.
Additional Restructuring Zones	Additional restructuring zones have been approved by the Minister. The inclusion of many new Restructuring Zones has occurred in smaller and secondary urban towns across the country.
Relocation of Institutional Subsidy	Cabinet approved that, with effect from 1 April 2017, there should be a single social housing capital funding stream, which must be located at the SHRA. This has resulted in the top-up portion for social housing from the Institutional Subsidy ("IS") as contained within the Human Settlements Development Grant being shifted from the provincial departments responsible for human settlements to the SHRA.
Relocation of the Community Residential Units (CRU) Grants for New Build initiatives	The Human Settlements MINMEC resolved on 9 June 2017 to transfer the funding and programme management of the new build option under the CRU Programme to the SHRA.148 New build initiatives, catering for low income (earning R 1500 - R 3500) people, will now fall within the social housing programme, enabling accredited SHIs to exercise control and management over the stock. The intention is for CRU units to be fully funded by the CCG

❖ SOCIAL HOUSING SECTOR PERFORMANCE

According to the SHRA Quarterly Report, Quarter 1 2023, there are 84 accredited Social Housing Institutions (SHI's) in the SHRA's accreditation register, with 8 of the institutions fully accredited, while 76 are conditionally accredited.

Out of the accredited institutions, 6 are actively involved in construction projects, and 29 conditionally accredited institutions are managing ongoing projects. However, 41 conditionally accredited institutions do not currently have any projects under their management.

In terms of geographical distribution, the majority of the accredited SHI's (42%) are situated in Gauteng, followed by Kwa-Zulu Natal, which accounts for 28.5% of the total. When combined, these two regions make up a substantial 70.5% of all the SHIs registered with the SHRA.

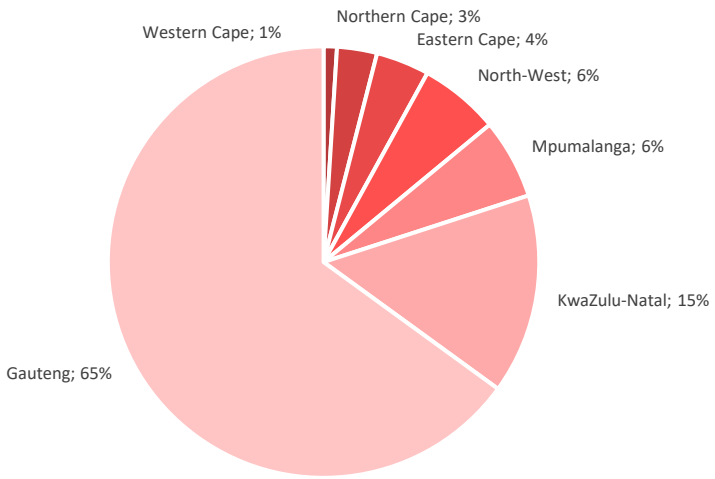
Table 7.2: Fully and Conditionally Accredited Social Housing Institutions

Province	Fully Accredited		Total
Eastern Cape	5	0%	1
Free State	1	0%	1
Gauteng	35	0%	2
KwaZulu-Natal	22	0%	4
Limpopo	2	20%	5
Mpumalanga	5	40%	5
North-West	5	14%	7
Northern Cape	1	4%	24
Western Cape	7	9%	35
Total / Average	**83**	**10%**	**84**

Source: DEMACON ex SHRA 2024:Q1 Quarterly Report

During the reviewed period, two projects obtained accreditation. Concurrently, certain projects were excluded from the pipeline, while 11 new projects were added and registered. As of the first quarter of 2023, the pipeline consists of a potential of 33 773 housing units distributed across 69 distinct projects. Among these projects, 34 were submitted by Organ of State (ODAs), while accredited Social Housing Institutions (SHIs) and Municipal Owned Entities (MoEs) submitted 35 projects. The majority of pipeline projects, totalling 64%, are situated in Gauteng Province.

Figure 7.1: ODA's Provincial Pipeline Split



Source: DEMACON ex SHRA 2024:Q1 Quarterly Report

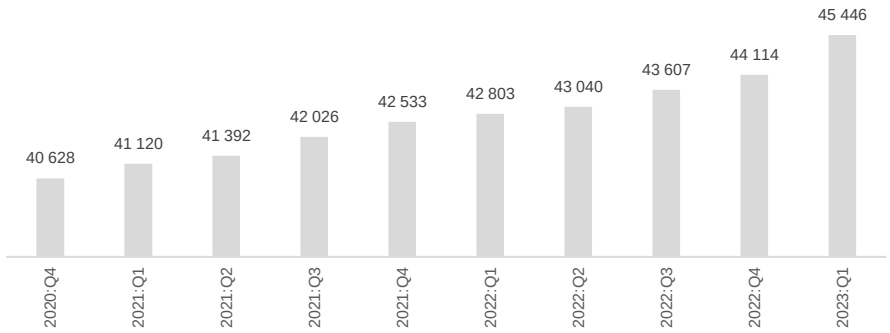
Table 7.3: Pipeline Projects as of December 2022

Province / Municipality	Number of Projects	Number of Units
Gauteng	42	19 111
KwaZulu-Natal	9	5 376
Western Cape	6	3 272
Nort West	4	2 722
Eastern Cape	4	3 091
Mpumalanga	3	940
Northern Cape	2	923
Limpopo	2	742
Total	**72**	**36 177**

Source: DEMACON ex SHRA 2023/24 Annual Performance Plan

As for the project pipeline, it saw significant activity: by the end of the third quarter, 62 projects were in progress, anticipated to yield 29 601 units. Subsequent to this, two projects were removed for reasons such as withdrawal or failing to meet requirements, but 12 new projects were added in the current quarter, bringing the total to 72 projects with a potential of 36 177 units. This translates to an approximate investment of R15 billion, considering a grant quantum of R426 308 per unit. However, many projects falter during the pre-screening phase due to various issues like inefficient organizational structures and expired purchase offers, which means some projects will ultimately be excluded from the pipeline after all support efforts have been exhausted.

Figure 7.2: Units Under Management



Source: DEMACON ex SHRA 2023/24:Q4 Quarterly Report

For the period under review 3 066 units have been completed against a set target of 3 200 with a shortfall of 134 units. This brings the units completed to 13 885 (77%) against the MTSF target of 18 000 units with a shortfall of 4 115.

Table 7.4: Units Completed – 2023/24:Q4

FY	Q1	Q2	Q3	Q4	TOTAL
2019/20	111	590	1 010	1 299	3 010
2020/21	0	377	715	764	1 856
2021/22	643	806	520	802	2 771
2022/23	771	825	531	1 055	3 182
2023/24	375	526	1 566	599	3 066
TOTAL					13 885

Source: DEMACON ex SHRA 2023/24:Q4 Quarterly Report

2 961 units were tenanted in the period under review against the target of 3 200, with a negative variance of 239 units. This would bring the number of units tenanted to 12 610 in the current MTSF period. The following projects were tenanted within the 4th quarter:

Table 7.5: Units Tenanted – 2023/24:Q4

FY	Q1	Q2	Q3	Q4	TOTAL
2019/20	514	485	954	2 059	4 012
2020/21	-	227	431	327	985
2021/22	479	387	258	933	2 057
2022/23	478	772	498	850	2 598
2023/24	419	809	521	1 226	2 961
TOTAL					12 610

Source: DEMACON ex SHRA 2023/24:Q4 Quarterly Report

The Free State province's performance with respect to its MTSF target has been subpar; however, there has been notable progress in convening PSC meetings. Currently, the province stands at 31% achievement relative to its MTSF target. At present, no new projects have been registered in the SHRA pipeline. However, one project has been presented before the PSC. This project is located at Raceway Park and is expected to yield a total of 912 units. It is important to highlight that this project still requires registration in the SHRA pipeline to advance further.

Table 7.6: Provincial Engagements

Province	MTSF Target	Delivery Agents	Number of Projects	Approved Units	Unit Completion 2019/20	Unit Completion 2020/21	Unit Completion 2021/22	Unit Completion 2022/23	Unit Completion 2023/24 YTD	Closing Balance
Eastern Cape	1 296	2	2	605	452	385	0	0	0	459
Free State	1 296	3	3	1 488	0	0	0	13	0	1 283
Gauteng	6 606	21	38	15 800	2 140	1 049	1 627	2 775	1 929	+2 914
KwaZulu-Natal	2 052	3	4	3 876	0	0	0	0	452	1 802
Limpopo	720	1	1	494	0	164	330	0	0	226
Mpumalanga	1 026	2	2	852	114	0	0	0	0	912
Northern Cape	360	1	1	372	0	0	0	0	0	360
North-West	1 908	2	2	1 501	0	0	144	0	168	1 740
Western Cape	2 736	8	8	2 954	304	258	670	394	517	593
Total	18 000	43	59	27 942	3 010	1 856	2 771	3 182	3 066	13 885

Source: DEMACON ex SHRA 2023/24:Q4 Quarterly Report

The number of approved housing units has significantly increased in Gauteng and Western Cape, leading to a rise in the overall completion of units. However, during this fiscal year, 1,596 units from CCG agreements were either withdrawn or terminated. Concerns have emerged due to a redistribution of provincial projects away from Gauteng and Western Cape, attributed to factors such as a lack of new or approved projects, slow progress, or issues with provincial, municipal, or debt funding. There is a firm commitment to ensure that underperforming provinces will complete at least two social housing projects by the end of the MediumTerm Strategy Framework (MTSF).

In contrast, the Eastern Cape, Mpumalanga, and Northwest have experienced a decline in both the number of delivery agents and housing units. Meanwhile, Gauteng has made significant progress, increasing its projects from 33 in the previous quarter to 38, with the possibility of further increases pending additional project approvals for SHIP 14B. Having surpassed its MTSF unit completion target, Gauteng is set to help achieve the overall MTSF goal and offset the shortfall from other provinces.

SOCIAL HOUSING UNIT RENTAL SEGMENTATION

The Social Housing State of Sector Report, 2020, reveals that approximately 32% of social housing unit households earn a monthly income below R3 500. Around 52% of units are occupied by residents earning monthly incomes between R5 501 and R15 000, while the remaining 16% are occupied by households earning more than R7 500 per month. Only 1% of units were allocated to residents earning less than R1 500 per month.

Social Housing Institutions (SHIs) have noted an increase in household incomes, particularly in metropolitan regions. However, this has created a disconnect between household incomes and the qualifying social housing income bands. Consequently, it is becoming increasingly challenging to attract low-income households to take up units in social housing projects as they no longer fall within the R1 500 to R3 500 income bracket. The largest portion of households now earn between R5 501 and R15 000 per month.

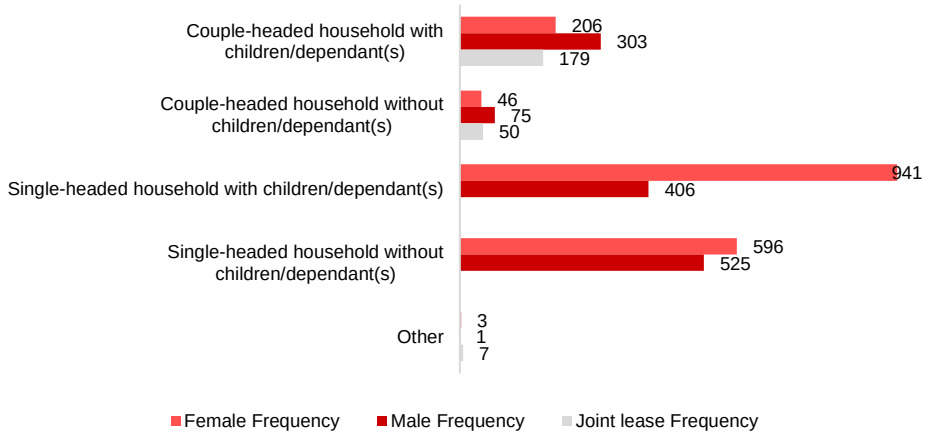
Table 7.7: Distribution of tenants' household income (at entry)

Household Income (Rand per month)	Households		Target Market		Monthly Income (Rands)		
	Frequency	%	Frequency	%	Average	Min	Max
Less than R1 500	31	1%	31	0.9%	1 083	315	1 400
R1 500 – R3 500	622	18%	1 089	32%	2 700	1 500	3 500
R3 501 – R5 500	467	14%			4 593	3 501	5 500
R5 501 – R7 700	740	22%	1 754	51.5%	6 648	5 503	7 700
R7 701 – R11 300	555	16%			9 369	7 710	11 300
R11 301 – R15 000	459	13%			13 159	11 310	15 000
R15 001 – R17 500	176	5%	532	15.6%	16 209	15 007	17 500
R17 501 – R20 000	137	4%			18 845	17 502	20 000
R20 001 – R22 500	66	2%			21 100	20 002	22 500
R22 501 – R25 000	59	2%			23 825	22 572	25 000
More than R25 000	94	3%			34 882	25 046	83 219
Total/Average	**3 406**	**100%**	**3 406**	**100%**	**9 257**		

Source: DEMACON ex SHRA Social Housing State of Sector Report, 2020

Out of 3 338 households, 1 121 units were classified as single-headed households without children, comprising 34% of the total. Among these, 596 units were headed by female leaseholders, while 525 were headed by male leaseholders. Additionally, 5.1% of units were rented by couples without children or dependents, while 38.7% were households with no financial dependents. Couple-headed households with children accounted for 688 units.

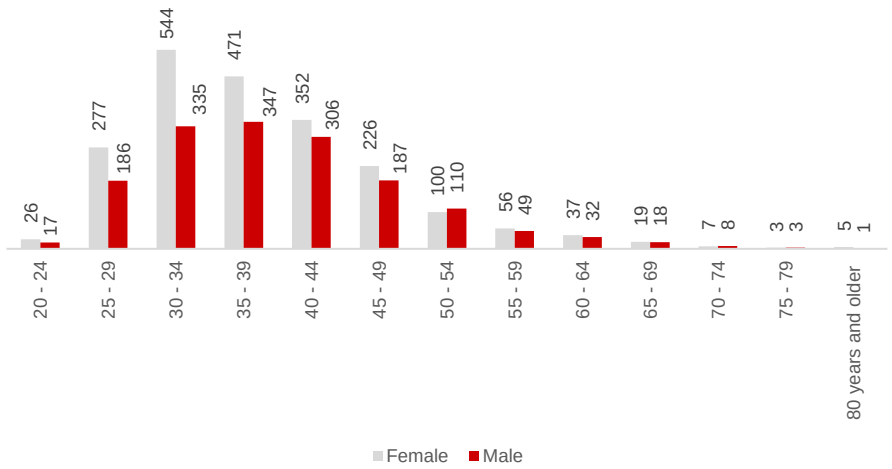
Figure 7.3: Household Type and Gender of Main Leaseholder



Source: DEMACON ex SHRA Social Housing State of Sector Report, 2020

Female leaseholders' number 2 123 (57%) and male leaseholders 1 599 (43%). Social housing tenants are relatively young and of working age, with very few people at or post-retirement age. Only 64 leaseholders (1.8%) were older than 65 years.

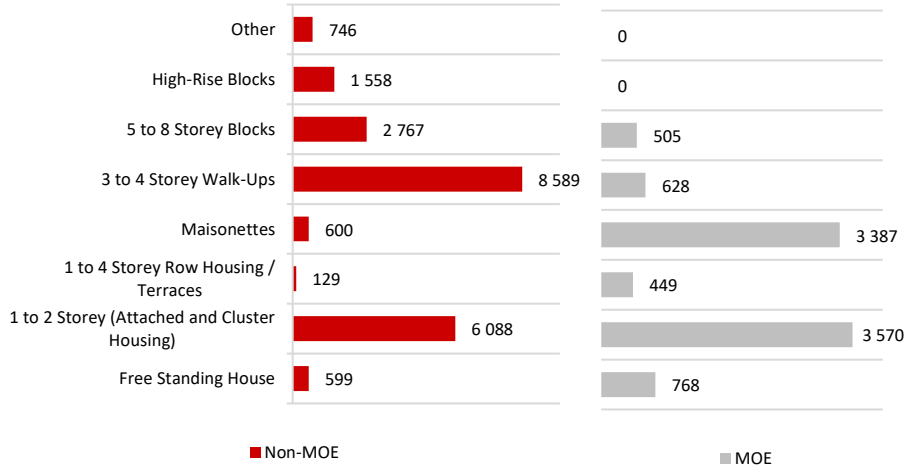
Figure 7.4: Age and Gender of Main Leaseholders



Source: DEMACON ex SHRA Social Housing State of Sector Report, 2020

Accordingly, the building typology for social housing units as supplied by SHI is illustrated in the figure below.

Figure 7.5: Number of Units per Building Typology (Q3 2017/18)



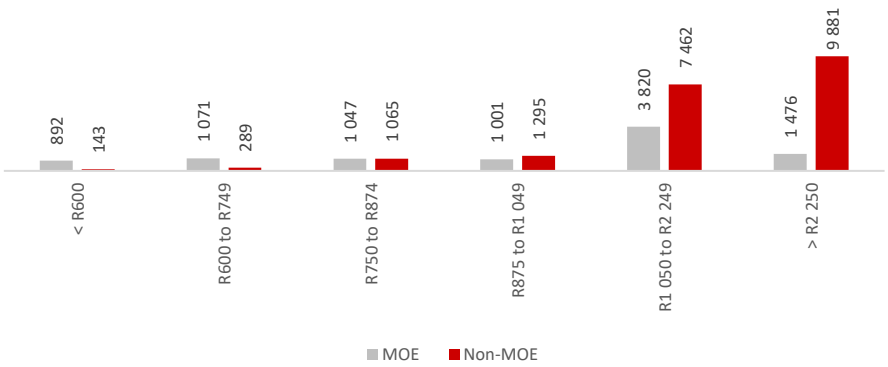
Source: DEMACON ex SHRA (Adapted), 2021

The report indicates that SHIs have focused on containing costs by developing 1 to 2 and 3 to 4 storey buildings, which are the most common types of structures in social housing developments. It was observed that 30% of units, typically smaller and cheaper, were allocated to the primary social housing market, while 70% of units, which are larger, were allocated to the secondary social housing market.

Operational costs of SHIs have generally exceeded the operational cost benchmark of R1 350 per unit per month set by the SHRA. Approximately 68% of SHIs have been unable to contain costs below the SHRA benchmark. MOEs, on average, incur operating costs of approximately R4 031 per unit per month, while Non-MOEs have an average operating cost of approximately R1 532 per unit per month. Municipal-backed funding may contribute to the higher operating expenditure of MOEs compared to Non-MOEs. SHIs noted that meeting the SHRA benchmark is only feasible with a larger stock of managed units.

The following data illustrates the number of units provided per average rental price in social housing projects.

Figure 7.6: Number of Units per Rental Segmentation (Q3 2017/18)



Source: DEMACON ex SHRA (Adapted), 2021

The data illustrates that social housing units are primarily rented for more than R1 050 per month. Due to infrequent changes to qualifying income bands for primary and secondary social housing markets, yearly rental escalations can push the rental prices of units beyond the scope of the defined income bands.

Rental collection rates at social housing projects vary significantly among institutions and provinces. For example, in the Northern Cape and Limpopo Provinces, rental collection rates are below 30% (13% and 28%, respectively). In contrast, KwaZulu-Natal and Mpumalanga Provinces have higher rental collection rates of 65% and 68%, respectively. Gauteng and Free State Provinces report even higher rates at 83% and 86%, respectively. The Eastern Cape has the highest rental collection rate at 93%, while the Western Cape reports full collection at 100%.

7.2.4 LESSONS AND TRENDS

Table 7.8: Lessons and Trends

Diverse Social Housing Project Location and Forms	Local Government Support	Government and Staffing	Growth Potential
• The recent adjustments to the social housing grant quantum and income bands may alleviate some of the locational and tenanting challenges for social housing projects. • Local government commitment to social housing and making land and buildings available for social housing in appropriate locations is critical for success within the sector. • Projects that are well-located have high demand. It is more difficult to attract primary market tenants to projects in suburbs owing to the lack of access to public transport and other social and economic amenities. As such, project location is key to achieving the developmental objectives of social housing. • Integrated and well-located state subsidised human settlements projects offer opportunities to extend social housing.	• Municipalities to understand the nature, objectives, and form of social housing, as well as how social housing financing works and how social housing can be supported by municipalities. • Municipalities to have clear social housing policies in place across municipal departments to enable the sector. • A need to engage further regarding the arguments for and against SHIs operating as municipal-owned-entities. • Strong and accountable local government that creates an enabling environment for social housing through the provision of land and infrastructure and supporting financial provisions.	• The SHRA should consider providing training for SHI Boards to further promote good governance and accountability within the sector. • There is a need for peer-to-peer learning of governance best practices within the sector and to explore alternative means of building strong relations with the public sector to inviting representation on SHI Boards. • Passionate staff who understand and are committed to social housing play a significant role in meeting the desired outcomes of the sector. • There may be opportunities for SHIs to share certain staffing services, such as legal services.	• The changing of the revised RCG subsidy quantum is unlocking investment within the social housing sector. However, in the absence of inflation-indexing the gains will be lost in the next few years. The anticipated payment of VAT will also undermine the gains made within the sector. • The lack of equity partners within the sector and the reliance on own resources for equity contributions by SHIs slows the pace of delivery within the sector. • A combination of seed funding, interest free and subsidised bridge funding, favourable finance from the NHFC, the subsidies and strong cost containment mechanisms are important to allow SHIs to develop a good quality product at a scale which enables them to invest its own equity into projects, allowing for continued growth. • Appropriate land availability, particularly state land which can be made available on affordable terms is critical to unlocking growth within the sector.
Company Diversification	**Social Challenges**	**Project Land Availability**	**Project Planning Approvals**
• Cross subsidisation of private and social housing rentals is an innovative way to encourage private sector participation within the social housing sector. • SHI involvement in the private rental market has implications for corporate governance with some SHIs establishing separate company vehicles to implement their private sector initiatives. • A concern is that the SHIs may over time decrease their participation in the social housing sector and focus on the private rental market. • The social housing financing model will play an important role in maintaining the attractiveness of the sector to participants.	• Social housing project planning needs to be evaluated in terms of the accommodation of social facilities and services. • The operational costs of SHIs need to factor in social services spend. • SHIs have demonstrated innovative approaches to mobilising public and private sector partnerships in addressing the social challenges. • There is a need to monitor the provision or facilitation of social services by SHIs and to share best-practices.	• Well-located land for social housing is costly and the making available of publicly owned land at a subsidised cost or lease for projects is extremely beneficial and enhances the financial viability of both the projects and the SHIs. • Accessing, releasing, and packaging land for social housing is time-consuming and this time needs to be factored into target setting and project planning. • Local government support for land release for social housing is a critical success factor for projects within the sector.	• Metros that have adopted clear SDFs that prioritise social housing and social housing policies are in a stronger position to fast-track social housing development approvals. • The lengthy and costly project preparation phase places financial pressure on SHIs, with SHIs needing to be in a strong enough position to cope with these demands or partnering with private developers and municipalities to share this cost and risk. • The additional costs of green servicing standards on social housing projects should be calculated and factored into the social housing financing model. • At the same time, however, embracing the green building certification programme may open new financing opportunities for SHIs.

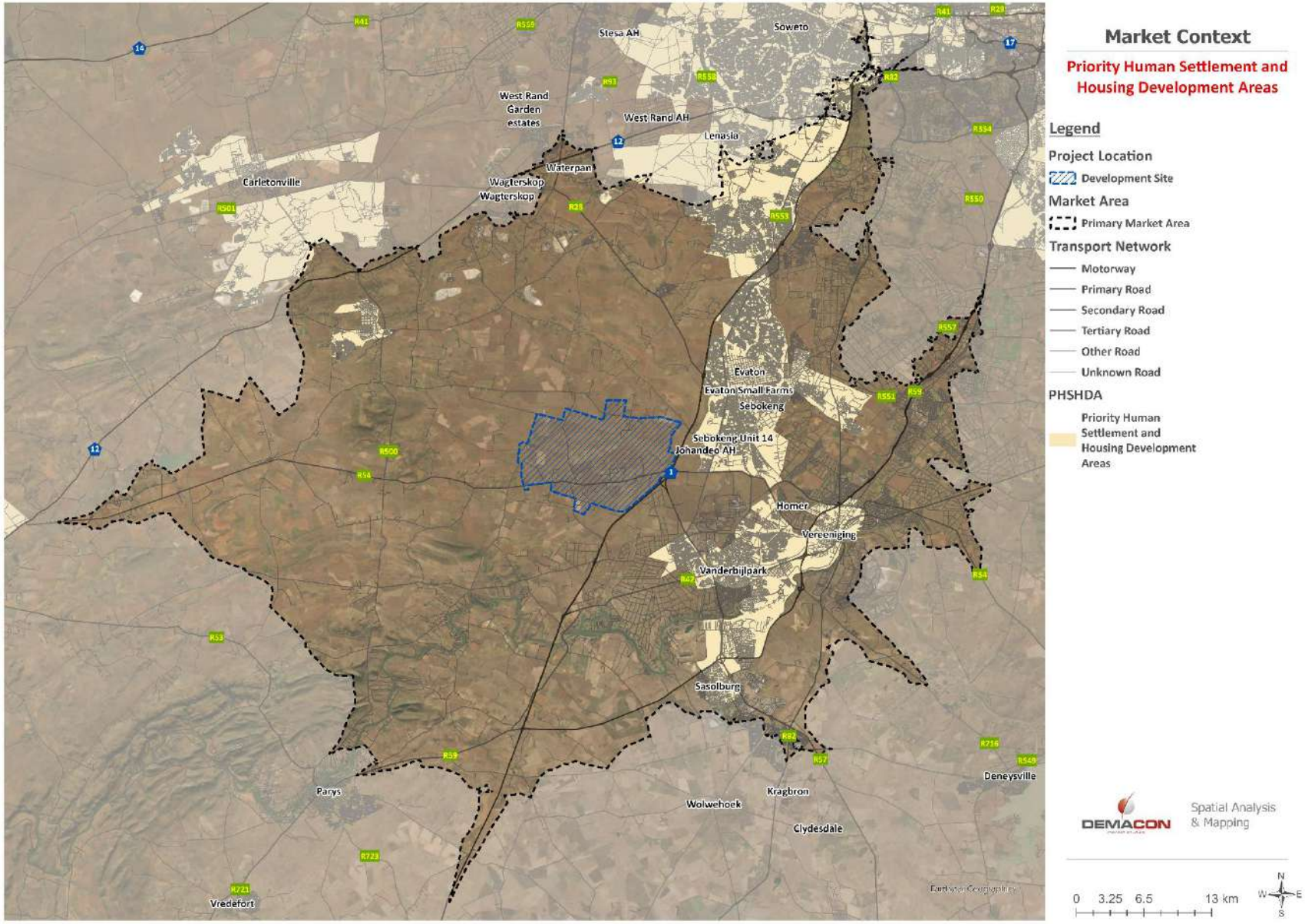
Project Financing	Speed of Tenanting Projects	Sub-Letting	Tenant Evictions
• Social housing grants are critical to the existence of the sector. Participation in the sector is directly linked to the availability of the grants. • There seems to be a movement from SHIs being wholly dependent on public funding, to being able to raise some of their own equity and securing additional private sector finance particularly amongst the more established SHIs that are already managing and developing new stock. • Local government can successfully incentivise and enhance the feasibility of social housing with appropriate benefits such as rates rebates, discounted development contributions, subsidised land and crowding in of other development grants.	• Project tenanting is not identified as a major challenge by the case-study SHIs, except in instances where external factors (such as delays in the electrification of projects) delay project completion and therefore the speed of tenanting. In these instances, there are major financial implications for the SHI. The project approval process should be further strengthened to ensure all conditions precedent are met. • The reason for the linking of the final RCG payment to tenanting is understood by the SHIs. However, payment delays are easier to manage in phased projects where the SHI is receiving rental income from part of the project that assists with cash flow. It may be necessary to review the final RCG payment system to alleviate the financial pressures experienced by the SHIs. • Criteria for qualifying for social housing are more easily met in the secondary than primary markets. The nature of the primary market is vulnerable, and the target set for this market may be unrealistic. The shifting of the income bands has addressed this problem to some extent.	• In these instances, the lease agreements may be signed by "front people" and not the actual tenant. This results in a problem where not all tenants should qualify for social housing. The SHI stated that: "There are all sorts of cars in the social housing complexes that don't belong there." Some research has proposed that more flexible practices around sub-letting should be allowed to enhance affordability in the inner-city areas, such as Johannesburg.30 The challenge with this approach is that the regulation over the sector delivering social housing units to the intended target markets will be weakened. One of the SHI's noted that it can provide for dual letting a unit between two parties, in this instance both parties are vetted by the SHI.	• Given the vulnerability of the social housing tenant (especially primary) market, developmental measures to assist tenants in need are necessary and should be a requirement of all SHIs. • Given the necessity of evictions as a last resort instrument, legal services may be considered as a shared service for SHIs, possibly at provincial levels to achieve greater financial efficiency.

Community Support for Social Housing Projects

- There is a general need for community education on social housing.
- SHIs and municipalities need to engage with the broader community in which a project will be located to address any concerns, highlight the benefits of such projects, and facilitate the integration of the social housing project with the broader community.
- SHIs who partner with developers who take responsibility for contractor and construction management can relieve the SHI of this burden.
- Job allocation processes need to be both transparent and proactively managed to minimise potential community conflicts.
- The land allocation process for social housing projects by the municipality or SHI must be transparent.

Source: DEMACON ex SHRA (Adapted), 2021

Map 7.1: Restructuring Zones & PHSHDAs



Source: DEMACON ex SHRA (Restructuring Zones) and Department of Human Settlements (PHSHDAs)

7.3 Social Housing Supply

There are currently no social housing projects within the primary market area.

7.4 Social Housing Demand Modelling

7.4.1 Defining Market Demand

Social Housing Income Bands

Two significant adjustments were recently effected to broaden the reach of the SHRA captive market segments:

1. Firstly, the inclusion of a so-called "deep down" market segment (households earning R800 to R3 500 per month) – the market segment formerly targeting the CRU market segment (Community Rental units).
2. Secondly, further adjustments to the existing SHRA income bands
   a. The threshold of the sub-primary market's household income limit has been adjusted from R1 500 to R1 850 per month.
   b. The threshold of the primary market's household income limit has been increased from R5 500 to R6 700 per month.
   c. The threshold of the secondary market's household income limit has been increased from R15 000 to R22 000 per month, in order to align with the National Housing Programme commonly known as the Financed-Linked Individual Subsidy Programme (FLISP).

In order to purposefully estimate demand for housing, a multi-layer data analysis is undertaken – the purpose is to define the target market and its trends based on various data sources at designated points in time. This is done to understand the possible future direction of growth and market demand based on credible and substantiated historic data (such as Statistics South Africa) and considering any potential trends that influence potential buyers of the product.

Sustainable Long-Term Demand

The multi-layered approach allows for estimating medium- to long-term sustanable demand. Sustainable demand referes to demand that may exist within the market area that would enable social housing institutions and projects to become sustainable over a medium- to long-term period, i.e capacity of a market area and its asociated economy to generate empoyment that in turn provides the target market with the capability to rent a social housing unit.

Economic factors influence the sustainabaility of semi-subsidised housing schemes, i.e. social housing. Social housing projects are depdent on a target market that has the ability to pay rental rates. Without income generated from rental rates, social housing projects would become financially unfeaseable due to not having operational capital. It is thus important to consider the effects that economic factors such as economy size and growth trends; and labour absorption trends have on the social housing target market within market area.

In the context of the preceding, the growth of the housing market demand is calibrated by considering, not only long-term demographic growth attributes, but also considering economic growth trends and labour absorption capabilities of the local economy. The calibration ensures that demand estimations generated for housing is sustained demand and not short-term high growth with medium- to long-term under performance.

Diagram 7.1: Sustainable Long-Term Demand Concept

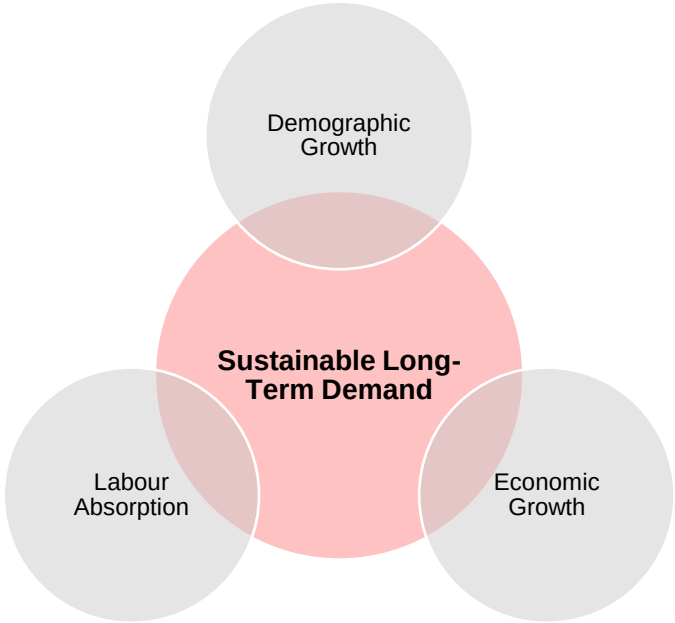
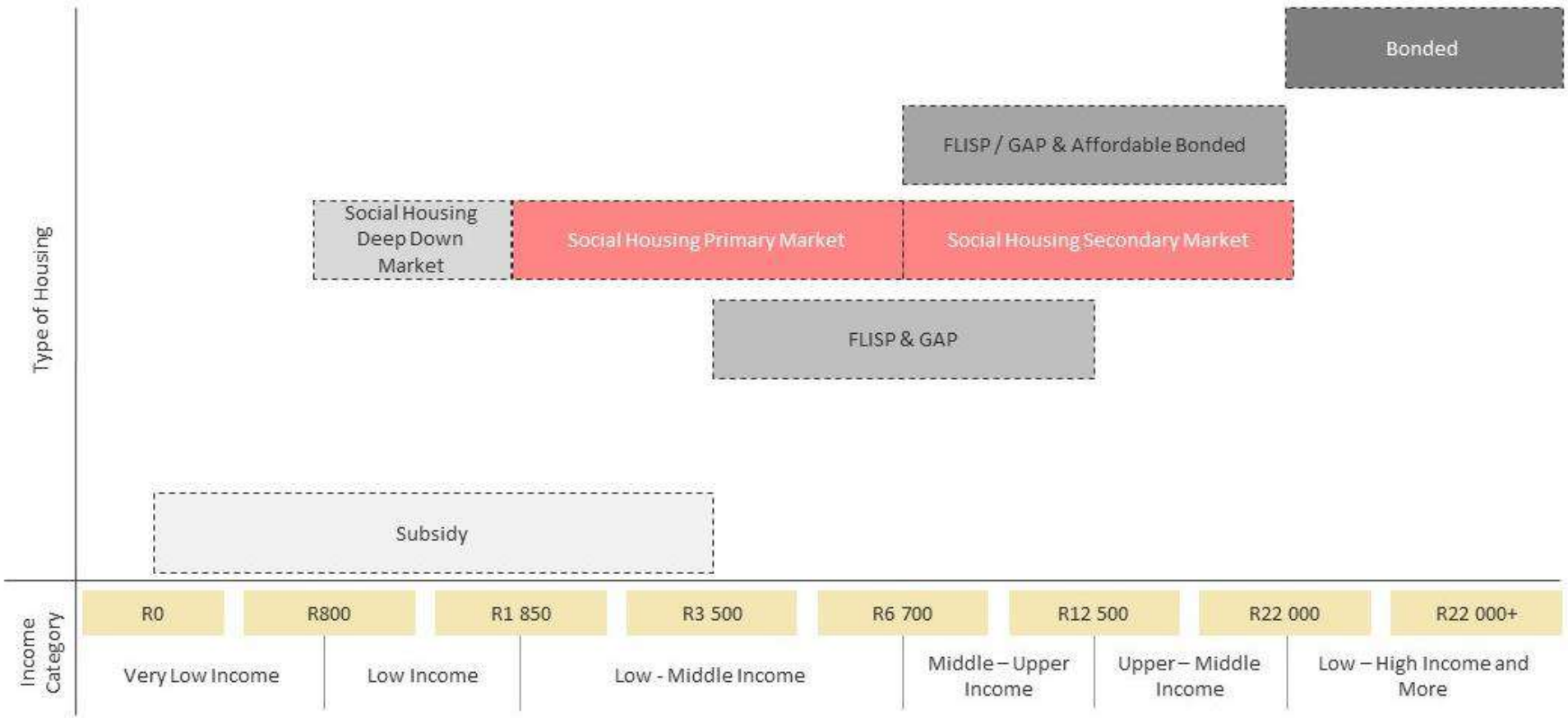


Diagram 7.2: Housing Income Categories



Source: DEMACON, 2024

7.4.2 SOCIAL HOUSING DEMAND MODELLING

TOTAL MARKET			
Additional Households: Base Year +5 Years		13 584	A
Annualised Market Growth (Full Housing Spectrum)		2 717	B
Social Housing Market Segment		48.4%	C
Social Housing Demand per Annum		1 316	D
Annual Secondary Market Contribution (Units / Annum)	Min	1 072	E
	Max	1 787	F
Total Annual Social Housing Market Take-Up	Min	2 388	G
	Max	3 103	H
PROJECT SPECIFIC – SOCIAL HOUSING UNITS			
Project Social Housing Units		3 100	I
Forecast Market Share of Total Market Sales	Min	10%	J
	Max	20%	K
Project Forecast Total Annual Take-Up Rate (Units / Annum)	Min	239	L
	Max	621	M
Years to 80% Take-Up (Social Housing Units)	Min	5.0	N
	Max	13.0	O
	Avg	9.0	P
Optimum Point of Market Entry (OPME)		2028+	Q

Findings:

- The modelling portrays market-based take-up based on medium to long-term market growth trends.
- Under present market conditions, this segment of the market (48.4%) demands 2 388 to 3 103 units per annum (including new households and resales).
- Approximately **3 100 social housing units** could be developed and taken-up within the medium to longer term (9 years).
- A first phase of 800 to 1 000 units is recommended.

Figure 7.7: Project Optimum Unit Typology (Units)

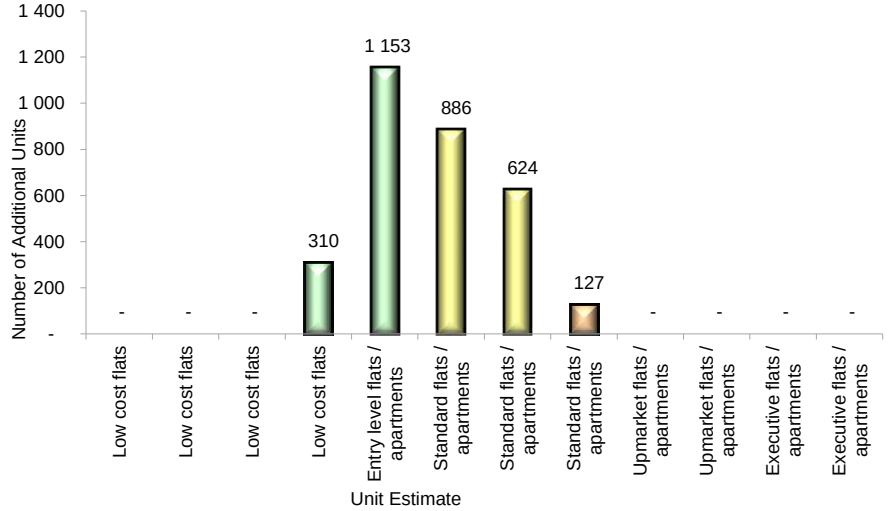
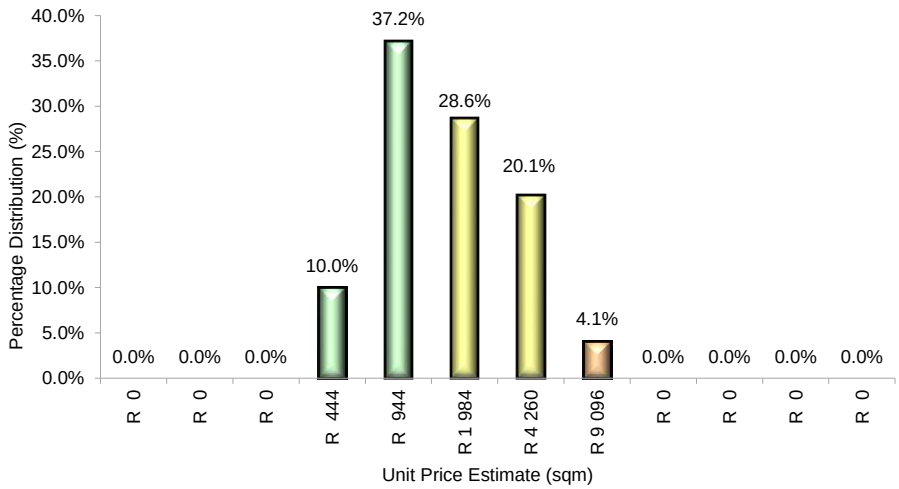


Figure 7.8: Unit Rental Estimate (Median Portfolio Values)



7.5 Gap Analysis and High Level Recommendations

This chapter provided an overview of the social housing market trends underlining the source market area. The following summarise the findings of the residential supply and demand in terms of the housing affordability and the net demand modelling.

❖ SUPPLY

- There are currently no social housing projects in the primary market area.

❖ GAP ANALYSIS

Development Type	Effective Market Gap	Development Propsect
Social Housing	Yes	Moderate to High

❖ DEVELOPMENT POTENTIAL

Social Housing Target Market Groups	SHRA Income Bands		SHRA Unit Split Aspiration	Market Reality*	Number of Units	Composition	Square Meters	Min Rental Rates	Max Rental Rates	Average Rental Rates
	Lower	Upper								
Sub-Primary	R1 850	R3 500	5%	32.9%	1 021	Bachelor	18m² to 25m²	R500	R945	R722
Primary	R3 501	R6 700	25%	30.2%	936	Studio	18m² to 25m²	R1 015	R1 943	R1 479
Secondary (Band 1)	R6 701	R11 300	25%	18.9%	585	1 Bedroom, 1 Bathroom	25m² to 35m²	R2 077	R3 503	R2 790
Secondary (Band 2)	R11 301	R15 000	30%	8.5%	265	2 Bedrooms, 1 Bathroom	42m² to 48m²	R3 729	R4 950	R4 340
Secondary (Band 3)	R15 001	R22 000	15%	9.5%	294	3 Bedrooms, 2 Bathrooms	52m² to 60m2	R5 250	R7 700	R6 475
Total					**3 100**					

**Note: The proposed configuration outlined above is project specific and based on the unique demand profile of the local market*

RETAIL LAND USE DEMAND ASSESSMENT

8

8 RETAIL LAND USE DEMAND ASSESSMENT

8.1 INTRODUCTION

Chapter 8 of the report provides an overview of the demand assessment for wholesale and retail trade land uses that can support the retail orientated land use opportunities of the Vaal Aerotropolis.

The purpose of the chapter is to estimate the development potential for wholesale and retail trade land uses at the Vaal Aerotropolis with the aim of measuring the potential market share of additional wholesale and retail trade space that the development could capture. The chapter ultimately seeks to establish whether a market gap exists that the airport can utilise as part of its long-term development opportunities and potential.

Subsequent iterations of the report will also incorporate a supply side perspective of the retail and wholesale market, in order to frame and highlight the retail and wholesale market demand in counter to the supply side considerations of the retail market.

The remainder of the chapter is discussed under the following main topics:

- Overview of the locational requirements for retail development
- Overview of key trends currently affecting the retail market
- Overview of the retail supply in the primary market area of the Vaal Aertropolis
- Defining retail and wholesale demand
- Modelling the medium- to long-term demand for additional retail and wholesale space
- Reporting the space demand results and identifying the potential market share the harbour could capture
- Providing an indication of the retail and wholesale market demand gap and development prospects.

8.2 GENERAL RETAIL MARKET CONSIDERATIONS AND TRENDS

The following section provides an overview of general retail market considerations and trends. The data provides an indication of current characteristics and trends that influence the retail and wholesale market.

8.2.1 RETAIL LOCATION REQUIREMENTS

The development and overall sustainability of a retail facility relies strongly on its location. The following location requirements determine the success of a retail facility:

- Visibility and exposure: Retail facilities should be highly visible and accessible to potential consumers. It should be in proximity to efficient road and transport networks.
- Accessibility: Retail facilities must be accessible to the local labour force as well as consumers. It should be accessible on a local and regional level, as well as on a site-specific basis referring to the ingress and egress from the development.
- Functionality & complementary: The centre should fit the urban context and should be functionally compatible.
- Sufficient buying power: Total disposable income of the market area population that is available to be spent at a specific retail facility.
- Competition: Existing shopping centres present competition and have an impact on the sustainability of future developments.
- Role & function in hierarchy: Should fit in with existing retail hierarchy of the area.
- Address value: Retail locates in areas where household expenditure is high, where it is accessible and visible.
- Growth: Growth in market population, disposable income, and retail support impact on developments.
- Traffic volume: Level of traffic volumes contribute to level of support and exposure.

	Visibility and Exposure		Competition
	Accessibility		Role and Functionality
	Functionality and Complimentary		Address Value
	Sufficient Buying Power		Growth
	Traffic Volume		

8.2.2 RETAIL MARKET TRENDS

This section provides an overview of key trends affecting the retail and wholesale trade market.

Consumer Price Index Downward Trajectory (StatsSA)	Annual consumer price inflation was 4,4% in August 2024, down from 4,6% in July 2024. The CPI increased by 0,1% month-on-month in August 2024. The main contributors to the 4,4% annual inflation rate were: • housing and utilities (4,8% and contributing 1,1 percentage points); • miscellaneous goods and services (7,0% and contributing 1,0 percentage point); • food and non-alcoholic beverages (4,7% and contributing 0,9 of a percentage point); and • transport (2,8% and contributing 0,4 of a percentage point).

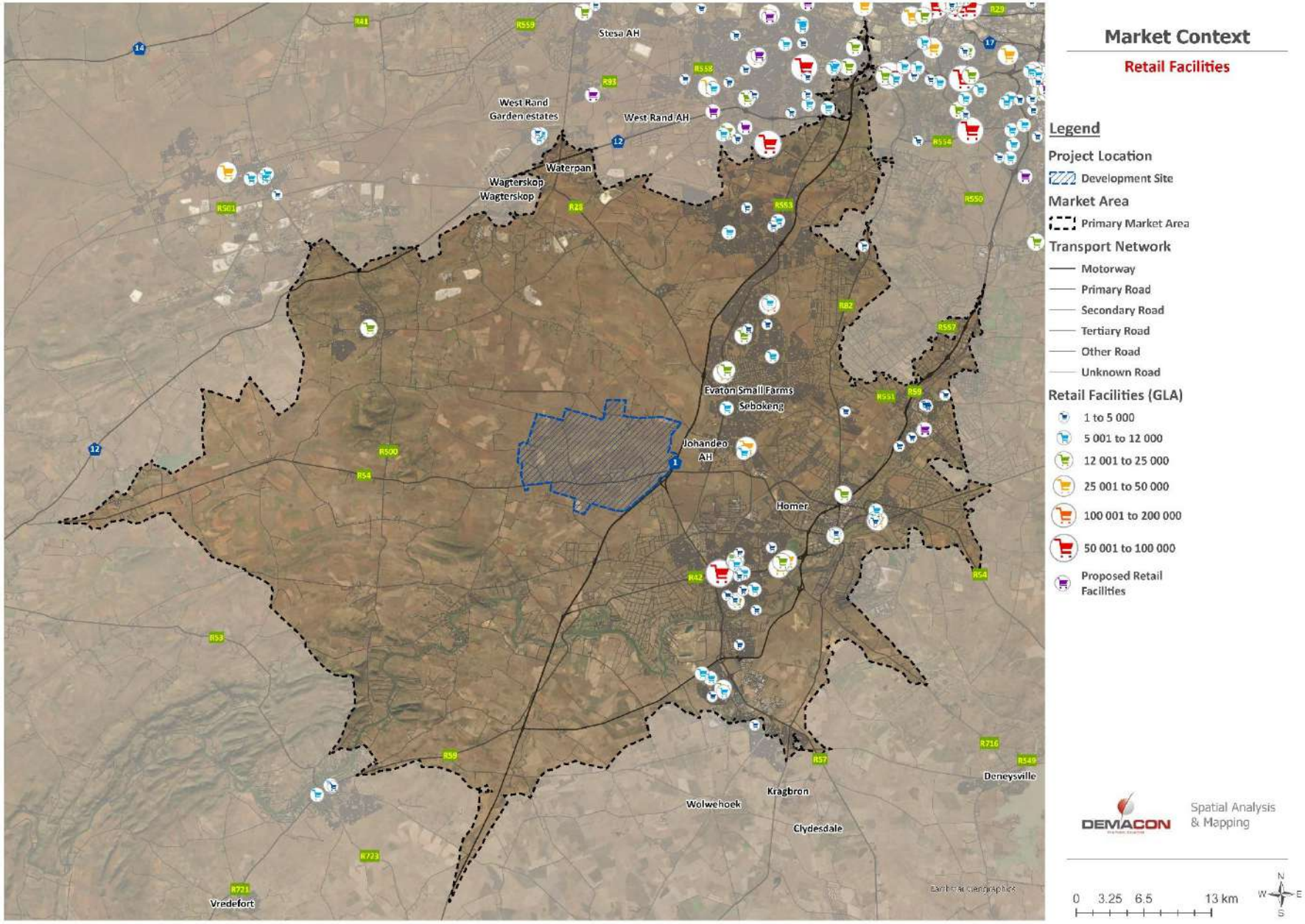
Retail Trad Sales Continue Positive Growth (StatsSA)	Retail Sales Growth
	• Measured in real terms (constant 2019 prices), retail trade sales increased by 3,2% year-on-year in August 2024. The largest positive contributor to this increase was general dealers (4,6% and contributing 2,1 percentage points)
	Contributors to Retail Sales Growth
	• Seasonally adjusted retail trade sales increased by 1,4% in the three months ended August 2024 compared with the previous three months. The largest contributors to the increase were:
	  • retailers in textiles, clothing, footwear and leather goods (4,6% and contributing 0,8 of a percentage point); and
	  • general dealers (1,1% and contributing 0,5 of a percentage point) –

Wholesale Trade Sales Continu to Decline (StatsSA)	Wholesale Trade Sales
	• Measured in nominal terms (current prices), wholesale trade sales decreased by 12,8% in August 2024 compared
	• with August 2023. The main negative contributors were dealers in:
	  • solid, liquid and gaseous fuels and related products (-33,6% and contributing -9,4 percentage points);
	  • construction and building materials (-21,8% and contributing -1,1 percentage points); and
	  • 'other' goods (-12,6% and contributing -1,0 percentage point) –

Key Trends Shaping the South African Retail Market in 2024

- Digital Transformation and E-commerce Growth: The pandemic has accelerated the shift towards digital platforms, making e-commerce a primary channel rather than a supplementary one. Major players like Takealot and Makro are expanding their digital footprints, while smaller retailers leverage social media and online marketplaces to reach broader audiences. This digital shift necessitates robust cybersecurity measures and efficient logistics to ensure a seamless customer experience.
- Omnichannel Retailing: Today's consumers demand a unified shopping experience across multiple channels—online, in-store, and mobile. Retailers are investing in technologies that integrate these channels, allowing customers to start their shopping journey on one platform and complete it on another. This seamless integration enhances convenience and drives customer loyalty.
- Sustainability and Ethical Shopping: South African consumers are increasingly environmentally conscious, influencing their shopping habits. There is a growing demand for sustainable products and ethical business practices. Retailers are responding by adopting eco-friendly practices, such as reducing plastic use, sourcing sustainable products, and supporting local suppliers. This trend not only appeals to environmentally conscious shoppers but also differentiates businesses in a competitive market.
- Advanced Payment Solutions: The adoption of advanced payment solutions like mobile wallets, contactless payments, and Buy Now, Pay Later (BNPL) options is transforming the shopping experience. Companies like Ozow are leading the way in providing innovative payment solutions that enhance convenience and security for shoppers. These technologies cater to a tech-savvy population, making transactions quicker and more efficient, which is crucial for both online and offline retail.
- Personalised Shopping Experiences: Leveraging big data and AI, retailers can now offer highly personalized shopping experiences. By analysing customer data, businesses can tailor their marketing strategies, product recommendations, and promotions to individual preferences. This personalization increases customer satisfaction and drives repeat purchases. Retailers are using data analytics to predict trends and manage inventory more effectively, ensuring that popular products are always in stock.

Map 8.1: Primary Market Area Retail Supply



8.3 Retail Demand Side Indicators

The demand-side dynamics within the market have been concisely described in preceding chapters, supported by a retail market growth assessment. An assessment of the net effective demand for additional retail floor space will be made in this chapter. A growth forecast, respectively for a five and ten-year horizon are provided based on economic, population and income growth prevalent in the market.

8.3.1 Defining Retail Demand

Retail demand modelling has become increasingly specialised over the past decade. One particular aspect that has changed is a notable shift away from broad based supply-demand estimations to multivariate, differentiated models. Contemporary models focus on specific expenditure patterns of selected SEM market segments. The demand and supply side of the retail market can be defined in terms of the following:

Defining Demand

Dret = f {Po; P%; Q; Y; Re; Cp; Sf}

Where:

Po = Population size
P% = Population growth
Q = Existing quality of retail space
Y = Household income
Re = Household expenditure patterns
Cp = Consumer preferences
Sf = Seasonality factors

Defining Supply

Sret = f {Dret; GLAret; R; Sc; Cc; Lu; Ia; Sp; Vret }

Where:

Dret = Demand
GLAret = Current rentable/useable area
R = Rent/m2
Sc = Competition
Cc = Construction cost
Lu = Surrounding land uses
Ia = Infrastructure availability
Sp = Speculative climate
Vret = Vacancy

8.3.2 Market Demand Modelling

The retail market is a derived demand. The primary demand drivers are community income and expenditure profiles. An important concept in retailing is the fact that different order size shopping centres cater to different consumer needs and hence, do not compete directly for market share. In this context, the objective of this sub-section is to assess the magnitude of retail development that can be sustained by the primary market area of the proposed project.

The retail demand estimations are conducted based on prevalent population and income growth trends (all values: 2024 constant prices). The demand estimations are considered conservative and realistic. Subsequent paragraphs indicate the market potential analysis of the proposed development. The retail market estimations are based on a trade area-based technique.

The following tables summarise the current and forecast market expenditure and the retail floor space for retail facilities within the retail node. Demand values are presented for 2024, 2029 and 2034 (all values: constant 2024 prices).

Retail Expenditure

The primary catchment population spends approximately **R14.3 billion per annum** (2024 net present value) on retail goods and services**.**

Table 8.3: Market Area Retail Expenditure (2024 to 2034)

Retail Category	2024 R/Annum	2029 R/Annum	2034 R/Annum
Groceries, Butchery & Liquor	R7 851 046 055	R9 140 858 677	R10 642 568 744
Fashion & Footwear	R1 275 242 842	R1 484 746 684	R1 728 668 959
Furniture, Homeware & Interior	R602 856 943	R701 897 567	R817 209 123
Hardware & DIY	R981 585 254	R1 142 845 427	R1 330 598 301
Entertainment, Bookstores, Gadgets & Hobbies	R193 045 100	R224 759 601	R261 684 333

Retail Category	2024 R/Annum	2029 R/Annum	2034 R/Annum
Cell phone & Electronics	R434 351 475	R505 709 102	R588 789 748
Restaurants, Coffee Shops & Takeaways	R543 961 828	R633 326 841	R737 373 225
Health & Beauty	R1 355 405 638	R1 578 079 061	R1 837 334 487
Sport & Outdoor Equipment	R643 539 562	R749 263 748	R872 356 879
Other Personal Goods & Services	R414 725 496	R482 858 860	R562 185 544
Total	**R14 295 760 194**	**R16 644 345 568**	**R19 378 769 342**

Source: DEMACON Demand Modelling, 2024

Market Retail Floor Space Demand

The total demand threshold increases from 499 877m² GLA in 2024 to 613 435m² GLA in 2034.

Table 8.4: Market Area Retail Floor Space Demand (2024 to 2034)

Retail Category	2024 R/Annum	2029 R/Annum	2034 R/Annum
Groceries, Butchery & Liquor	207 700	230 085	254 883
Fashion & Footwear	39 178	43 400	48 078
Furniture, Homeware & Interior	22 966	25 441	28 183
Hardware & DIY	37 394	41 424	45 889
Entertainment, Bookstores, Gadgets & Hobbies	6 566	7 274	8 058
Cell phone & Electronics	14 774	16 366	18 130
Restaurants, Coffee Shops & Takeaways	14 391	15 942	17 660
Health & Beauty	46 102	51 071	56 575
Sport & Outdoor Equipment	21 889	24 248	26 862
Other Personal Goods & Services	14 106	15 627	17 311
Services	74 812	82 875	91 807
Total	**499 877**	**553 753**	**613 435**

Source: DEMACON Demand Modelling, 2024

Market Area Demand Estimation

In the context of residual nodal capacity calculations, indications suggest, that the optimum centre size could ideally measure approximately ±47 188m² GLA.

Table 8.5: Recommended Centre Options

	Rand or m²
Total annual growth in the market	9 163m²
Centre share of growth (sqm/a)	687m²
Optimum point of market entry (OPME)	2034+
Additional growth in demand for centre (sqm)	8 246m²
Retail GLA at OPME	40 126m²
Services GLA at OPME	7 062m²
OPME Centre Size (sqm)	**47 188m²**
On-site job creation	1 573
Retail sales potential (2024 NPV)	R1 451 750 482
Total capital investment (2024 NPV)	R896 579 202
Parking bays required	2 831
Parking infrastructure & landscaping cost	R67 385 005

Source: DEMACON Demand Modelling, 2024

Demand Modelling Findings

- In the context of the above calculations, indications suggest, that there is retail potential of approximately ±47 188m² GLA
- The optimum point of market entry for the centre could be 2034+
- In the event that the full retail capacity as calculated is constructed and operational, annual sales of approximately R1.5 billion (based on benchmark

trading densities and the baseline analysis) could be achieved and ±1 573 permanent on-site jobs could be created.

The following table provides a summary of the potential tenant composition and space utilisation based on the market demand outcome outlined by Table 8.4.

Table 8.6: Ideal Tenant Composition

Retail Category	Size in m² GLA
Groceries, Butchery & Liquor	23 058
Fashion & Footwear	4 349
Furniture, Homeware & Interior	2 550
Hardware & DIY	4 151
Entertainment, Bookstores, Gadgets & Hobbies	729
Cell phone & Electronics	1 640
Restaurants, Coffee Shops & Takeaways	1 598
Health & Beauty	5 118
Sport & Outdoor Equipment	2 430
Other Personal Goods & Services	1 566
Total	**47 188**

Source: DEMACON Demand Modelling, 2024

8.4 Gap Analysis and High-Level Recommendations

This Chapter of the report focused on a demand assessment of retail and wholesale land uses at the Vaal Aerotropolis.

A gap analysis for the retail and wholesale market shows that a gap exists within the socio-economic market area of the harbour for additional retail and wholesale space over the medium term. The market gap is the result of the steady growth of the residence consumer market as well as the seasonal demand for retail goods that originate from tourists visiting the area. Market entry for retail and wholesale uses could be from 2027 onwards.

Development Type	Effective Market Gap	Development Propsect
Regional Centre	Yes	Moderate

The following summarises the demand potential of retail space as part of the proposed development. The purpose is to highlight the opportunities and potential configurations that could be considered as development opportunities for the project.

- Based on the purchase power of the catchment area a centre of ±47 188m² GLA can be sustained. This centre would be classified as a regional centre.
- Two or more grocery anchors could be included.
- The development prospects are rated moderate.
- The optimum point of market entry is 2034+, once the development has gained traction.
- A retail centre of ±47 188m² could create approximately 1 573 permanent on-site jobs.
- Ample parking should be provided at a ratio of at least 4 to 6 bays per 100m² retail GLA.
- The centre should provide ±2 831 parking bays.
- The parking area should be accessible, convenient, paved and well-lit in the evenings.
- Performance will be dependent on, inter alia, appropriate tenant composition.
- High levels of security measures should be put in place. This could include:
    - Video Surveillance Systems through CCTV throughout the centre (including in the mall, parking lots, elevators, near ATM machines)
    - Alarm System in shops
    - Trained Security Guards
    - Adequate lighting, particularly in parking lots and walkways
    - Locking mechanisms for all shops
    - Backup power system.

INDUSTRIAL AND WAREHOUSING LAND USE DEMAND ASSESSMENT

9

9 INDUSTRIAL AND WAREHOUSING LAND USE DEMAND ASSESSMENT

9.1 INTRODUCTION

Chapter 9 of the report provides an overview of the demand assessment for industrial and warehousing land uses.

The purpose of the chapter is to estimate the development potential for industrial and warehousing land uses at the Vaal Aerotropolis site with the aim of measuring the potential market share of additional industrial and warehousing space that the site could capture. The chapter ultimately seeks to establish whether a market gap exists that the Vaal Aerotropolis can utilise as part of its long-term development opportunities and potential.

Subsequent iterations of the report will also incorporate a supply side perspective of the industrial market, in order to frame and highlight the industrial market demand in counter to the supply side considerations of the industrial market.

The remainder of the chapter is discussed under the following main topics:

- Overview of industrial market concepts
- Overview of key trends affecting the industrial market
- Overview of local industrial activity
- Defining industrial and warehousing demand
- Modelling the medium- to long-term demand for additional industrial space
- Reporting the space demand results and identifying the potential market share the harbour could capture
- Providing an indication of the industrial and warehousing market demand gap and development prospects.

9.2 GENERAL INDUSTRIAL MARKET TRENDS

The following section provides an overview of general industrial market concepts. The data provides an indication of current characteristics and trends that influence the industrial market.

9.2.1 INDUSTRIAL PARKS

Industrial parks simply refer to developments dedicated to accommodating and clustering industrial related activities in a designated area and subsequently managing these as one entity. Industrial parks typically accommodate heavier industries in relation to activities in business parks which is associated with office and light industries. Industrial parks are therefore well-planned developments that can be easily managed and typically offers a more appealing environment with complementary facilities and services as opposed to traditional industrial areas. The key characteristics of industrial parks include:

- Developed according to a predetermined master plan
- Managed and governed by a single management body, whether the owner or an association of occupiers
- Subject to control exercised over the uses and activities, by means of zoning, title conditions and mutual agreements
- Subject to the compatibility of uses is protected to the advantage of the occupiers and the owners as well as the community in which the industrial park is located
- Reliant on access to various modes of transport and interconnected networks including roads and in certain cases, railway facilities.
- Accommodate a variety of complementary facilities and activities including parking, services, as well as eating and recreational facilities.

The following table summarises the key advantage and limitations of industrial parks for various parties in volved in the property sector

Table 9.1: Advantages and Limitations of Industrial Parks

Developer
• The development of an industrial site increases the value of adjacent sites. In an industrial park, the developer owns the adjacent sites and therefore enjoys the advantage of appreciation in value. • The developer hopes for greater returns from the development of an industrial park than from sales of the underdeveloped land. • The industrial park offers the possibility of scale advantages from a planning and cost viewpoint. • Sites and buildings in an industrial park are usually easier to market than individual sites or buildings.

- Financing an industrial park may be easier and better terms may possibly be obtained.
- The developer can determine the pace of development by phasing. The development success of an earlier phase also affects the success of later phases-he therefore controls his own future to a great extent.
- The developer of an industrial park requires exceptional skill and high capital cost. Capital often has to be invested for long periods before a return is obtained.
- The cost of improvements may be higher than in the case of individual sites, which are often served by existing roads and services.
- Requirements set by local authorities may be more restrictive than in the individual sites.
- If certain services (like access roads) must be provided by the local authorities it may happen that they are not provided according to schedule with the accompanying embarrassments and costs to the developer.
- The sustained enforcement of park standards and control measures is time-consuming and expensive. The developer is not involved in the short-term, but remains involved until the whole industrial park is completed and often afterwards as well.
- The developer cannot adjust easily to changing market circumstances.

Industrialist / Occupier

- Immediate availability of a variety of full-equipped spaces
- Possible scale benefits of development costs, as well as operating costs
- A choice of different site sizes, shapes and locations is usually possible in the industrial park.
- A wide variety of services (e.g., security, landscaping) is usually available.
- Pleasant working conditions and usually nearby-situated eating and recreation facilities for employees.
- Stability of environment and character
- Sites and buildings in an industrial park are usually easier to market, lease or sublet in the future, than individual sites or buildings.
- High cost. In spite of possible scale benefits, a specific industrialist may not always need all the services supplied in the industrial park.
- Control measures, which were initially acceptable, may later prove to be unnecessarily restrictive.
- Industrial parks are not suitable or acceptable for all industries (e.g., large chemical, steel or cement factories)
- Possible loss identity, especially in the case of large, nationally known enterprises.
- Traffic problems may arise if access roads prove to be insufficient.

Community

- Increased job opportunities, income and taxes.
- Orderly industrial development, with the least negative effort on the community.
- Diversification of the local economy.
- More economic utilization of municipal infrastructure.
- Insufficient planning of access roads may cause traffic problems
- Future growth of the industrial park may cause an overloading of municipal services

Given the mentioned definition of industrial parks, it is evident that industrial parks are planned and are therefore structured according to general functions / businesses that tend to cluster together in a particular location. The subsequent table provides an overview of the typical industrial park within the South African market.

	General or Composite Uses	The least specialised type of industrial park in which non-industrial uses are permitted and often encouraged. In some cases of the occupiers of the industrial park, like filling stations, retailers and catering facilities. However, if other uses are allowed unchecked, the unique character in the area park may be lost
	Exclusive Industrial Parks	Industrial parks exclusively occupied by industries are the most common and also a rule the most attractive developer. They do not compete with commercial developments in the area, for instance, and offer the greatest possible basis for industrial development.
	Single Use Industrial Parks	The accommodation of only one type of manufacturing or distributive operation offers the potential of greater possible returns as a result of specialisation. On the other hand, they are exposed to greater risks, since changes in the specific industry's operation, standards or even preferences may take the whole park obsolete. A specialised variant of the single use industrial park is the single industry park, which accommodates only one industrial enterprise. Since it does not house a community of industries, it is not strictly definable as an industrial park. However; it does not illustrate the importance of aesthetics and compatibility with the environment for modern industries
	Office / Mixed Use Parks	Office parks are based on the same principles of developments as industrial parks, with the difference that office uses only are allowed (e.g., at Barlow Park in Sandton).As a result of the need for office accommodation in the immediate vicinity of industries,

	an office park may be developed directly next to an industrial park (e.g. at City Deep, Johannesburg). Office accommodation may of course also be developed in an industrial park, if the rights allow for this. Besides limited offices inside the factory building or warehouse, office buildings as such may be placed inside the industrial park (e.g., the Isando Industrial Park in Kempton Park or Kya Sands Business Park, Randburg).
Research / Technology Parks	A research park or technology park is an industrial park closely connected with local universities or other research bodies, so far that technology, and especially high-level technology, can be conveyed and commercially applied. The first and probably the best known example is the Stanford Research, sometimes also known as Science parks, are also found in Britain, France, Israel, Australia and Taiwan. An extensive bibliography is provided in AURPP (1997). Because Research Park has to be located in an area where there is a considerable concentration of higher education institutions, there are only a few locations in South Africa which are suitable for purpose. Examples include Perserquor Techno Park in Pretoria (Techno forum 1992), the Techno Park in Stellenbosch (Malan 1988) and the Capricorn industrial and technology park in Muizenberg.
Airport Industrial Parks	The facilities offered by airports for transport, as well as international and national travellers, create attractive possibilities for industrial parks in the immediate vicinity of an airport (especially for industrial exhibition space). Fisher (1962, 1966) offers information on the development of this type of industrial park. The potential contribution of an airport to economic development in a region could be greatly enhanced by means of the judicious application of the principles of airport economics.

Industrial parks tend to cluster together similar and/or complementary industrial activities and the type of industrial space on offer is also highly influenced by the location of the industrial parks e.g., warehousing and distribution centres require greater centrality to market while noxious manufacturing industries will require a more peripheral location given its harmful nature.

The subsequent section provides greater insight into the typical types of industrial space within the market.

9.2.2 Types of Industrial Space

The industrial property market consists of various types of buildings, each offering specialised industrial space, designed to accommodate a particular function. As such, the industrial property market typically offers the following industrial space:

- Manufacturing space
- Warehousing space
- Bulk warehousing and distribution space
- Cold storage
- Research and development space
- Data centres.

The subsequent table provides a brief overview of the types of industry space typical in the industrial property market.

Table 9.2: Types of Industrial Space

Manufacturing Space	
	• Manufacturing industrial space refers to buildings used for the production or assembly of goods. This includes light manufacturing activities and heavy industrial activity, noxious industries and specialised manufacturing activities. • Heavy and specialised industrial activities tend to occupy larger building than light manufacturing activities. The more specialised the manufacturing process, the more costly the industrial building as opposed to light manufacturing properties that are simpler and more affordable. • These buildings often have highly specialised infrastructure such as specialised drainage, ductwork, ventilation systems, loading docks as well as specialised finishes and heavy electrical power, depending on the type of manufacturing process and products produced.

- Super specialised manufacturing space is often custom built for the needs of a specific tenant.

Warehousing Space

- Warehousing space typically consist of large, single-storey buildings with higher ceilings, multiple dock and loading doors that facilitate the loading and unloading of goods.
- These buildings are usually associated with storage and distribution functions where the bulk of the unit is dedicated to the storage of product or inventory. As such, the office component is typically comparatively smaller.
- Stands are large with ample yard space to accommodate superlink and interlink trucks.
- Small businesses often prefer to use warehousing space for both their manufacturing and office needs, especially in cases where more storage space is required.
- Warehouses are typically not air-conditioned, although some tenants might require specialised HVAC systems and tenants might install their own air-conditioning.

Bulk Warehousing and Distribution

- Bulk warehousing and distribution centres are also large, single-storey buildings with higher ceilings, multiple docks and loading doors, but are much larger than ordinary warehouses.
- These bulk warehousing and distribution warehouses cater for the needs of the logistics and distribution industry.
- The office component within these buildings typically covers 5% to 10% of the overall unit size as the bulk of operations are dedicated to warehousing.
- Lower parking ratios than other industrial types.
- Location is a key factor for these units, given their function. Proximity to key transportation infrastructure is crucial.

Research and Development Space

- Industrial buildings used for research and development typically require a mix of office, testing areas and smaller warehousing space, depending on the tenant.
- These buildings are often preferred by companies doing research and development in the technology and biotechnology industries
- These facilities typically require more space and more power than traditional office and healthcare facilities, hence their need for industrial space.

Data Centres

- Data centres are a very specialised type of warehousing building.
- These facilities are used to house rows and rows of computer servers, massive amounts of cabling and telecommunications equipment.
- Typically, these data centres have large warehousing components but have very few employees, given the nature of the hosted activity.
- Data centres require large amounts of electricity from reliable and consistent power sources. It is essential to include backup generators as well as extensive security systems given the high value nature of such operations.
- These buildings will also require customised flooring and raised for cabling and cooling of equipment and a robust supplemental HVAC systems to keep servers and equipment cool.
- These facilities are usually custom built for the tenant to cater to their specific requirements.

Flex Space

- Flex space refers to industrial buildings that were designed to be flexible and to be able to accommodate a variety of office and industrial uses. These buildings can be easily retrofitted to meet a company's specific needs.
- These buildings are ideal for companies that require office space together with larger storage space or warehouse access. range of office and warehouse uses
- Flex buildings will usually have a lower ceiling clear height than traditional distribution warehouse buildings but will still be larger than traditional office space. In addition, a larger proportion of the unit will be dedicated to office functions.
- Flex buildings also have more parking and nicer landscaping than manufacturing and warehousing buildings and operate like a business park but offers access to larger warehousing and storage facilities or loading docks and doors. .
- These units are popular for start-ups as they are typically more affordable than traditional office space.
- Most flex buildings have some type of overhead loading doors, but tenants should be sure the loading situation works for their use
- Flex space is often occupied by research and development tenants, data centres and trade related tenants. Often have more dedicated office space – often more than 30% - incudes research and development, data centres and showrooms
- Can work well for office tenant like start-up businesses as rates are typically lower compared to traditional office space.

Industrial parks typically offer a variety of unit sizes to accommodate different industrial activities. Generally, the market refers to mini, midi and maxi units, relating to the unit size. More recently, mega industrial units, predominantly associated with warehousing and distribution activities have also been increasingly evident in the industrial property market. Typically, smaller scale, light manufacturing activities will make use of smaller, more affordable mini and midi units while larger scale manufacturing and distribution related activities will require large space to accommodate their functions. The subsequent diagram provides an overview of the typical industrial unit size classifications generally used in the market.

Mini Units

Less than 500m²

Smaller scale manufacturing activities that require affordable industrial space.

Midi Units

500m² to 1 000m²

Light manufacturing and smaller warehousing needs

Maxi Units

1 000m² to 10 000m²

Typically used for specialised manufacturing and the logistics and distribution industry.

Mega Unit

Larger than 10 000m²

Specialised warehousing space for large-scale, regional distribution functions.

9.2.3 New Age Warehousing and Distribution Space

Globally and locally, the use of e-commerce as a preferred shopping method has increased significantly. This trend in turn had a major impact on the warehousing and distribution industry, including the layout and design requirements of warehouses. This increased demand for warehousing space specifically for the logistics and distribution industry, has resulted in a new, modern type of warehousing space to emerge in the market. The subsequent section provides an overview of key trends driving the change of traditional warehousing space.

Size

- Demand for larger, higher capacity warehouses, especially by major supermarket groups to be used for distribution purposes.
- New warehousing space features higher ceilings to allow for higher stacking to allow for greater warehouse capacity. Ceiling heights have increased to 12m as opposed to the norm of 8m to 10m.

Technology

- Warehouses have become increasingly technologically advanced and access to fast, reliable fibre internet has become the standard.
- Technology – Internet of things and internet
- E-commerce is driving demand and drive future uptake

Location

- Demand for warehouse and distribution space – need for new, modern and efficient distribution centres
- Demand for urban locations given the increase in las-mile logistics and its demand for well-located warehousing space.
- Demand for last-mile, instantaneous delivery intensified warehouse demand in areas closer to urban centres.

Cold Storage

- Cold storage has become an essential component in the last-mile logistics industry. Consumers purchase goods from supermarkets via e-commerce platforms and cold-storage is essential.

Eco-Conscious

- Warehouses are encouraged to incorporate eco-conscious elements and key features include LED lighting, sky-lights for improved lighting, grey water systems and in-house recycling facilities.

9.2.4 INDUSTRIAL LOCATION CONSIDERATIONS

Location is by far the most important consideration in the development of an office park. Location is, in the first instance, linked to the accessibility to freeways and highways, which in turn improves the accessibility to the CBD, other residential areas and airports. A series of locational requirements are considered during industrial development considerations. These location requirements include are summarised in the schematic below.

Table 9.3: Industrial Location Factors

Traditional Location Factors	Contemporary Location Factors
Accessibility	Established address / monitored node
Functional & complementary uses	Visibility
Address Value	Emerging commercial node
Proximity to educated labour force	Directional growth of the area
Moderate to Higher SEM Profile	Availability of land
Perceived level of security	Proximity to freeways / major provincial routes

9.3 NATIONAL INDUSTRIAL MARKET TRENDS AND INDICATORS

The industrial property market had a decent 2022, with nominal rentals for space of 500 m2 rising by 5.3%, well up from the 2.2% for 2021. Regionally, Cape Town had the best year, but growth in most of the other industrial conurbations also picked up. However, the story is not so bright in real terms, after deducting building-cost inflation (BER BCI) of about 11%. Turning to fourth-quarter survey results, rental growth remained stable at about 5.7% compared to the fourth quarter of 2021. This means the industrial sector is still comfortably the best placed of the major non-residential sectors. The market has been boosted by continued low vacancies, especially for warehouses linked to logistics due to the online sales boom. That said, all retail sales recovered strongly, rising to above pre-Covid levels.

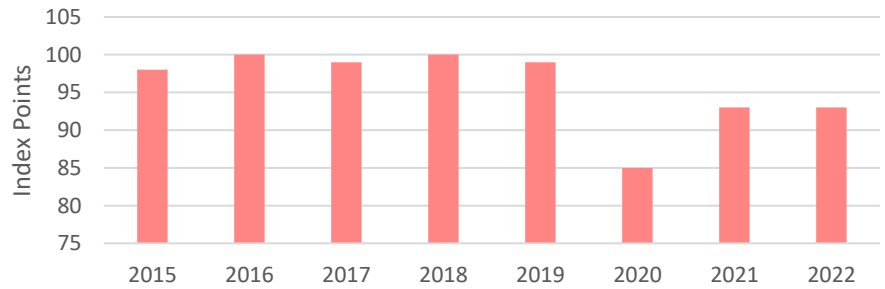
Another key reason for the outperformance of industrial property is the largely non-speculative nature of developments. A negative factor has been the struggles of traditional manufacturing. But the flipside of the coin is that imports that replace SA manufactured goods also need storage.

Note that ultra-large premises like logistics warehouses of 10 000 m² and greater are not reported on in Rode's Report. Thus, the relatively good rental growth in the industrial sector reported in this issue does not incorporate this new generation of super buildings. These buildings are generally custom built, meaning the rentals tend to be higher than market rents as the rent will be a function of building- construction and land costs and the initial return required by the developer. One would expect the sharp rise in building-cost inflation to also put upward pressure on new-build rentals.

Major Factors Impacting the Industrial Market

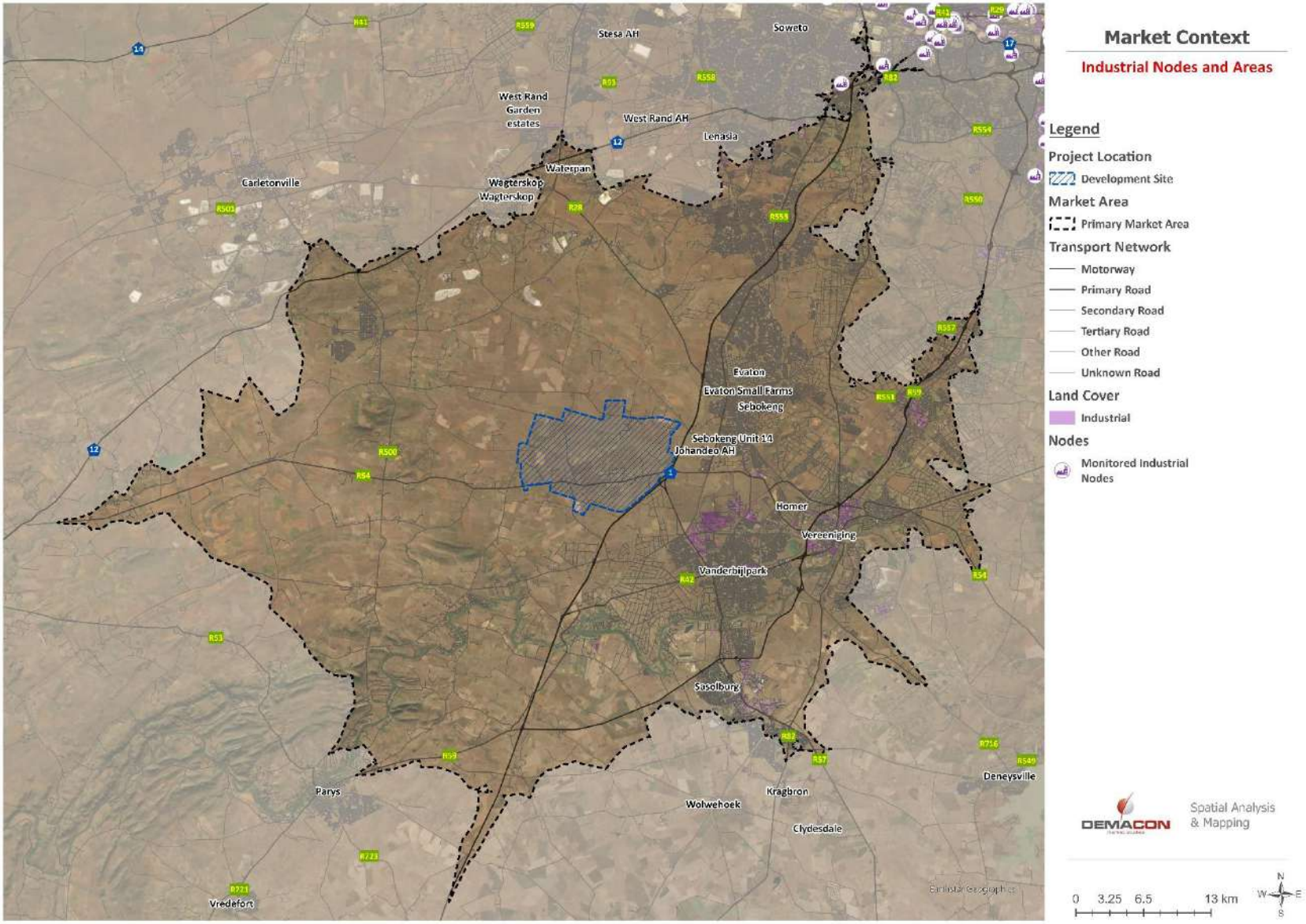
The key driver of industrial property is the performance of the manufacturing and retail sectors. The manufacturing sector underpins the demand for industrial space for manufacturing production purposes, while the retail sector underpins the demand for warehouse space and manufacturing. So far in 2022 the manufacturing sector has failed to build much on 2021's recovery, with production for the first ten months of 2022 up only 0.3% compared to the corresponding period in 2021, as shown in the chart below. Production was negatively impacted by electricity supply disruptions, flooding in KwaZulu-Natal, the Transnet strike and elevated input cost (think energy and metal prices). Production levels are also well below pre-Covid levels, which is indicative of the sector's underperformance.

Figure 9.1: South Africa Manufacturing Production January to October (2019 = 100)



Source: DEMACON ex StatsSA, 2024

Map 9.1: Primary Market Area Industrial Supply



9.4 INDUSTRIAL MARKET DEMAND SIDE INDICATORS

The following section is focused on estimating the market demand for industrial and warehousing space within the local economy, given macro and local-economic trends and drivers.

The purpose of the section is to highlight the key elements that inform market demand modelling, estimating the market demand for industrial and warehousing space, and provide an indication of market gap and development potential of industrial and warehousing space in line with possible market entry periods for industrial real estate development.

9.4.1 DEFINING INDUSTRIAL AND WAREHOUSING DEMAND

Industrial and warehousing real estate is a crucial component of the modern economy, supporting a wide range of businesses from manufacturing and logistics to distribution and storage. The demand for industrial and warehousing space is driven by a multitude of factors, including retail and wholesale market dynamics, consumer goods demand, macro-economic growth, etc.

Defining Demand

The demand in the industrial and commercial market is dependent on the following aspects:

$$D_{whol} = f\{P_o, P_{\%}, Q_w, R, T_x, Y; R_s; R_{s\%}\}$$

Where:

P_o	=	Population size
$P_{\%}$	=	Population growth
Q_w	=	Quality of existing facilities
R	=	Rental levels
T_x	=	Property rates and taxes
Y	=	Household income
R_s	=	Retail sales
$R_{s\%}$	=	Retail sales growth

Defining Supply

The supply of industrial and commercial land users can be described as being the following:

$$S_{whol} = f\{D_{whole}, C_w, V_w, L_u, I_a, GLA_w, C_c\}$$

Where:

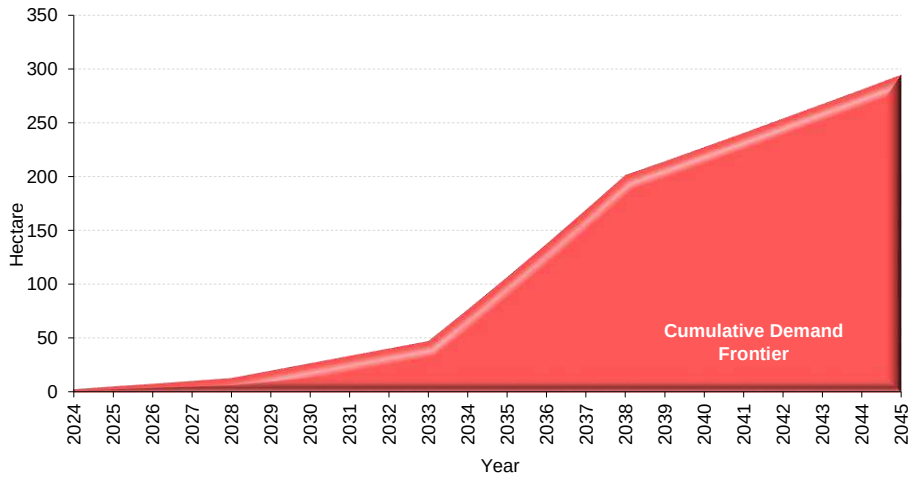
D_{whole}	=	Demand
C_w	=	Competition
V_w	=	Vacancies
L_u	=	Surrounding land uses
I_a	=	Infrastructure availability
GLA_w	=	Current usable / rentable area
C_c	=	Construction cost

9.4.2 MARKET DEMAND MODELLING

It is known that the demand for industrial / commercial space depends on the production of goods within a specified area. The following figure illustrates cumulative additional industrial and warehousing land demand for the Emfuleni sub-regional economy.

Subsequent demand modelling indicators provide insight to the performance of current and future demand of the industrial market of the Emfuleni local economy and the Vaal Aerotropolis site.

Figure 9.2: Emfuleni Sub-Regional Economy Cumulative Additional Industrial and Warehousing Land Demand



Source: DEMACON Space Demand Modelling, 2024

Figure 9.2 shows that between 2024 and 2045 an additional 280 hectares of industrial and warehousing space would be required to support growth in the manufacturing and related industries of the Emfuleni sub-regional economy.

Table 9.4 provides and overview of the demand modelling and potential baseline take-up for industrial and warehousing space by the Vaal Aerotropolis and its land use opportunities.

Table 9.4: Industrial Space Demand Modelling Results (Nodal Potential) - m² Gross Lettable Area (Constant Values)

Cumulative Additional Land Demand	Up to 2029	2034	2039	2044
Total Manufacturing (Hectares)	8.0	29.3	79.6	103.9
Total Warehousing (Hectares)	12.1	47.4	134.3	176.3
Total: Emfuleni Sub-Regional Economy	20.0	76.7	213.8	280.2
Minimum Share	11.0	42.2	117.6	154.1
Maximum Share	13.0	49.8	139.0	182.1
Project Specific	12.0	46.0	128.3	168.1
Total sqm bulk developable	60 147	230 048	641 446	840 464

Source: DEMACON Space Demand Modelling, 2024

Table 9.5 provides a summary of the long-term space demand forecast for the Vaal Aerotropolis industrial and warehousing land use opportunities.

Table 9.5: Vaal Aerotropolis Long-Term Industrial and Warehousing Space Demand Forecast

Recommended Sizes	
Capital investment (2024 constant values)	R 14 287 892 623
Employment opportunities	15 281
Parking	16 809
Parking infrastructure & landscaping cost (2024 constant values)	R 376 527 994
Point of market entry	2027+
Size of development (sqm GLA)	**840 464m²**

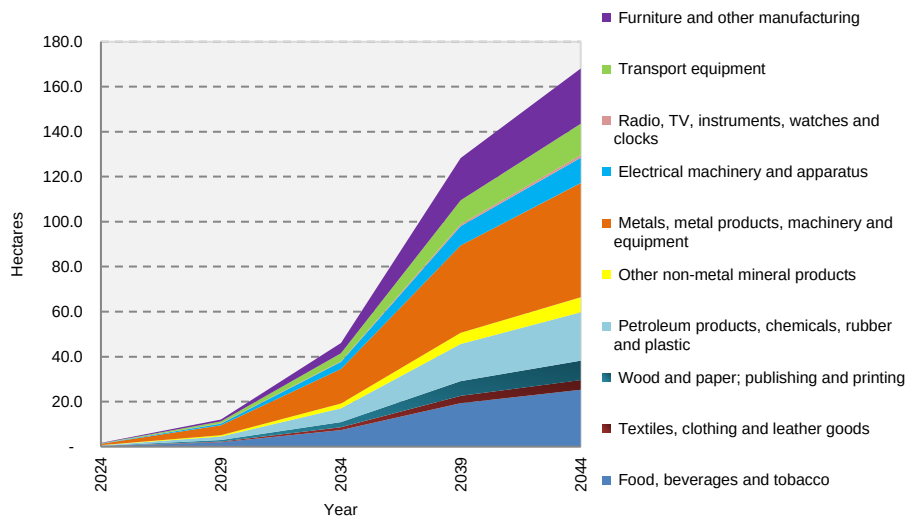
Source: DEMACON Space Demand Modelling, 2024

Demand Modelling Results:

- Industrial sector market demand for the Emfuleni Sub-Regional Economy increases cumulatively from 20 hectares in 2029 to 280 hectares by 2044.
- Viable market-based take-up for the site and its land use opportunities over the medium- to long-term is approximately 840 464m² gross lettable area (GLA).
- The optimum point of market entry for industrial uses within the sub-regional economy and market is from 2027+.

Figure 9.3 illustrates the likely demand from various sub-sectors based on the prevailing industrial sub-sector profile of the Emfuleni Sub-Regional Economy.

Figure 9.3: Project Specific Cumulative Land Demand



Source: DEMACON Space Demand Modelling, 2024

Figure 9.3 shows that the bulk could originate from sectors such as:

- Metals, metal products, machinery and equipment
- Food, beverages and tobacco
- Furniture and other manufacturing
- Petroleum products.

9.5 Gap Analysis and High-Level Recommendations

This Chapter of the report focused on a demand assessment of industrial and warehousing land uses at the Vaal Aerotropolis.

A gap analysis for the industrial and warehousing market shows that a gap exists within the Emfuleni Sub-Regional economy for additional industrial and warehousing space over the medium- to long-term. This market gap is based on the growth in existing manufacturing sectors that in spite of slow industrial orientated growth and the limited diversity of the local industrial market, would create growth that can support additional industrial land demand. Market entry for industrial and warehousing uses could be from 2027 onwards.

Development Type	Effective Market Gap	Development Propsect
Industrial and Warehousing	Yes	Moderate to High

In light of the development of the Vaal Aerotropolis, light industrial and warehousing land use opportunities could be unlocked in support of the airport.

The industrial demand indicated in this chapter is a sector based forecast which may ultimately be influenced by the nature and quantum of anchor tenants successfully procured.

TRADE & AUTOMOTIVE LAND USE DEMAND ASSESSMENT

10

10 Trade And Automotive Land Use Demand Assessment

10.1 Introduction

Chapter 10 of the report provides an overview of the demand assessment for trade and automotive land uses that can support the trade and automotive orientated land use opportunities for the Vaal Aerotropolis.

The purpose of the chapter is to estimate the development potential for trade and automotive land uses at the Vaal Aerotropolis with the aim of measuring the potential market share of additional trade and automotive facilities that the development could capture given potential trade activity growth in the market area. The chapter ultimately seeks to establish whether a market gap exists that the development can utilise as part of its long-term development opportunities and potential.

The remainder of the chapter is discussed under the following main topics:

- Defining trade and automotive demand
- Modelling the medium- to long-term demand for additional trade and automotive space
- Reporting the space demand results and identifying the potential market share the harbour could capture
- Providing an indication of the trade and automotive market demand gap and development prospects

10.2 Defining the Sector and Subsector

The formal definition of the wholesale and retail trade sector according to the Stats SA SIC (Standard Industrial Classification and all Economic Activities (SIC) is:

MAJOR DIVISION 6: Wholesale and retail trade, repair of motor vehicles, motorcycles and personal and household goods, hotels and restaurants. The formal definitions of the sub-sectors according to the Stats SIC are:

SIC 61 - Wholesale and commission trade, except of motor vehicles and motorcycles	This sector (61) includes the following activities: 611 wholesale trade on a fee or contract basis 612 wholesale trade in agricultural raw materials, livestock, food, beverages and tobacco 613 wholesale trade in household goods 614 wholesale trade in non-agricultural intermediate products, waste and scrap 615 wholesale trade in machinery, equipment and supplies 616 other wholesale trade
SIC 62 - Retail trade, except of motor vehicle and motorcycles; repair of personal household goods	This sector (62) includes the following activities: 621 non-specialised retail trade in stores 622 retail trade in food, beverages and tobacco in specialised stores 623 other retail trade in new goods in specialised stores 624 retail trade in second-hand goods in stores 625 retail trade not in stores 626 retail trade of personal and household goods
SIC 63 - Sale, maintenance and repair of motor vehicles and motorcycles; trade in automotive fuel	This sector (63) includes the following activities: 631 sale of motor vehicles 632 maintenance and repair of motor vehicles 633 sale of motor vehicle parts and accessories 634 sale, maintenance and repair of motorcycles and related parts and accessories 635 retail sale of automotive fuel
SIC 64 - Hotels and restaurants	This sector (64) includes the following activities: 641 hotels, camping sites and other provision of short-stay accommodation 642 restaurants, bars and canteens

10.3 Automotive Trends and Outlook 2024 [5]

Vehicle Statistics – October 2024

- The automotive industry contributes 5.3% to GDP (3.2% manufacturing and 2.1% retail);
- In 2023, the export of vehicles and automotive components reached a record amount of R270.8 billion, equating to 14.7% of South Africa's total exports;
- The industry accounts for 21.9% of the country's manufacturing output;
- Vehicles and components are exported to 148 international markets;
- The manufacturing segment of the industry presently employs in the order of 110 000 people across its various tiers of activity (from component manufacturing to vehicle assembly);
- Combined with the industry's strong multiplier effect, the industry is responsible for approximately 457 000 jobs across the South African economy's formal sector.

September 2024 – Industry New Vehicle Sales at a Glance:

Passenger Vehicles - YTD Sep 2024

252 093 -3.3% ↓ compared to YTD Sep 2023 (260 701)

2020	2021	2022	2023
246 539	304 338	363 682	347 381

Medium Trucks & Buses - YTD Sep 2024

5 663 -6.9% ↓ compared to YTD Sep 2023 (6 081)

2020	2021	2022	2023
6 735	7 520	8 308	8 252

Light Commercial Bakkies & Mini Buses - YTD Sep 2024

102 499 -11.6% ↓ compared to YTD Sep 2023 (115 998)

2020	2021	2022	2023
110 912	133 078	135 711	151 490

Heavy Trucks & Buses - YTD Sep 2024

17 580 -4.4% ↓ compared to YTD Sep 2023 (18 389)

2020	2021	2022	2023
16 019	19 555	21 841	24 655

New Vehicle Sales Totals and Export Sales

	Sep 2024		Sep 2023		Var %		Aug 2024		Sep 2024 YTD		Sep 2023 YTD		Var %	
	Local	Exp	Local	Exp	Local	Exp	Local	Exp	Local	Exp	Local	Exp	Local	Exp
Passenger	30 218	10 482	29 627	23 950	2.0%	-56.2%	30 116	17 346	252 093	154 888	260 701	189 837	-3.3%	-18.4%
Light CV < 3501kg	10 914	11 402	13 171	11 494	-17.1%	-0.8%	10 710	9 859	102 499	76 832	115 998	98 702	-11.6%	-22.2%
Medium CV 3501-8500kg	821	11	817	3	0.5%	266.7%	746	7	5 663	45	6 081	85	-6.9%	-47.1%
Heavy CV 8501-16500kg	570	13	482	19	18.3%	-31.6%	433	14	3 948	134	4 113	207	-4.0%	-35.3%
Extra Heavy CV > 16500kg	1 473	51	1 787	29	-17.6%	75.9%	1 600	46	12 976	267	13 768	332	-5.8%	-19.6%
Bus > 8500kg	85	5	86	4	-1.2%	25.0%	76	1	656	33	508	35	29.1%	-5.7%
Industry Total	**44 081**	**21 964**	**45 970**	**35 499**	**-4.1%**	**-38.1%**	**43 681**	**27 273**	**377 836**	**232 199**	**401 169**	**289 198**	**-5.8%**	**-19.7%**

Despite the lingering effects of a high inflationary environment, South Africa's automotive industry remains optimistic that the tide for higher new vehicle sales will turn and show some signs of recovery as we move closer to year end.

Naamsa reaffirmed that at the beginning of 2024 they anticipate a year of two halves, with a taxing first six months of the year and improved prospects for the second half of the year. All the economic challenges of 2023 rolled over into 2024, such as the high interest rate and inflation environment, a weaker Rand exchange rate, high fuel prices, port delays, and indebted consumers, along with a vehicle affordability crisis. Our predictions and overall outlook for this year played out exactly as we suspected for the first half of the year.

[5] *Source: Naamsa Report, October 2024*

Some positive movements during the third quarter but both new vehicle sales and vehicle imports for the first nine months of the year were still 6% and 3%, respectively, below the 2023 levels.

For the period under review, September 2024, **new vehicle sales experienced another modest decline of -4.1%** and exports dropped by -38.1%. Aggregate domestic new vehicle sales in September 2024, stand at 44 081 units, showing a decline of 1 889 units, compared to the 45 970 vehicles sold in September 2023. Export sales also fell by 13 535 units, to 21 964 units in September 2024, from the 35 499 vehicles exported in September last year.

South Africa celebrates Transport Month in October and reaches the first 100 days of the 7th administration of the Government of National Unity (GNU). The GNU has sparked positive sentiment both within the country and internationally, with its focus on infrastructure development and its commitment to revitalising key sectors, including transport and the automotive industry.

In a year marked by economic fluctuations, year-to-date data reveals that new vehicle sales in South Africa reached 401 169 units by September 2024, reflecting a decline of -5.8% compared to the same period in 2023. Similarly, exports fell to 289 198 units, showing a significant drop of -19.7%. A key factor in this export decline is the waning demand for models nearing the end of their production cycles, compounded by stricter environmental regulations in key global markets. These combined pressures have tempered growth in an industry poised for recovery amid shifting dynamics.

Out of the total industry sales of 44 081 vehicles, an estimated 34 830 units, or 79%, represented dealer sales. An estimated 15% were attributed to sales in the vehicle rental industry, 3% to government, and 2% to corporate fleet sales.

The **new passenger car** market in September 2024, at 30 218 units, registered an increase of 112 cars, or a rise of 2%, compared to the 29 626 new cars sold in September 2023. Sales to the car rental industry accounted for a substantial 28 % of new passenger vehicle sales during the month.

Domestic sales of new light commercial vehicles, bakkies, and mini buses at 10 914 units in September 2024 recorded a decrease of 2 257 units, or a loss of 17.1%, from the 13 171 units sold in September 2023.

In the **medium and heavy truck segments**, sales presented a mixed performance. Medium commercial vehicles saw an increase to 821 units, reflecting a gain of 4 units or 0.5%, compared to the 817 units sold in September 2023. However, heavy trucks and buses experienced a decline, with a decrease of 314 units or 18% compared to the 1 849 units sold in the same month last year.

Economic indicators in September 2024 showed **positive trends,** including the first interest rate cut in four years by the South African Reserve Bank, a stronger Rand, and easing inflation below the mid-point of the central bank's target range. Lower fuel prices further bolstered consumer confidence, offering relief to household budgets. Although the July 2024 market rally did not continue in August, the passenger car segment has shown a positive trend in recent months, boosted by rental sales, currency strength, and decreasing inflation.

As the country anticipates further interest rate reductions, the costs of borrowing are expected to decline, which may stimulate economic activity, even though immediate improvements in vehicle affordability may be limited. Since the decline in new vehicle sales began in August 2023, expectations are rising that the new vehicle market could see improvement for the remainder of the year due to favourable economic conditions and the comparison to last year's lower base levels.

Internationally, the US Federal Reserve Bank's reduction in interest rates and the European Central Bank's second interest rate cut in 2024 could provide a boost to South Africa's export performance. Although vehicle exports to Europe have slowed due to regional economic challenges, exports to the US have surged by 132% year-to-date, offering promising signs for the remainder of the year.

10.4 Trade Market Demand Side Indicators

Space demand modelling has become increasingly specialised. One particular aspect that has changed is a notable shift away from broad based supply-demand estimations to multivariate, differentiated models. In the context of preceding chapters, the trade development potential in the market is subsequently determined, based on a specialist econometric model. It is known that the demand of space depends on the production function of a market area.

Defining Demand

Trade and automotive demand depend on a variety of customer-related aspects. It can be conceptualised as follows:

Dret = f {Po; P%; Q; Y; Re; Cp; Sf}

Where:

Po	=	Population size
P%	=	Population growth
Q	=	Existing quality of retail space
Y	=	Household income
Re	=	Household expenditure patterns
Cp	=	Consumer preferences
Sf	=	Seasonality factors

Defining Supply

The supply of the markets entails the following:

Sret = f {Dret; GLAret; R; Sc; Cc; Lu; Ia; Sp; Vret }

Where:

Dret	=	Demand
GLAret	=	Current rentable/useable area
R	=	Rent/m^2
Sc	=	Competition
Cc	=	Construction cost
Lu	=	Surrounding land uses
Ia	=	Infrastructure availability
Sp	=	Speculative climate
Vret	=	Vacancy

Trade demand modelling has become increasingly specialised. One particular aspect that has changed is a notable shift away from broad based supply-demand estimations to multivariate, differentiated models. In the context of preceding chapters, the development potential for trade in the market is subsequently determined, based on a specialist econometric model.

To develop a model, inter alia three data sets are required in time series format.

They are:

- Total employment of the market area,
- Trade sector employment,
- Trade sector productivity indicator.

Related property market indicators, together with the four data series were used in the following formula.

The following equation is used to determine office space absorption:

ABt' =ĩ(OC*t' – OCt-1)

=ĩ(α0 + α1EM1 + α2EWt + α3Qt – α4Rt-2) - ĩ1 OCt-1

Key:

AB	=	Net absorption of space
OC	=	Occupied Space
EM	=	Employment in Wholesale & Retail sector
EW	=	Employment in Catering & Accommodation sector
Q	=	Trade Sector Output per Worker
R	=	Rental Rate for Retail Space

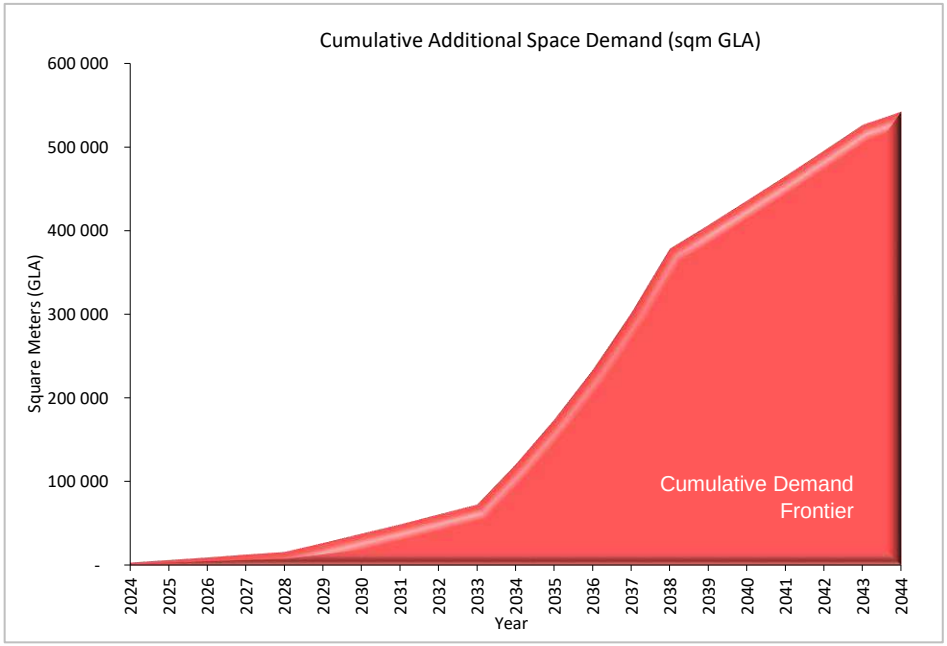
It is known that the demand for industrial space depends on the production of goods within a specified area. The following figure illustrates cumulative additional trade and automotive land demand for the Emfuleni sub-regional economy.

Subsequent demand modelling indicators provide insight to the performance of current and future demand of the trade and automotive market of the Emfuleni sub-regional economy and Vaal Aerotropolis designated harbour area.

10.5 Market Demand Modelling Results

It is known that the demand for industrial space depends on the production of goods within a specified area. The following figure illustrates cumulative additional land demand for the specified area.

Figure 10.1: Emfuleni Sub-Regional Economy Cumulative Additional Industrial Land Demand



Source: DEMACON Industrial Space Demand Model, 2024

The following table provides and overview of the demand modelling and potential baseline take-up.

Table 10.2: Industrial Space Demand Modelling results (nodal potential) – m² GLA (constant values)

Cumulative Additional Land Demand	Up to 2029	2034	2039	2044
Wholesale & Retail Trade (sqm GLA)	11 134	49 810	175 490	267 070
Catering & Accommodation (sqm GLA)	15 549	70 545	259 630	290 121
Total: Emfuleni Sub-Regional Economy (sqm GLA)	26 684	120 354	435 120	557 191
Automotive Share (28.5%) (sqm GLA)	7 626	34 397	124 357	159 245
Minimum Share (sqm GLA)	381	1 720	6 218	7 962
Maximum Share (sqm GLA)	763	3 440	12 436	15 925
Project Specific (sqm GLA)	572	2 580	9 327	11 943

Source: DEMACON Industrial Space Demand Model, 2024

Table 10.3 indicates the recommended space options for the baseline scenario.

Table 10.3: Recommended Project Size

Recommended Sizes	
Capital investment (2024 constant values)	R177 209 218
Employment opportunities	311
Parking	373
Parking infrastructure & landscaping cost (2024 constant values)	R8 879 115
Point of market entry	2034+
Size of development (sqm GLA)	**9 327m²**

Source: DEMACON Calculations 2024

The following is evident from the above tables:

- Trade and Automotive sector market demand of **Emfuleni Sub-Regional Economy** increases cumulatively from 26 684m² GLA in 2029 to 557 191m² GLA in 2044.
- Viable market based take-up for the development over the medium to longer term is approximately **9 327m²**.
- Optimum point of market entry: **2034+,** once the development has gained traction.
- This floor space could include dealerships, automotive workshops, speciality shops and related activities.

10.6 Gap Analysis and High-Level Recommendations

This Chapter of the report focused on a demand assessment of trade and automotive land uses at the Vaal Aerotropolis Site.

A gap analysis for the trade and automotive market shows that a gap exists within the sub-regional economy of the harbour for additional automotive space over the medium- to long-term. Market entry for automotive and related uses could be from 2034 onwards.

Development Type	Effective Market Gap	Development Propsect
Automotive and Related Facilities	Yes	Moderate to High

DEMACON's Demand Modelling results illustrate that the consumer market can, optimistically, sustain trade and automotive space of approximately **9 327m² GLA** over the medium to longer term.

This floor space could include automotive dealerships, automotive repairs/workshops, auto parts, specialised fitment centres, etc.

OFFICE AND RELATED LAND USE DEMAND ASSESSMENT

11

11 Office and Related Land Use Demand Assessment

11.1 Introduction

Chapter 11 of the report provides an overview of the demand assessment for office and related land uses that can support the Vaal Aerotropolis development.

The purpose of the chapter is to estimate the development potential for office and related land uses at the Vaal Aerotropolis with the aim of measuring the potential market share of office space that the development could capture. The chapter ultimately seeks to establish whether a market gap exists that the development can utilise as part of its long-term development opportunities and potential.

Subsequent iterations of the report will also incorporate a supply side perspective of the office market, in order to frame and highlight the office market demand in counter to the supply side considerations of the retail market.

The remainder of the chapter is discussed under the following main topics:

- Defining office and related space demand
- Modelling the medium- to long-term demand for additional office space
- Reporting the space demand results and identifying the potential market share the harbour could capture
- Providing an indication of the office and related space market demand gap and development prospects.

11.2 General Office Market Concepts

The following section provides an overview of general office market concepts. The purpose of the information contained in the section is to define core aspects of the office market in order to provide a basis from which office market supply and demand side aspects can be interpreted and understood.

11.2.1 Office Space Grading

Office space is defined by the functions performed in them, the type of premises occupied, and the occupational sector accommodated within them. The function of offices can be described as personal services, administration and management of social and economic systems. Office space is generally classified according to four categories – Grade P, Grade A, Grade B and Grade C. These categories are based on the quality of space determined by, among other, building age, design, quality of finishing's, complementary features etc. The following Diagram provides a brief overview of office space grading in the South African market.

Diagram 11.1: Office Space Grading

P

Top quality office with modern space that is generally a pacesetter in establishing rentals and which includes the latest or a recent generation of building services, ample parking, a prestige lobby finish and good view, or good environment

A

Generally new and not older than 10-years unless renovated. These offices are located in prime locations and provide high quality finishes, on-site parking and air-conditioning. Grade A offices typically accommodate financial service activities and rely on agglomeration provided by large retail nodes

B

Generally, 10 to 20 years old, unless renovated. Accommodation is modern, situated in good locations and provides on-site parking and air-conditioning. B-grade offices typically accommodate government institutions and small businesses. These offices are usually located in the vicinity of smaller retail centres and in CBD's

C/D

Generally, 20 to 30 years old. Buildings are in a fairly good condition, although finishes are not to modern standards. These offices generally accommodate government institutions, small businesses and activities related to industrial uses, and are typically located in older CBD's

11.2.2 Location Considerations

Location is by far the most important consideration in the development of an office park. Location is, in the first instance, linked to the accessibility to freeways and highways, which in turn improves the accessibility to major nodes, other residential areas and airports. A series of locational requirements are considered during office development considerations – see graphic.

Accessibility	Directional Growth of the Area
Functional & Complimentary Uses	Established Address / Monitored Node
Address Value	Visibility
Moderate to Higher SEM Profile	Emerging Commercial Node
Proximity to Educated Labour Force	Proximity to Freeways / Major Routes
Perceived Level of Security	Availability of Land

11.3 Office Market Trends

This section of the report provides insight into general office market trends. The overview includes a few quick facts as introduction, followed by the impact of the Covid pandemic, the concept of flexible offices and the future of office space.

11.3.1 Quick Facts

The following section provides several quick facts regarding overarching office market trends.

Diagram 11.2: Quick Facts about the Office Market and Its Outlook

Office Market and Covid

- Commercial property sector was the hardest hit by the Covid -19 pandemic
- Retail and office space was most affected with industrial & warehousing space being the only exception
- Office market is still navigating the aftermath of hard-lockdown, social distancing and other Covid related regulations
- Significant change in doing business

- Office market was already affected by challenging economic conditions pre-covid and pandemic implication compounded the detrimental effects on the market
- Increasingly higher vacancy rates.

Business Impact

- Downscaling of office space
- Increased need for affordable office space options
- Change in the way of doing business
- Change in the traditional workplace set-up
- Increased reliance on digital technology

Market Outlook

- Low office construction levels expected to persist
- Increased conversion of office stock – especially more dated B and lower grade office stock.
- Conversion into residential, mixed-uses, educational and medical space – among other uses.
- Despite negative market sentiment, office space will always have a function
- Office space will not disappear entirely, but the look and function of traditional office space is set to change significantly
- New office space place significant focus on quality work environments and the health and wellbeing of employees.
- Increase move toward offering offices as a service as opposed to space. Also referred to as the "hotelling" of offices which essentially rents furnished and serviced offices space together with complementary facilities and amenities to individuals or companies.

11.3.2 COVID-19 AND ITS IMPACT ON THE OFFICE MARKET

In light of the Covid-19 pandemic that historically impacted several facets of daily life, the response that general business has had to implement in order to balance continued operation as well as safety of personnel is immense. To this day the effect of the pandemic remains an aspect that has shaped the demand and functionality of office space. It is therefore important to take due consideration of the impact that Covid-19 has had on the office market and take note of business' response to maintaining operational integrity.

Market Trends

Office transactions down by **60%** on an annual basis by the end of 2020

Nationally, **rentals** for decentralised **A Grade** office space **decreased sharply** (2024:Q2) – rentals are still 1% below pre-covid levels.

Cape Town (5%) and Durban (6.2%) nodes recorded the **highest rates of growth**.

Low construction rates of office space expected.

High conversion rate of office space into other uses

Impact on Doing Business

- Change in the traditional way of doing business – companies are embracing new business models and new flexible office options.
- Globally, it is predicted that by 2023, a third of staff will still be working from home.
- Rise in the presence of flexible office space – shared offices, co-working centres, private offices etc.
- Increased focus on cost-efficient and more affordable office space options.
- Increased reliance on digital technology – high speed internet, virtual meetings, digital equipment etc.
- Staggered working – employees work at the office during different times and / or days of the week to reduce concentration of people in one building.

Business Response to Covid

The COVID pandemic has resulted in a significant **change in the way of doing business** given the implications of lockdown, social distancing and new occupational health and safety requirements. Businesses have been observed to respond to the challenges and opportunities brought about by COVID in various ways. In terms of business and office space needs, the market has revealed **four primary responses or models** – work from home, flex, core and flex and business as usual.

Work from Home	Various businesses have embraced the work from home model. In this model, businesses typically do not have a physical office address or headquarters and all staff work separately and remotely from their homes
Flex	Many businesses have chosen to cancel their leases or dispose of their offices to opt for flexible office space alternatives including coworking space, shared offices, private office suites etc. Businesses make use of one or more flexible office options and does not own the building but leases space from a flexible office space operator
Core and Flex	This model is characterised by a combination of remote working – either from home or flexible office space – as well as having a physical office building accommodating the core activities of the business. This model also manifests either as a permanent arrangement or as staggered work-days - employees work from home a few days during the week and go into the office for the remaining days of the week
Business as Usual	For some companies, given the nature of their core business activity, are bound to have a physical address and requires workers to come to a central place to perform their duties. There is, however, an implication for the traditional office space layout given health and safety precautions associated with Covid

The particular response will depend on the organisation type and structure with no one model fitting the needs of all business requirements. The type of response will depend on:

- Type of business and nature of services delivered.
- Size of the business
- Degree of flexibility required

11.3.3 Flexible Office Space

Flexible office space refers to a variety of office space options aimed at providing adaptive and affordable office options. These options are usually based on the concept of space sharing and flexible leasing options. In light of the current office climate and changing needs of office workers and businesses, due consideration should be afforded to flexible office space options and opportunities. The following seeks to provide an overview of characteristics, benefits and types.

Characteristics of Flexible Office Space

- Mostly associated with being a shared space – shared among different organisations or different people
- Flexible spatial options – lease entire floor, leasing of one desk, coworking space etc.
- Flexible rental and lease agreements – hourly, daily, weekly, monthly options.
- Various types of flexible office space - co-working space, serviced offices, shared offices, hot-desk, hybrid etc.
- Facility can be characterised as either serviced or not serviced but will at minimum include furniture and access to internet.
- Access to high-speed internet, meeting rooms, boardrooms, soundproof pods, restaurant, coffee tea, business services (printing), reception etc. – depending on the level of service offered by the centre.
- Operated by co-working or flexible office space operators or landlords operate flexible space on their own. Partnerships – landlord and operator also often an option for property owners.

Benefit to Business Owners

- Lower business operating costs
- Scalability – easily accommodate growth and decline within the business and the associated need for workspace
- Furnished
- Sense of community
- Amenities, facilities, and services to choose from
- Minimises start-up capital required
- Custom offices pace with not or little cost to the tenant
- Affordable business address for small businesses and start-ups

Characteristics of Flexible Office Space

Co-Working Space	Open plan workspace with desks or pods to rent. Clients rent a desk, pod or meeting room and those who make use of the facility are not necessarily from the same organisation. Includes options like dedicated desk or hot-desk (shared desks)
Serviced Office Spaces	Open plan workstations with the majority of the floor utilised a private office space by a particular organisation. Ready to use workspace – furnished and cabled. Flexible contracts
Shared Offices	Renting a desk within another organisation's building. An affordable option with access to a good address and serviced building
Virtual Offices	Provides businesses with a physical address without owning property. Typically includes a phone number and access to meeting rooms when required
Hybrid Centres	Combination of different types of flexible and adaptive office space

The extent of services offered at flexible office centres range significantly between facilities. At the most basic, coworking centres offer access to internet and office furniture

Typical Services and Amenities Offered:

- Reception
- Concierge
- Access to fast and reliable internet
- Meeting rooms
- Conferencing facilities
- Sound-proof booths / pods
- IT support
- Printing services
- Courier services
- Restaurant, cafeteria, canteen, coffee
- shops etc.
- Cleaning services

11.3.4 Office Space Conversion

The office market is experiencing a trend whereby dated office stock is being converted into other uses, specifically into residential apartments.

Definition

Increasingly popular among commercial property owners given rising **vacancies** as well as **dated** and **underperforming** commercial **stock**

Conversion of dated stock into:

- Residential apartments
- Student accommodation
- Short-stay accommodation
- New shared & flexible office space

Conversion Trends

- Increased tendency for dated, underperforming and vacant B-grade office space to be converted for alternative uses including short-stay accommodation, residential, healthcare etc.
- Trend emerged due to increased pressure on the commercial property market and increasing vacancy rates
- This trend has experienced great success in the City of Johannesburg and several cased are already evident in the Pretoria CBD
- Conversion of defunct office space addresses a demand in the market among young professionals looking for residential options close to work and amenities
- Mid-market residential apartments in well-located areas are gaining favour among young professionals
- Unit offering differs depending on target market -could range from luxury apartments, mid-range apartments for the working professional to lower income options for those wishing to move closer to work.
- Builds on the work-live-play concept
- Selected markets have shown success in converting offices into apartment-style hotels
- Conversion of existing office stock into flexible office types – coworking space, serviced office space, hybrid office models etc.
- Contributes toward urban renewal and investment attraction

94 on Main - Marshalltown

Rand President Apartments - Randburg

Reuben's Place – Pretoria Central

Black Brick Apartments - Sandton

The Onyx – Cape Town

The Bolton - Rosebank

11.3.5 THE FUTURE OF OFFICE SPACE

The Covid 19 pandemic undoubtedly had a major impact on the office market. The performance of traditional office space is struggling as demand patterns change and vacancy rises. Office space will, however, always form an integral part of the urban fabric in cities, fulfilling a vital function for government and other institutions in need of a physical presence in the market.

Despite the challenges experienced by the commercial property sector, the office market is responding well to new opportunities presented by the change of doing business. Office space conversion, alternative uses and flexible office space present unique opportunities for office space to fulfil an adapted purpose in the built environment.

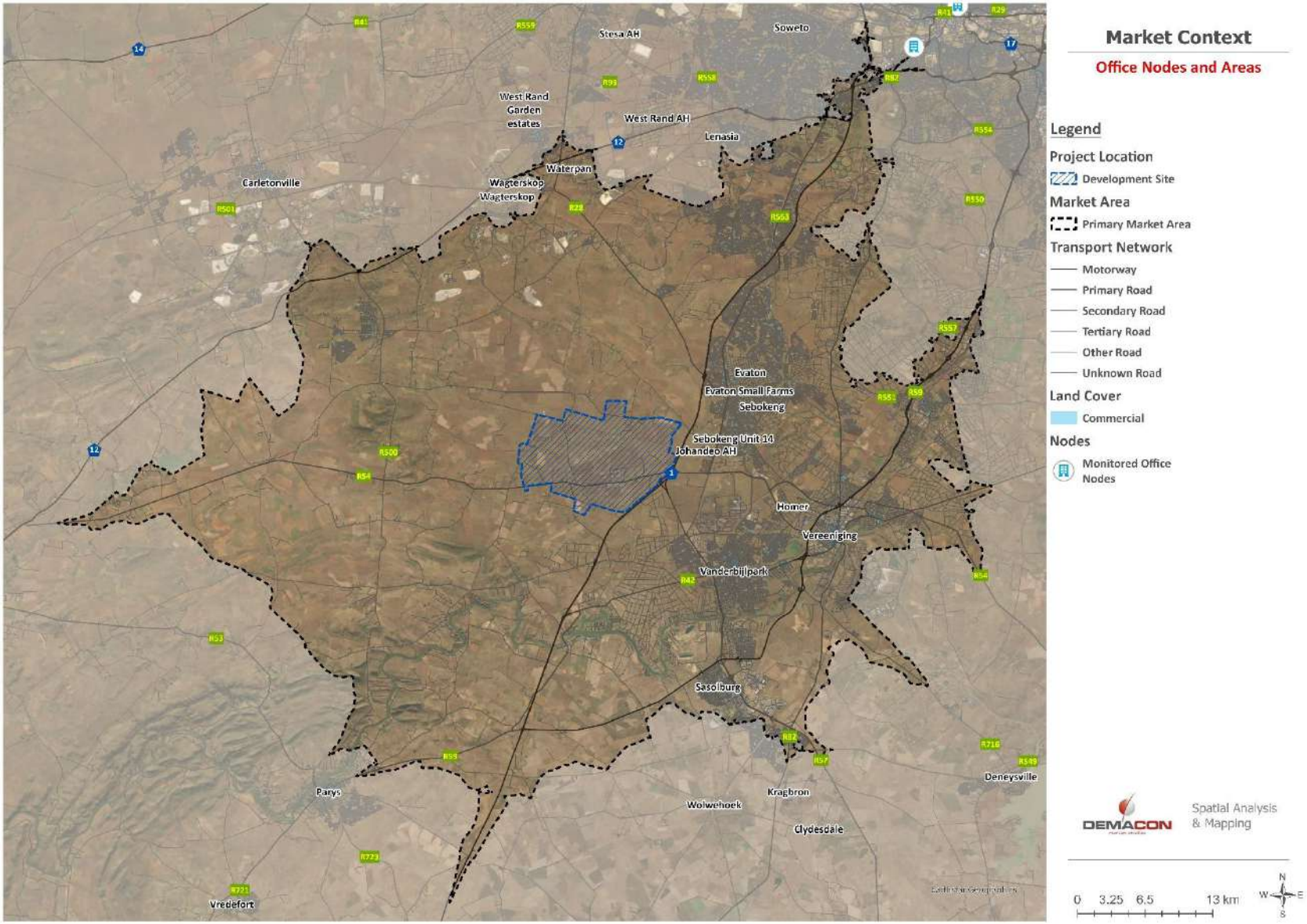
It is anticipated that flexible working arrangements will continue to grow in popularity and with it, the demand for flexible working space. The market has also reflected a definite shift towards office design that is employee focused – address new health and safety requirements, incorporating considerations for employee well-being and eco-friend, green architectural design.

The only exception to prevailing office market conditions is the government sector. Most government departments operate on a rotational basis with building occupation not exceeding 50% at any time. Vacancy rates are comparatively lower in the Pretoria Node given the concentration of government offices in the Pretoria CBD. Given the mandate of government, it is anticipated that employees with return to office over the longer term and the need for adequate office space among government departments will continue to exist.

Key Concepts Driving the Future of Office Space:

- Adaptability
- Flexibility
- Hotelling – offices as services vs. space
- Affordability
- Green building
- Hybrid-office space
- Office space conversion
- Greater focus on employee well-being and health at the workplace.

Map 11.1: Distribution of Office and Commercial Land Uses in the Primary Market Area



Source: DEMACON GIS, 2024

11.4 Office Market Demand Side Indicators

11.4.1 Defining Office Space Demand

Office demand modelling has become increasingly specialised. One particular aspect that has changed is a notable shift away from broad based supply-demand estimations to multivariate, differentiated models. In the context of preceding chapters, the development potential for office and related land uses in the Emfuleni market and, more specifically, as a land use opportunity at the Vaal Aerotropolis site is subsequently determined, based on a specialist econometric model. It is known that the demand office space depends on the production function of a market area. To develop a model, inter alia three data sets are required in time series format:

- Total employment of the market area,
- Finance and business services employment,
- Finance and business services productivity indicator.

Related property market indicators, together with the four data series were used in the following formula.

The following equation is used to determine office space absorption:

$$AB_t = *CO)\bar{i}t' - OC_{t-1})$$

$$= \bar{i})\alpha 0 + \alpha 1EM1 + \alpha 2EW_t + \alpha 3Q_t - \alpha 4R_{t-2}) - 1\bar{i}\ OC_{t-1}$$

Where:

AB	= Net absorption of space
OC	= Occupied Space
EM	= Employment in Finance Sector
EW	= Employment in business Sector
Q	= Finance and Business Output pr Worker
R	= Rental Rate for Office Space

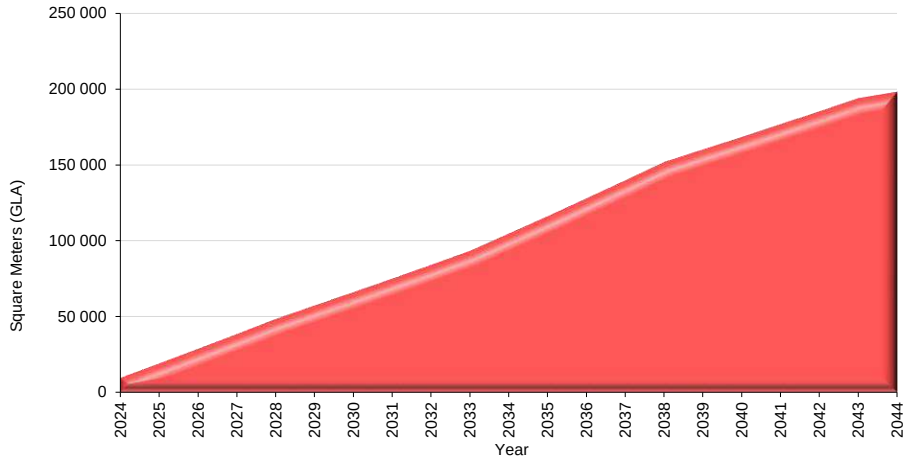
11.4.2 Market Demand Modelling

The following section is focused on providing the outcome of the market demand modelling for office space in the primary market area of the proposed development. The following local economy attributes play a defining role in the demand for office space.

11.4.3 Cumulative Demand Estimate

The following diagram provides an overview of the cumulative office market demand estimate for the Emfuleni sub-regional economy.

Figure 11.1: Cumulative Additional Office Space Demand (Emfuleni Sub-Regional Economy)



Source: DEMACON Demand Modelling, 2024

The following table summarises the space demand modelling results for the office sector.

Table 11.1: Synthesis of Space Demand Modelling Results - m² GLA (Cumulative)

	Up to 2029	2034	2039	2044
Finance and Insurance (sqm GLA)	2 626	4 875	7 646	11 956
Business Services (sqm GLA)	54 520	99 756	152 381	186 156
Total Emfuleni Sub-Regional Economy	57 146	104 631	160 028	198 113
Nodal Share – Min	11 429	20 926	32 006	39 623
Nodal Share – Max	17 144	31 389	48 008	59 434
Site Share	14 287	26 158	40 007	49 528

Source: DEMACON Demand Modelling, 2024
** Note: the nodal shares and the average figures are cumulative*

The following table provides an overview of the recommended office space options for the proposed development.

Table 11.2: Recommended Office Space Options

Variables	Medium to Longer Term
Capital Investment (2024 Constant Values)	R 720 123 795
Optimum Size (m² GLA)	**40 007**
Employment (On-Site)	2 000
Parking Bays	1 600
Parking Infrastructure & Landscaping Cost (2024 Constant Values)	R 38 086 547
Point of Market Entry	2027+

Source: DEMACON Demand Modelling, 2024

Demand Modelling Results

- Market demand for office floor space in the sub-regional economy, increases cumulatively from 57 146m² GLA in 2029 to 198 113m² GLA in 2044
- Over the medium to longer term, the project could attract office take-up of approximately 40 007m² GLA.
- Optimum point of market entry: 2027+
- This space includes GLA for offices and related facilities, but excludes parking, storage and basements

11.5 Gap Analysis and High-Level Recommendations

This Chapter of the report focused on a demand assessment of office and related land uses at the Vaal Aerotropolis site.

A gap analysis for the office and related market shows that a gap exists within the sub-regional economy of the site for additional office and related space over the medium- to long-term. This market gap is the result of the primary function that the business and financial services sector plays within the sub-regional economy as a key employer and gross value adding industry. Market entry for office and related uses could be from 2027 onwards.

Development Type	Effective Market Gap	Development Propsect
Office Space	Yes	Moderate

- The office market has rebounded much quicker than anticipated with an accelerated “return-to-office” that has less than 5% of office workers still working from home.
- It is recommended that low to medium density office development could be supported as part of the proposed mixed-use development.
- Two storey, stand-alone office blocks could be considered.
- Take-up will predominantly be from small enterprises, SMMEs and NGO’s:
  - Service orientated occupants: dentist suites, medical practitioners, local surgeons, attorneys, financial services etc.
  - Local government service functions.

TOURISM AND SHORT-STAY ACCOMMODATION LAND USE DEMAND ASSESSMENT

12

12 Tourism And Short-Stay Accommodation Land Use Demand Assessment

12.1 Introduction

Chapter 12 of the report provides an overview of the demand assessment for tourism and short-stay accommodation land uses that can support the tourist orientated land use opportunities of the Vaal Aerotropolis.

The purpose of the chapter is to estimate the development potential for tourism and short-stay accommodation land uses at the Vaal Aerotropolis with the aim of measuring the potential market share of additional short-stay accommodation that the development could capture given potential tourist activity growth in the market area. The chapter ultimately seeks to establish whether a market gap exists that the development can utilise as part of its long-term development opportunities and potential.

The remainder of the chapter is discussed under the following main topics:

- Defining tourism and short-stay accommodation demand
- Providing an overview of the tourism market
- Modelling the medium- to long-term demand for additional short-stay accommodation
- Reporting the space demand results and identifying the potential market share the harbour could capture
- Providing an indication of the short-stay accommodation market demand gap and development prospects.

12.2 Defining Tourism and Short-Stay Accommodation Product

Defining Tourism

Tourism is travel for recreational, leisure or business purposes. The World Tourism Organisation defines tourists as people who “travel to and stay in places outside their usual environment for more than 24 hours and not more than one consecutive year for leisure, business and other purposes not related to the exercise of an activity remunerated from within the place visited.”

Tourism is an amalgam of visitors’ consumption of goods and services which include transportation, accommodation, food and beverage, recreation and entertainment, travel and tour operations, and souvenirs. It is envisaged that tourism is becoming a global pillar of productive and sustainable source of national revenue, decent employment, and poverty reduction globally.

Tourism is the business of selling leisure as a destination or a place as a product. The characteristics of the product are:

- Spatial Scale: a place is inevitably one component in the hierarchy of a spatial scale, a characteristic unique to the ‘place product’. A different structured hierarchy may create a different product.
- Multi-sold: The same destination, the same facilities etc. are sold to different groups of consumers for different purposes. The place is often viewed differently in tourist origin area and tourist destinations inclusive of travel in the former and exclusive of travel in the latter.

A Tourism Product = Place Product + Travel

A tourism product can therefore be defined as a sum of the place product (destination tourism offering including accommodation and ancillary services) and the travel experience.

Characteristics of Tourism

Tourism has the following characteristics as a product:

- Inflexibility: The tourism industry is highly inflexible in terms of capacity. The number of beds in a hotel or seats on a flight is fixed so it is not possible to meet sudden upsurges in demand similarly restaurants tables, hotels beds and flights seats remain empty and unused in periods of low demand.
- Perishability: It is related to the fact that travel products are intended to be consumed as they are produced. For example, an airline has seats to sell on each flight; a hotel has rooms to sell for each night. If the airline is not able to sell all its seats on its flight, or a hotel is not able to sell its rooms for the night then the opportunity to sell the product is lost forever. Service sector cannot keep inventory like products. If the tourist cannot visit the place, the opportunity is lost. Hence, this becomes one of its important characteristics.

- Inconsistency: In the Travel and Tourism industry a product or a package of a tourism service can be standardised i.e. for example of 2 days 3 nights in so and so hotel, but the actual experience of consuming this package is highly inconsistent. There are lots of travel stories which becomes a portrayal of a lot of bad experiences for example the tourist guide may not be good, the hotels lodging, and boarding was bad etc. Therefore, there is high level of inconsistency prevailing.
- Intangibility: Travel products cannot be touched as they include flight experience on an airplane, cruise on an ocean liner, a night's rest in a hotel, view of the mountains, a visit to a museum, a good time in a night club and much more. These products are experiences. Once they have taken place they can only be recalled and relished.

Factors that make a Successful Tourism Destination

For a tourism destination to be successful it should provide for the following factors as discussed in the following table.

Table 12.1: The 5 A's of a Successful Tourism Destination

Accessibility	Most often when access is discussed in relation to destinations, it refers to how easily visitors can get to your place. However, accessibility can also refer to your destination's infrastructure, wayfinding, ability to cater to visitors with disabilities, ease of access to attractions that are off the beaten path, etc
Accommodation	More and more often, visitors want to feel as though they are a part of your community when they visit, and accommodation play a big part in fostering feelings of belonging. Taking a page out of AirBnB's book, hotels have begun offering insider tips intended to help guests feel like locals, contributing to the overall industry shift towards "authentic" travel experiences
Attractions	Consider leveraging your destination's unique attractions as a pillar of your marketing strategy to pique the interests of potential visitors. Attractions vary widely among destinations, and identifying your main attractors is the first step towards positioning your destination as a compelling travel option for your target markets. Attractors can be people, places, things, and/or experiences that attract visitors who value what those attractions represent. Becoming familiar with who your attractions appeal to and why is important for successfully marketing what makes your destination appealing to the right people
Activities	Whatever activities your destination has to offer, always think in terms of how they will influence a visitor's overall travel experience. Market them in a way that not only supports your brand identity, but appeals to the desires of your target market(s) to experience something new, fresh and different
Amenities	Amenities include (access to) basic facilities and services that help a visitor feel comfortable and secure in your destination. Sometimes referred to as the "pleasantness" of a place, they play an important role in shaping the visitor experience and include things like public restrooms, signage, connectivity, emergency services, postal facilities, roads, sidewalks, safe drinking water, etc. And while it can be tempting to take these elements for granted, ready access to them plays a major role in determining whether visitors will plan a return visit or recommend your destination to others

12.3 Tourism Market Segmentation

Background

Market segmentation can be defined as the process through which people (both tourism providers and consumers) with similar needs, wants and characteristics are grouped together so that a tourism business/organisation can use greater precision in serving and communicating with these groups (marketing). The benefits of segmentation are that it enables better marketing decisions, and promotes more viable operations. Characteristics commonly used to divide markets into segments include:

Supply Side

- Product related
- Geographic
- Channels of distribution
- Economics

Demand Side

- Demographics
- Socio-economics
- Behavioural & psychographics
- Purpose of trip
- geographic

The following comments focus on the three main basis for market segmentation:

- Product
- Demographic
- Behavioural

Supply Side Segmentation

Product Related Segmentation: Typical product-related segmentation may be along the lines of the following:

- Accommodation: From campgrounds to high end wilderness lodges
- Adventure Operators/Organisers: These incorporates family adventures and motorcycle tours to hunting and birdwatching
- Attractions: These include museums and theme parks to sports clubs and festivals
- Transportation and Services: These include cruise liners, train and van tours to restaurants and gas stations

The tourism product can be a location where the specific place is the destination and it can either be natural or manmade e.g. theme parks, the travel process itself as the destination e.g. cruise liners and train tours or the stay as the destination e.g. resorts and palaces.

Other supply-side segmentation criteria may be geographical location of the customers, e.g. Europe, Africa etc. while channel of distribution entails the means by which the consumer is reached e.g. packaged tours, individuals and tour operator.

Demand Side Segmentation

Demographics: Understanding demographics is imperative to product development and segmentation, especially with regard to understanding trends in the marketplace. Demography (the study of age, sex, education, family status, life cycle etc.) is an excellent tool for product developers and marketers. According to the well-respected demographer, David Foot, demographics accounts for “two-thirds of everything”, (markets, social problems, demand for services etc.). The subject therefore plays a key-role in decision-making regarding demand for tourism products.

Behavioural Segmentation: People’s activities, interests and opinions (AIO’s) also play a key role in decision-making and travel habits. These behavioural characteristics (also known as psychographics), when used in conjunction with demographics, provide a much stronger marketing tool for tourism businesses and planners. Key among these behaviours are:

- Intimacy & Romance
- Experiencing Different Cultures
- Natural Wonders
- Fine Cuisine and being pampered
- Escaping winter weather
- Adventure and Excitement
- Experiencing Unspoiled Nature
- Historic sites
- Hands on Learning
- Hobby or sport

Business Tourism

Leisure tourism is when someone travels to a destination because they want to and there is no other motivation except looking for fun and relaxation and it has experience at its core. Whatever subtle reasons or motivations for leisure travel, when done, one engages in an experience. One does not just buy a product (although one may buy souvenirs) or just buy services (although one buys transportation, accommodation, food service, etc.), but buys an experience that comprises what and how one feels during and at the end of a trip –emotional response to a journey through time and space that includes purchases of products and services, but also an interaction with people and places.

Business tourism comprises of a trip that is undertaken for the purpose of attending a conference, meeting, exhibition or event, or as part of an employment incentive. Business travel, by contrast, is conducted by individual businesses, which is more difficult to track and to market in a targeted fashion. Business tourists as a category tend to be more worldly and well-travelled than the norm, and thus more interested in new and better experiences. These economic benefits of business tourism need to be effectively managed in order for destinations to yield the maximum benefit. When this is the case, the ‘impact of this industry on a nation’s economy is tremendous’ (Lee and Josiam, 2004: 105).

Without proper consideration, environmental and social factors may have a negative impact. From creating additional pollution and waste to the demand for infrastructure, the physical environment may suffer negatively from an influx of business tourists. Socially, business tourism appears to have mixed impacts, with the business traveller experiencing a more favourable time than the local community in the destination who may suffer negative impacts (Swarbrooke and Horner, 2001).

Large cities are multifunctional and therefore any business tourism operations become part of the mix of activities in a big city. In Law's categorisation of cities, he found that the 'invisibility of tourism in cities partly arises from the fact that many facilities are used both by residents and visitors. Improving these facilities therefore provides benefits for residents as well as assisting the promotion of tourism' (Law, 1996: 5). New projects and development of convention centres and arenas are often the 'centrepieces of the regeneration of derelict areas on the downtown areas' (Law, 1996: 12) and can be used effectively to secure funding for upliftment of the community.

12.4 Defining Short-Stay Accommodation

Accommodation or guest lodging is the hospitality sector in charge of overnight stays, whether that is one or many nights. It is a broad market, including anything from youth hostels to motels, economy to mid-market, luxury, long-stay hotels and serviced apartments, to resort hotels and professionally run AirBnB.

When it comes to the hospitality industry, we can differentiate between two types of accommodation: serviced and non-serviced.

- In **serviced accommodation**, the hotel staff is in charge of catering to the guest's needs throughout their stay. Therefore, housekeeping and catering services are to be expected. We can consider hostels and guest houses as some of the typical examples of serviced accommodations.

Hotels	Hotels are perhaps the typical type of accommodation in tourism within the serviced category. The sizes can vary, and they might be an extension of a popular hotel chain or perhaps an independent business. It is also possible for a hotel to be part of holiday resorts
Guest Houses	A guest house is all about cultural tourism. Sometimes, breakfast and other meals might be included in the pricing, but that's up to the owner. You may have access to the internet via Wi-Fi, professional staff, and certain types of interior décor, among many other services
B&B	Accommodation offering bed and breakfast is usually in a private house. B&Bs normally accommodate no more than 6 guests and may or may not serve an evening meal
Chalets	Sometimes, people travel as groups and look forward to bonding together and experiencing most things with each other. In that case, a chalet is the best type of lodging to choose. Sports teams, corporate teams, and even families are some of the typical examples of people who stay at chalets
Resort Hotels	International resort hotel with a 5-star quality award has a range of leisure and sports facilities. These include an 18-hole golf course, swimming pool and leisure centre, and country pursuits
Serviced Apartments	Serviced apartments are essentially self-catering apartments where services such as cleaning are available. Meals and drinks may also be available, either to each apartment or in a restaurant and/or bar on site
Lodge	Lodge is a country house occupied in season for sports such as hunting, shooting, or skiing
Hostel	A hostel is a building run by a private operator or non-profit membership organisation, where beds and sometimes meals and other services and facilities are provided

- In **non-serviced accommodation**, the guest has access to accommodation but not to certain services. For instance, cottages or camping facilities can enter this category.

Self-Catering	Self-catering is a house, a cottage, an apartment, a chalet or similar accommodation, with self- catering facilities, which is let normally on a weekly basis to individuals, although shorter breaks may be available
Cottage	A cottage is a traditional and small house, typically found in rural or semi-rural areas. Cottages have become quite popular types of holiday accommodation due to the cultural background and inimitable character they have. You'll feel at home while you're staying at a cottage, as you will be able to do all of your daily activities as you would back at your place
Apartments	Apartments are available in towns and cities, among many other locations. The prices can vary depending on the size and the duration of your stay. Like a prefab office, you will have access to all the amenities you need to be comfortable during your trip
Camping	A camping park is for camping only

12.5 Tourism Statistics

The following section provides an overview of tourism performance data for various geographies (i.e., national and provincial). The purpose of the data is to establish overarching tourism trends affecting the national tourism market and how these trends are affecting the regional tourism markets.

12.5.1 South Africa International Tourism Performance

The following section provides an overview of the South African tourism market's performance with regard to international tourists.

Performance Indicators

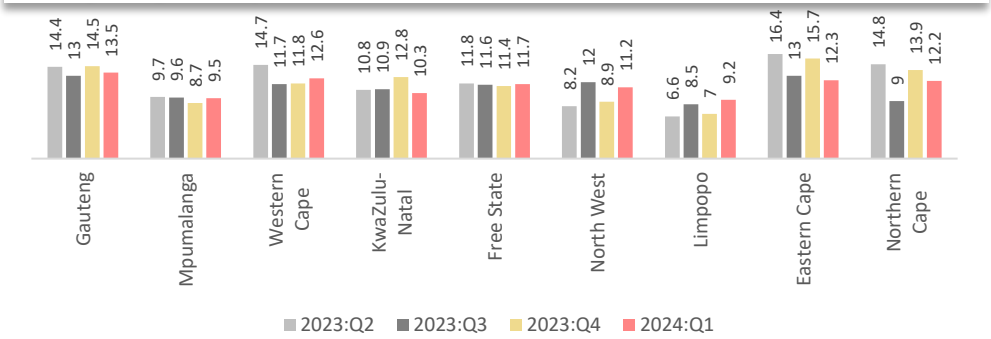
	2023:Q2	2023:Q3	2023:Q4	2024:Q1
International Tourist Arrivals	2.0 million	2.1 million	2.3 million	2.4 million
Total Foreign Direct Spend	R21.5 billion	R25.4 billion	R25.7 billion	R19.9 billion
Length of Stay	15.2 nights	12.4 nights	12.7 nights	11.6 nights
Bed Nights	26.7 million	31.2 million	32.5 million	26.6 million

Average Length of Stay (2023)
13.6
nights

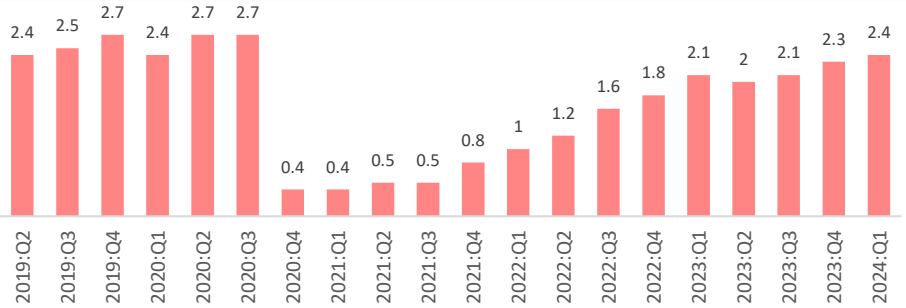
Number of International Arrivals (2023)
8.4
million

Total Bed Nights (2023)
111.8
million

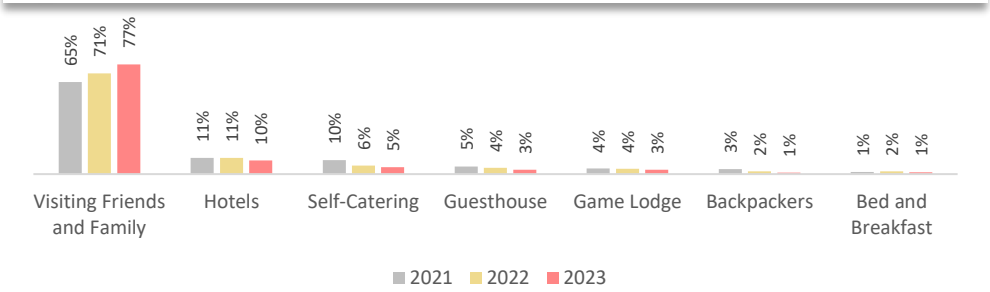
Average Length of Stay per Province



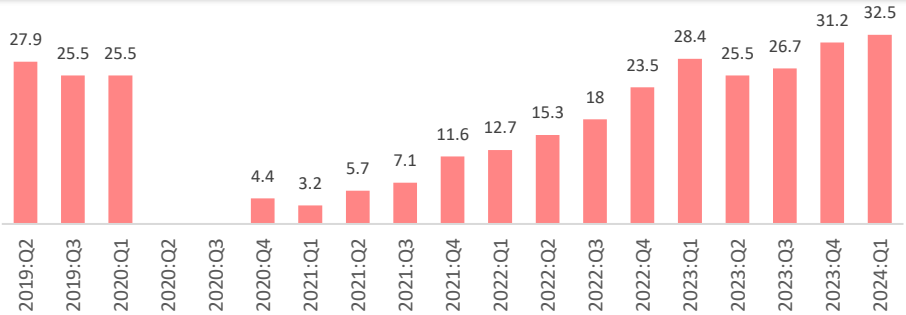
Arrivals



Type of Accommodation



Bed Nights (million)



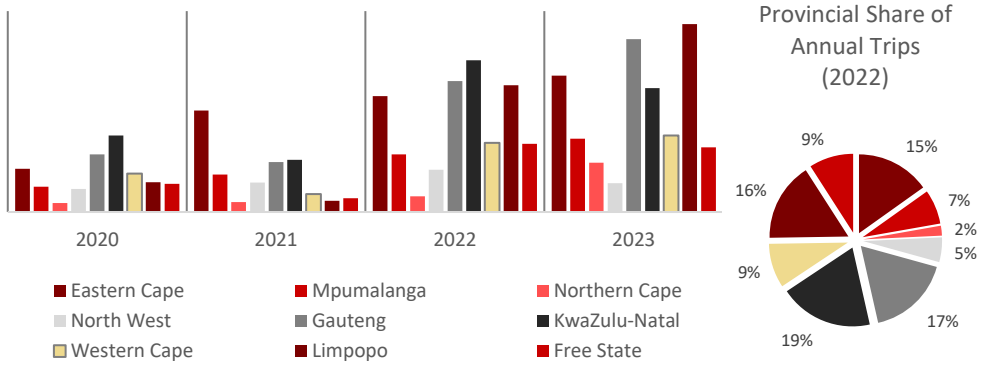
12.5.2 South Africa Domestic Tourism Performance

The following section provides an overview of the South African tourism market's performance with regard to domestic tourists.

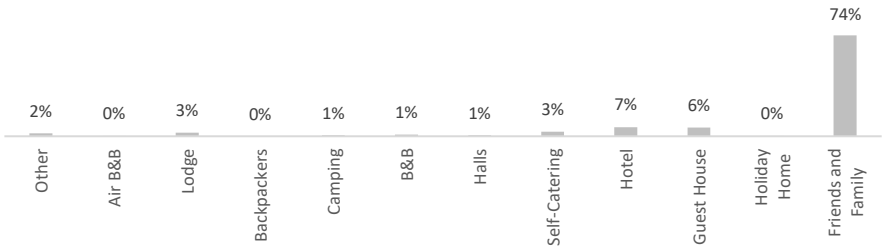
Performance Indicators

	2023:Q2	2023:Q3	2023:Q4	2024:Q1
Domestic Trips	10.0 million	9.0 million	10.1 million	8.5 million
Domestic Spend	R29.0 billion	R30.3 billion	R38.6 billion	R26.0 billion
Average Spend per Trip	R2 890	R3 356	R3 820	R3 039
Bed Nights	37.8 million	33.0 million	34.3 million	29.2 million
Length of Stay	3.8 nights	3.7 nights	3.4 nights	3.4 nights
Day Trips	20.1 million	35.2 million	47.6 million	48.1 million

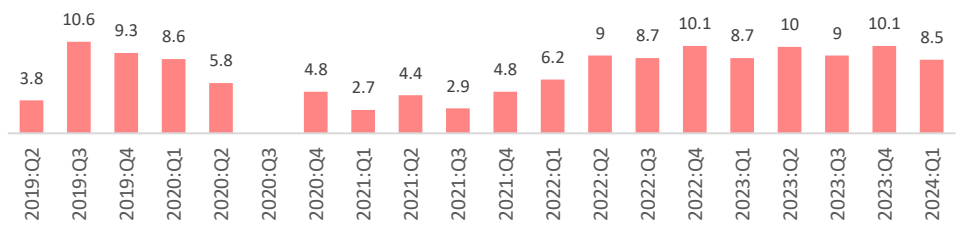
Number of Trips per Province



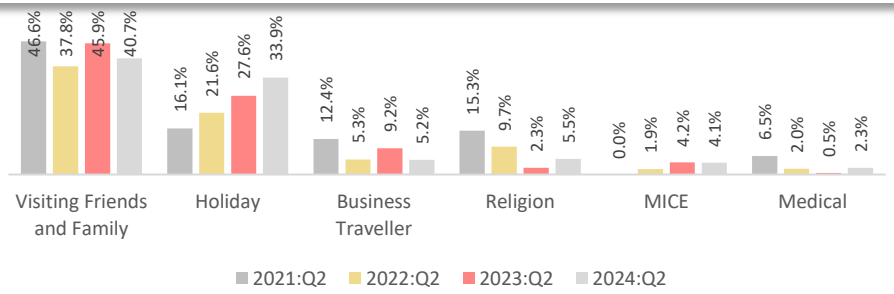
Type of Accommodation



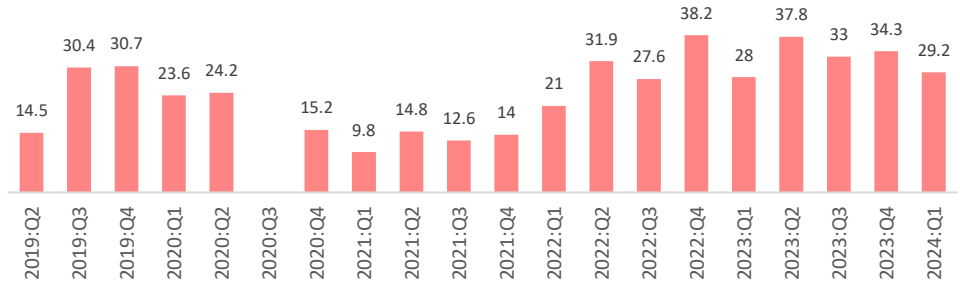
Domestic Trips (million)



Purpose of Trip



Domestic Bed Nights (million)



12.6 Tourist and Short-Stay Market Demand Side Indicators

The following section is focused on estimating the market demand for short-stay accommodation within the local economy, given growth trends and drivers for tourist activity and growth in the Emfuleni sub-regional economy.

The purpose of the section is to highlight the key elements that inform market demand modelling, estimating the market demand for short-stay accommodation, and provide an indication of market gap and development potential of tourist activity and short-stay accommodation in line with possible market entry periods for short-stay accommodation real estate development.

12.6.1 Market Demand Modelling

The following section focuses on estimating the market demand that exists in the market area for a short-stay accommodation facility.

The market demand estimations are calculated for the hotel market and auxiliary facilities per market segment. The share analysis refers to the expected market share generated according to the capacity provided.

Table 12.2: Gauteng Attractions of Bed Nights (Total Bed Nights)

Bed Nights	2029	2034	2039	2044
Foreign Bed Nights	65 233 886	90 308 868	125 022 319	173 079 127
Domestic Bed Nights	29 469 114	41 183 049	57 553 259	80 430 606
Total	**94 703 000**	**131 491 918**	**182 575 577**	**253 509 733**

Source: DEMACON Demand Modelling, 2024

Table 12.3: Gauteng Attractions of Hotel Bed Nights

Bed Nights	2029	2034	2039	2044
Foreign Bed Nights	7 744 936	10 721 979	14 843 356	20 548 932
Domestic Bed Nights	3 206 088	4 480 504	6 261 498	8 750 436
Total	**10 951 024**	**15 202 483**	**21 104 854**	**29 299 368**

Source: DEMACON Demand Modelling, 2024

Table 12.4: Project Summary

Bed Nights	2029	2034	2039	2044
Emfuleni Sub-Regional Economy Share (GVA & Employment)	3.7%	3.7%	3.7%	3.7%
Emfuleni Hotel Share (Bed Nights)	401 172	556 917	773 140	1 073 331
Nodal Share	40 117	55 692	77 314	107 333
Project Specific Share (Bed Nights)	22 064	30 630	42 523	59 033
Demand	**69**	**96**	**133**	**184**

Source: DEMACON Demand Modelling, 2024

Table 12.5: Short-Stay Demand (sqm)

Bed Nights	2029	2034	2039	2044
Keys (65% Occupancy)	106	147	204	284
Restaurant Seats	212	295	409	568
Conference / Function Seats	180	250	348	482
Total GLA	8 687	12 059	16 741	23 241

Source: DEMACON Demand Modelling, 2024

Demand Modelling Results

- Total tourist bed-nights in the Gauteng Province for 2029 is expected to amount to approximately 94.7 million.
- This results in a demand of approximately 10.9 million hotel bed-nights for 2029 increasing to 29.3 million by 2044
- The Emfuleni local economy has a share of approximately 3.7%, resulting a demand of 401 172 bed-nights (2029), increasing to approximately 1 073 331 bed-nights over the long term (2044)
- The project could attract approximately 22 064 bed-nights over the medium term and 59 033 bed-nights over the long term (2044)
- Ultimately short-stay accommodation with 147 keys can be developed over the medium to longer term. As well as a restaurant with approximately

295seats and a conference / function venue catering to approximately 250 people could be developed.

12.7 Gap Analysis and High-Level Recommendations

This Chapter of the report focused on a demand assessment of tourism and short-stay accommodation land uses at the Vaal Aerotropolis.

A gap analysis for the tourism and short-stay accommodation market shows that a gap exists within the local tourist market for additional short-stay accommodation over the medium- to long-term. Tourism growth is anticipated to contribute to the long-term growth of additional tourists to the local tourism market.

In addition, the growth of tourists will create a concomitant growth in the demand for tourist related activities and leisure. Market entry for short-stay accommodation uses could be from 2034 onwards.

Development Type	Effective Market Gap	Development Propsect
Short-Stay Accommodation	Yes	Moderate to High

Ultimately, a short-stay accommodation facility with approximately 147 could be developed. The development should ideally be a graded (at least 3 star) facility with a 4 star offering.

CONCLUSIONS AND RECOMMENDATIONS

13

13 Conclusions and Considerations

13.1 Introduction

This section provides a summary of the main socio-economic characteristics of the primary market area as well as demand summary and land budget.

13.2 Demographic Overview

POPULATION SIZE AND GROWTH

- Approximately 1.15 million people / 368 875 households reside in the primary market area.
- The average annual growth rate of population is 2.2% per annum, while the average annual growth rate of households is 2.5% per annum.

AGE AND GENDER PROFILE

- The age and gender profile reveals that:
  - The largest segment of the resident population is between the ages of 15 to 34 (38.7%) – classified as the youth population,
  - The second largest segment of the resident population are between the ages of 35 to 64 (30.9%) – classified as the adult population,
  - The third largest segment of the resident population are between the ages of 0 and 14 (26.5%) – classified as children, and
  - The smallest segment of the resident population is older than 64 years (3.9%) – classified as elderly.
- The profile shows a proportionally large contribution from the youth and adult categories, indicating a large expanding working age population.

RACIAL PROFILE

- The racial profile of the primary market area shows that the largest segment is Black African (84.1%), followed by a segment of White (10.2%), and smaller segments of Coloured (3.1%) and Indian / Asian (2.6%) populations.

MIGRATION PROFILE

- Since 2011, the primary market area has experienced a proportionally large influx of population, 36.4% of the population are migrants of which, 32.0% of migrants are South African, while 4.4% are from outside the South African border.

EDUCATION PROFILE

Highest Level of Education Attained

- Of the population within working age, 3.3% have obtained no education.
- A large portion of the primary market area has some secondary education (42.4%), or Grade12 / Matric (31.2%).
- A small percentage of the population have a higher education (10.3%).

Attendance at an Education Institution (Persons Aged 20 and Older)

- Of the persons aged 20 years and older, 7.7% are currently enrolled at an educational institution. They are primarily enrolled at a university (43.0%), followed by enrolments at a FET College (20.0%) or an ordinary school (17.4%).

EMPLOYMENT PROFILE

Economically Active Population and Employment

- Of the population of the primary market area, 62.9% are economically active, meaning that just more than two thirds of the population are of working age and are actively participating in the economy or seeking employment.
- The remaining 37.1% represent population that fall outside the scope of the economically active population definition and represent people who are not available for work such as full-time scholars and students, full-time homemakers, those who are retired and those who are unable or unwilling to work.

- Of the economically active population, 67.0% are employed and 33.0% are unemployed. The primary market area is characterised by moderately high unemployment levels, reflecting moderate to high dependency ratios.

Employment per Industry

- Of the population, 6.2% of employed persons are employed in the primary economic sector of which the mining sector is the most prominent.
- The tertiary economic sector is proportionally, the largest contributor in terms of employment (57.2%) of which the community, social and other personal services sector and the trade sector are the most prominent.
- The secondary economic sector proportionally contributes 24.4%, of which the manufacturing sector is the most prominent.

Employment per Occupation

- In the primary market area, 19.8% of the employed population are employed in skilled occupations of which technicians and associate professionals form the largest segments.
- Semi-skilled employed occupations proportionally make up 49.6% of employed persons of which craft and related workers and service workers, shop and market sales workers are the most prominent.
- Low skilled occupations contribute 25.5% to the total employed persons. Elementary occupations are the most prominent.

DWELLING TYPOLOGY

- The primary dwelling type for households in the primary market area are house or brick structures – formal dwellings (79.2%). The largest segment of formal dwellings are free standing houses on single erven (70.5%).
- Of the households in the primary market area, 20.5% resides in informal dwellings, of which 11.1% are informal dwellings on an erf and 9.2% are informal dwellings in the backyard.

TENURE STATUS

- Of households in the primary market area, 36.6% own the dwelling/property in which they reside and have fully paid the bond registered to the property with a further 12.9% of households in the process of paying off their bond.
- A large segment of households (27.5%) rent their current dwelling, whilst 23.0% occupy their current dwelling rent-free.

HOUSEHOLD INCOME PROFILE

- Affluent households (R1.3 million and more) make up 0.5% of households.
- Approximately 17.7% of households in the primary market area earn no formal income.
- The weighted average annual household income for the resident population for 2024 amounts to R103 938 per annum, which amounts to R8 661 per month for all SEM groups.
- For SEM groups 2 and higher, the average income is R309 465 per annum, which amounts to R25 789 per month.
- Independent research affirms that income is typically understated.

SEM PROFILE

- The discontinuation of the All-Media Products Survey (by the South African Audience Research Foundation (SAARF)), on which the Living Standard Measure (LSM) classifications were based, gave way to a new measurement system called The Socio-Economic Measure model (SEM). The newly released SEM model is a more accurate reflection of South African society in terms of how people live and is not dependent solely on durables, as the historical LSMs have been. The new SEM offers marketers a statistical and technical solution that depicts how our citizens are living, not only what they have in their homes.
- Approximately 66.5% of the primary market area's households are classified within the SEM Supergroup 1 with 33.5% of households classified within the SEM Supergroup 2+ categories.

13.3 Summary Of Demand Analysis

The following table provides a summary of the demand potential for the project.

Development Prospects	Proposed Size	Development Prospects	OPME	Notes
Residential	5 000 units	**Moderate to High**	2027+	• Modelling portrays demand and take-up based on prevailing (historic short and long term) market trends. As such, it can be expected that demand conditions may continue to improve. • The model consists of two sections, 1) total market and 2) project specific. Between 2024 and 2029 an estimated 13 584 new households will seek accommodation in the target geographic market area, resulting in an annual growth in demand of approximately 2 717 units (across the full housing spectrum, including informal and subsidy). • Under present market conditions, the finance-linked and bonded segment (36.8%) will yield a take-up rate of between 2 358 and 3 715 units per annum (including new households and resales). • A total of 5 000 units could be developed and taken-up within approximately 14 years (80% take-up). • The optimum point of market entry is 2027+. • A first phase of up to 1 000 units is recommended.

Optimum Distribution Range Configuration (based on market demand profile)

Residential Typology	Percentage	Nr of Units	Price Range	Composition	Unit Sizes
Apartments	17.0%	850	R410 000 - R450 000	0.5 bedroom, 1 bathroom	45-55
	25.5%	1 274	R500 000 – R650 000	1 bedroom, 1 bathroom	55-70
Freestanding houses	19.2%	962	R680 000 - R780 000	1.5 bedrooms, 1 bathroom	60 - 70
	12.8%	641	R800 000 - R1.1 million	2 bedrooms, 2 bathroom	80 - 90
	11.0%	550	R1.2 million - R1.5 million	3 bedrooms, 2 bathrooms	110-130
	7.3%	367	R1.6 million - R2.3 million	4 bedrooms, 3 bathrooms	130-160
	7.1%	356	R2.4 million+	4+ bedrooms, 3+ bathroom	160-200
Total	**100.0%**	**5 000**			

Social Housing	3 100 units	**Moderate to High**	2028+	• The modelling portrays market-based take-up based on medium to long-term market growth trends. • Under present market conditions, this segment of the market (48.4%) demands 2 388 to 3 103 units per annum (including new households and resales). • Approximately **3 100 social housing units** could be developed and taken-up within the medium to longer term (9 years). • A first phase of 800 to 1 000 units is recommended.

	SHRA Income Bands				Composition	Square Meters			

Development Prospects	Proposed Size	Development Prospects	OPME	Notes

Social Housing Target Market Groups	Lower	Upper	SHRA Unit Split Aspiration	Market Reality *	Number of Units			Min Rental Rates	Max Rental Rates	Average Rental Rates
Sub-Primary	R1 850	R3 500	5%	32.9%	1 021	Bachelor	18m² to 25m²	R500	R945	R722
Primary	R3 501	R6 700	25%	30.2%	936	Studio	18m² to 25m²	R1 015	R1 943	R1 479
Secondary (Band 1)	R6 701	R11 300	25%	18.9%	585	1 Bedroom, 1 Bathroom	25m² to 35m²	R2 077	R3 503	R2 790
Secondary (Band 2)	R11 301	R15 000	30%	8.5%	265	2 Bedrooms, 1 Bathroom	42m² to 48m²	R3 729	R4 950	R4 340
Secondary (Band 3)	R15 001	R22 000	15%	9.5%	294	3 Bedrooms, 2 Bathrooms	52m² to 60m2	R5 250	R7 700	R6 475
Total					3 100					

	Proposed Size	Development Prospects	OPME	Notes
Retail	±47 188m² GLA	**Moderate**	2034+	• In the context of the retail demand modelling, indications suggest, that there is retail potential of approximately ±47 188m² GLA • The optimum point of market entry for the retail land uses could be 2034+ • In the event that the full retail capacity as calculated is constructed and operational, annual sales of approximately R1.5 billion (based on benchmark trading densities and the baseline analysis) could be achieved and ±1 573 permanent on-site jobs could be created. • Ample parking should be provided at a ratio of at least 4 to 6 bays per 100m² retail GLA. • The centre should provide ±2 831 parking bays. • The centre will be classified as a regional centre.

Industrial & Warehousing	840 464m² (±168.1 ha)	**Moderate**	2027+	• Industrial sector market demand for the Emfuleni Sub-Regional Economy increases cumulatively from 20 hectares in 2029 to 280 hectares by 2044.
				• Viable market-based take-up for the site and its land use opportunities over the medium- to long-term is approximately 840 464m² gross lettable area (GLA).
				• The optimum point of market entry for industrial uses within the sub-regional economy and market is from 2027+.
				• The industrial demand is modelled based on an industrial sub-sector demand forecast which may ultimately be influenced by the nature and quantum of anchor tenants successfully procured.
				• The bulk of industrial demand could originate from sectors such as:
				  • Metals, metal products, machinery and equipment
				  • Food, beverages and tobacco
				  • Furniture and other manufacturing
				  • Petroleum products.

Automotive	9 372m² GLA	**Moderate to High**	2034+	• Trade and Automotive sector market demand for Emfuleni Sub-Regional Economy increases cumulatively from 26 684m² GLA in 2029 to 557 191m² GLA in 2044. • Viable market based take-up for the development over the medium to longer term is approximately 9 327m²

Development Prospects		Proposed Size	Development Prospects	OPME	Notes
					• Optimum point of market entry: 2034+, once the aerotropolis development has gained traction. • This floor space could include dealerships, automotive workshops, speciality shops and related activities.
	Office	40 007m^2 GLA	**Moderate**	2027+	• Market demand for office floor space in the sub-regional economy, increases cumulatively from 57 146m² GLA in 2029 to 198 113m² GLA in 2044 • Over the medium to longer term, the project could attract office take-up of approximately 40 007m² GLA. • Optimum point of market entry: 2027+ • This space includes GLA for offices and related facilities, but excludes parking, storage and basements
	Hotel	147 keys	**Moderate to High**	2034+	• Total tourist bed-nights in the Gauteng Province for 2029 is expected to amount to approximately 94.7 million. • This results in a demand of approximately 10.9 million hotel bed-nights for 2029 increasing to 29.3 million by 2044 • The Emfuleni local economy has a share of approximately 3.7%, resulting in a demand of 401 172 bed-nights (2029), increasing to approximately 1 073 331 bed-nights over the long term (2044) • The project could attract approximately 22 064 bed-nights over the medium term and 59 033 bed-nights over the long term (2044) • Ultimately short-stay accommodation with 147 keys can be developed over the medium to longer term. As well as a restaurant with approximately 295seats and a conference / function venue catering to approximately 250 people could be developed.
	Social Facilities	54.6 ha	**High**	2027+	• The development of approximately 8 000 residential units (social housing, FLISP & bonded units) necessitates the development of various social facilities, i.e. schools, creches, clinics, open spaces, SASSA paypoints etc. • Approximately 54.6 ha will required for the social facilities.

13.4 Synthesis & Land Budget

The following table indicates the land required for each land use over the medium term.

Vaal Aerotropolis Mixed Use Development Medium to Long Term Demand Potential Summary

Development Prospects	Proposed Size	Total Demand (ha)	Net Demand (including roads and surplus buffer) (ha)	Composition (%)	Development Prospects	OPME
Residential	5 000 units	200.0	253.0	40.9%	Moderate to High	2027+
Social Housing Units	31 00 units	22.1	28.0	4.5%	Moderate to High	2028+
Retail	±47 188m^2 GLA	13.5	17.1	2.8%	Moderate	2034+
Industrial & Warehousing*	840 464m^2 (±168.1 ha)	186.8	236.3	38.2%	Moderate to High	2027+
Automotive	2 277m^2 GLA	2.7	3.4	0.5%	Moderate to High	2034+
Office	40 007m^2 GLA	6.7	8.4	1.4%	Moderate	2027+
Hotel	147 keys	3.0	3.8	0.6%	Moderate to High	2034+
Social Facilities	54.6ha	54.6	69.1	11.2%	High	2027+
Total		**489.4**	**619.0**	**100.0%**		

** Includes overlap with larger Gateway precinct.*

A total of **619 hectares** could be developed and taken up over the medium to longer term. This includes 281.0 ha (45.4%) for residential uses, and 338.0 ha (54.6%) for non-residential uses. The industrial and warehousing space will require approximately 38.2% of land.

The successful implementation of the Vaal Aerotropolis will ultimately hinge on the procurement of anchor tenants to drive industrial and warehousing demand.

The development site is ideally located to serve a vast rural community with various large scale farmers residing in the North West and Free State. This agricultural market could provide the necessary demand required for a cargo hub exporting and importing live animals. The main destinations for South African export animals include bordering countries, but also Spain, Italy, United States, Hong Kong, Qatar, United Arab Emirates, China and Qatar. Animals are therefore predominantly exported via ship. The exports of animals via flight could not only fast track exports, but also ensure safer and more humane travelling for live animals.

ANNEXURE

A

ANNEXURE A: NATIONAL AIRPORT CASE STUDIES

OR TAMBO INTERNATIONAL

LOCATION

Kempton Park
Ekurhuleni Metropolitan, Gauteng Province

Opened in 1952

Renamed in 2006

Largest and busiest airport in Africa and South Africa

KEY CHARACTERISTICS

Location:

- Ideally situated in the heart of South Africa's commercial and industrial hub and has excellent road infrastructure
- Well locate with access to major regional routes with access to major cities, industrial and commercial nodes.

Access:

- R21 - Albertina Sisulu Freeway
- R24
- N12 freeway
- The Gautrain rapid rail system had its first section opened, inking the airport with Sandton and is being extended to Johannesburg and Pretoria.

Airport Features:

- Two asphalt runways, one of 4 421m and another of 3 405m.
- Domestic terminal: 90 000m²
- Central terminal: 110 000m²
- Annual passenger volume: 4.0 million in 2020/2021 with pre-covid volume at 21.3 million during 2018/2019.
- Annual passenger capacity: 28 million
- Air traffic movements: 70 414 (2020/2021) with pre-covid movement at 219 586 (2018/2019)
- Cargo capacity: 650 000 tonnes per annum
- 82% of South Africa's cargo comes through OR Tambo
- 16 300 parking bays
- 3 000+ employees

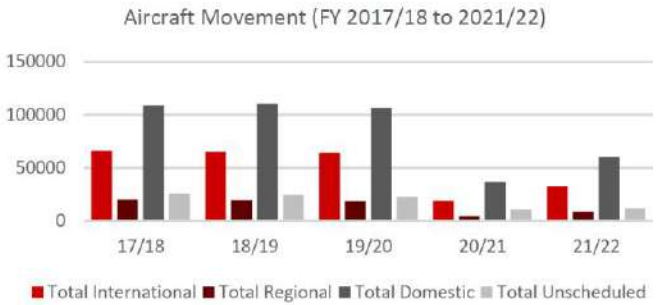
CAPACITY

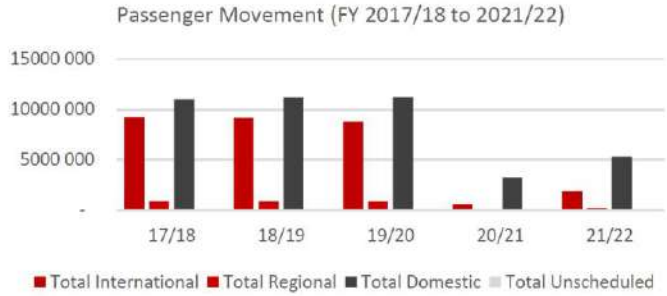
Aircraft (FY 20/21)

- International: 18 851
- Regional: 4 511
- Domestic: 36 553
- Unscheduled: 10 499
- Total: 113 314

Passengers (FY 20/21)

- International: 635 873
- Regional: 59 102
- Domestic: 3 264 655
- Unscheduled: 104 1091
- Total: 4 063 739

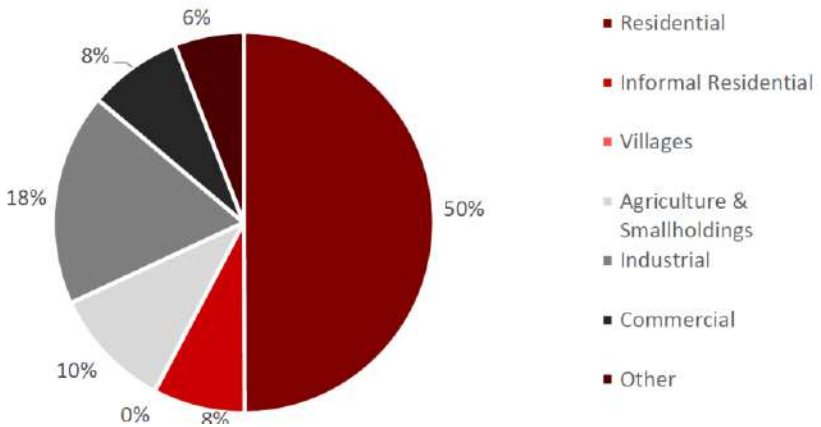




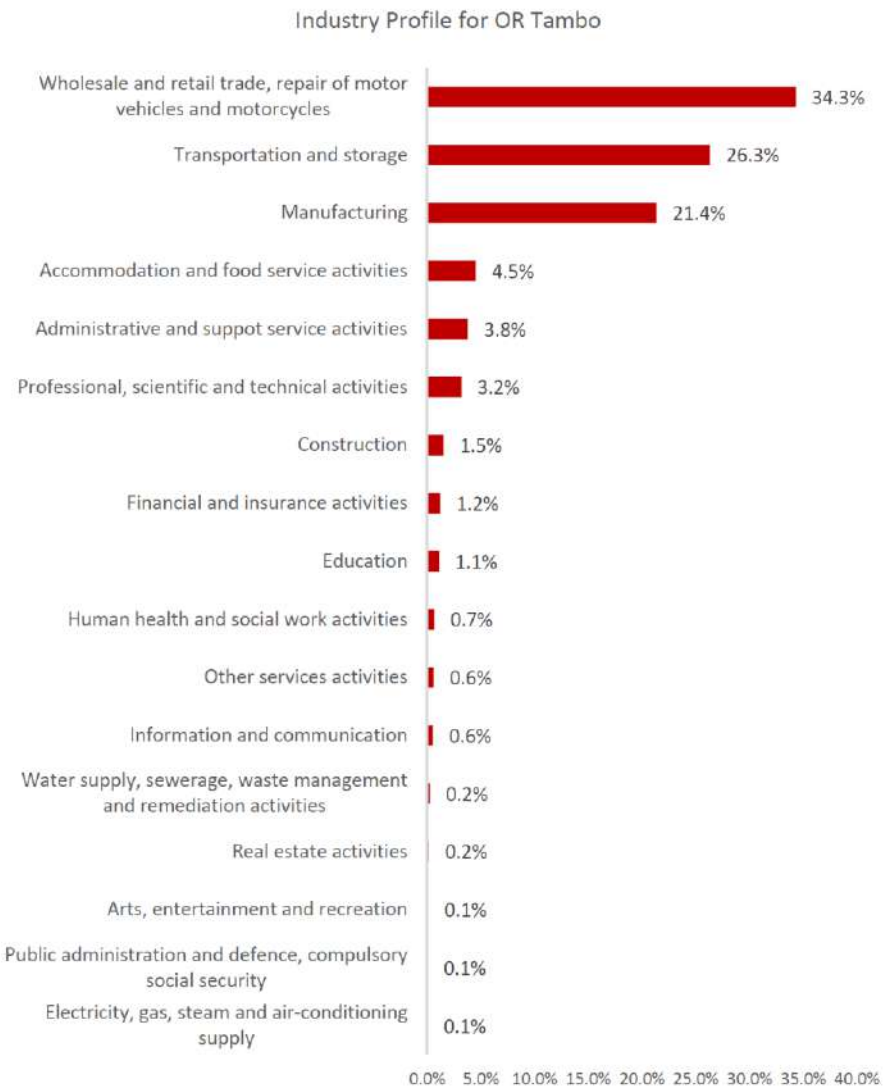
OR TAMBO: LAND USE PROFILE

The dominant land use within a 10km radius of the OR Tambo International Airport is residential activities, occupying half of total land. This is followed by Industrial activities at 18% and agricultural and smallholdings at 8% as well as informal residential at 8%. The immediate environment surrounding OR Tambo is densely built up although areas just beyond the immediate airport area is characterised by significant by agricultural and small holding activity. The subsequent table and figure provide an overview of the land use profile within a 10m radius of the OR Tambo International airport.

Land Use	Size (Ha)	Proportion
Residential	15 682	50%
Informal Residential	2 457	8%
Villages	-	0%
Agriculture & Smallholdings	3 247	10%
Industrial	5 677	18%
Commercial	2 502	8%
Other	1 851	6%
Total	31 865	100%

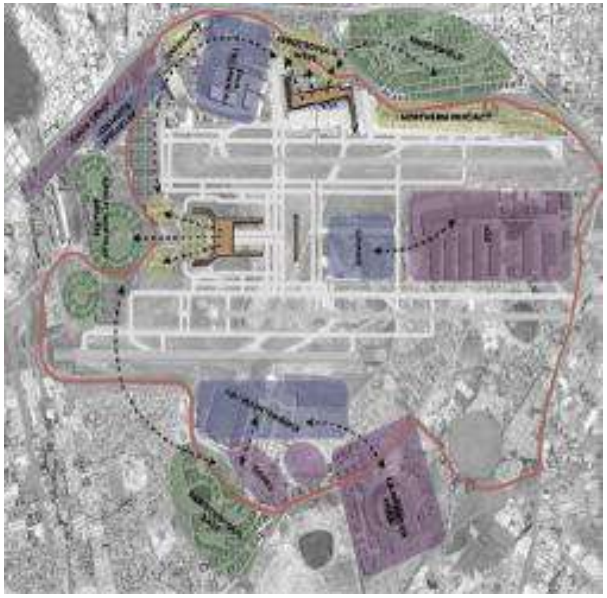


OR TAMBO INTERNATIONA AIRPORT: INDUSTRY PROFILE



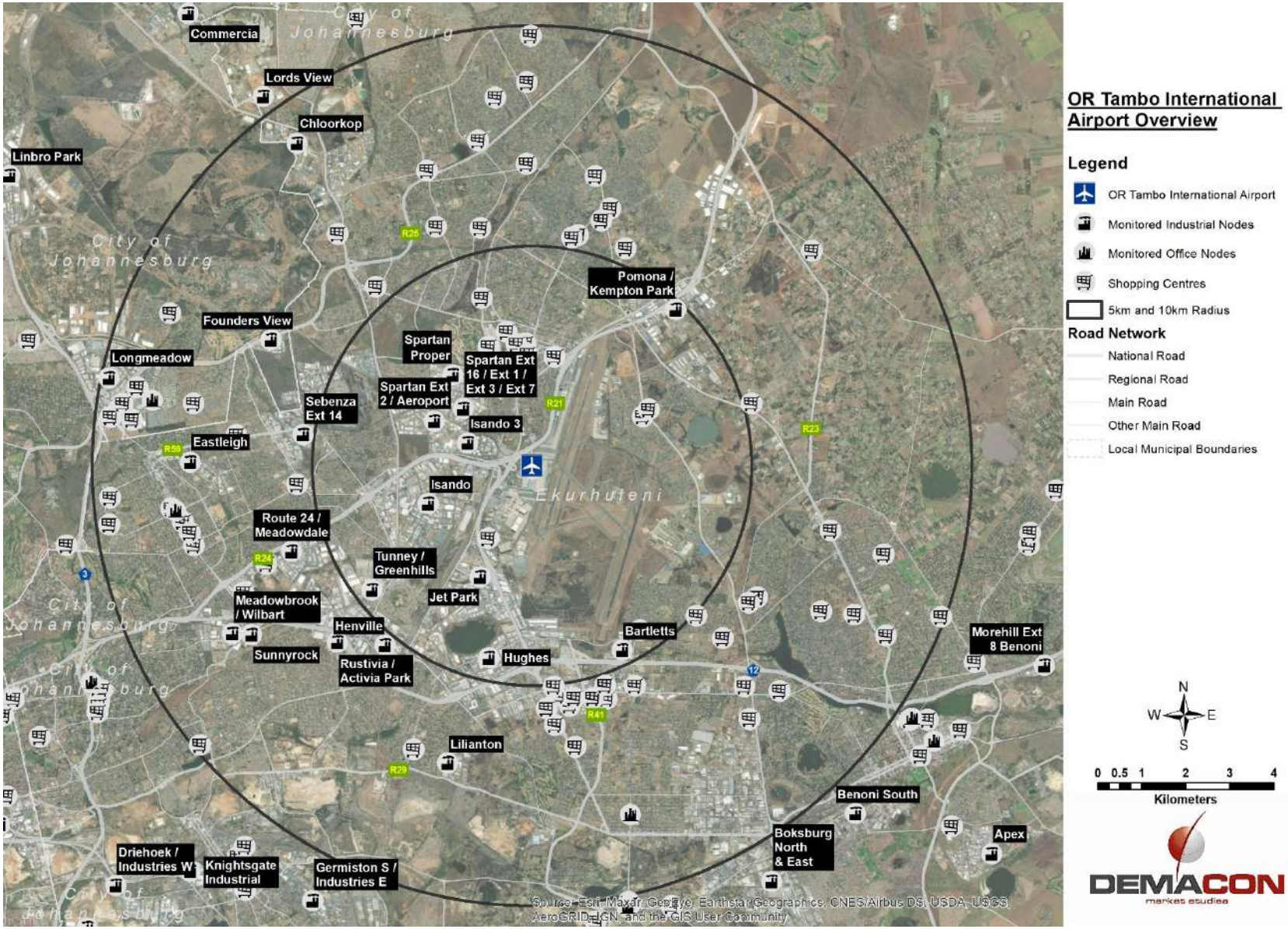
KEY DEVELOPMENT TRENDS

Ekurhuleni Aerotropolis	• Long term vision to develop the greater region into an aerotropolis by following key airport-centric development trends. • Development of a mixed use, integrated environment offering economic and social opportunities • Key focus areas include aerospace and manufacturing of aviation, logistics and distribution, manufacturing and high tech, health and life sciences, agri-business and food processing, natural resources and energy, education and skills training, tourism and culture, retail as well as professional services and public administration.	

OR Tambo IDZ	• Development of 725ha
	  ○ 7.5ha in OR Tambo International Airport
	  ○ 29ha located outside the airport but within close proximity
	  ○ 14ha 30km away adjacent to the Impala Platinum Refinery in Springs
	• OR Tambo Industrial Development Zone (IDZ). Once operational, the IDZ will cater for the production and export of high value low mass goods, focusing on sectors such as food processing, jewellery, diamond beneficiation and fuel cells.
	• Plans for expansion possibilities identified within proximity to the airport to house further agro-processing opportunities, aerospace/aviation electronics and pharmaceutical manufacturing
	• Secured domestic investment for the development of the largest and most diverse ultra-fresh food facility in the southern hemisphere and the second-largest refrigeration facility in the world.
	• Construction of an agro-processing facility in partnership with a local premier food giant, the In2food Group, started in 2018 and was completed in April 2019. Factory is 22 735m² in size.
		

Recent Developments	• Recent development in the grater airport region includes industrial developments with an increased focus on warehousing space for the logistics and distribution sector. • P-Grade industrial and logistics space	

OR Tambo International – Key Commercial Points of Interest



OR Tambo International Airport Overview

Legend

- OR Tambo International Airport
- Monitored Industrial Nodes
- Monitored Office Nodes
- Shopping Centres
- 5km and 10km Radius

Road Network

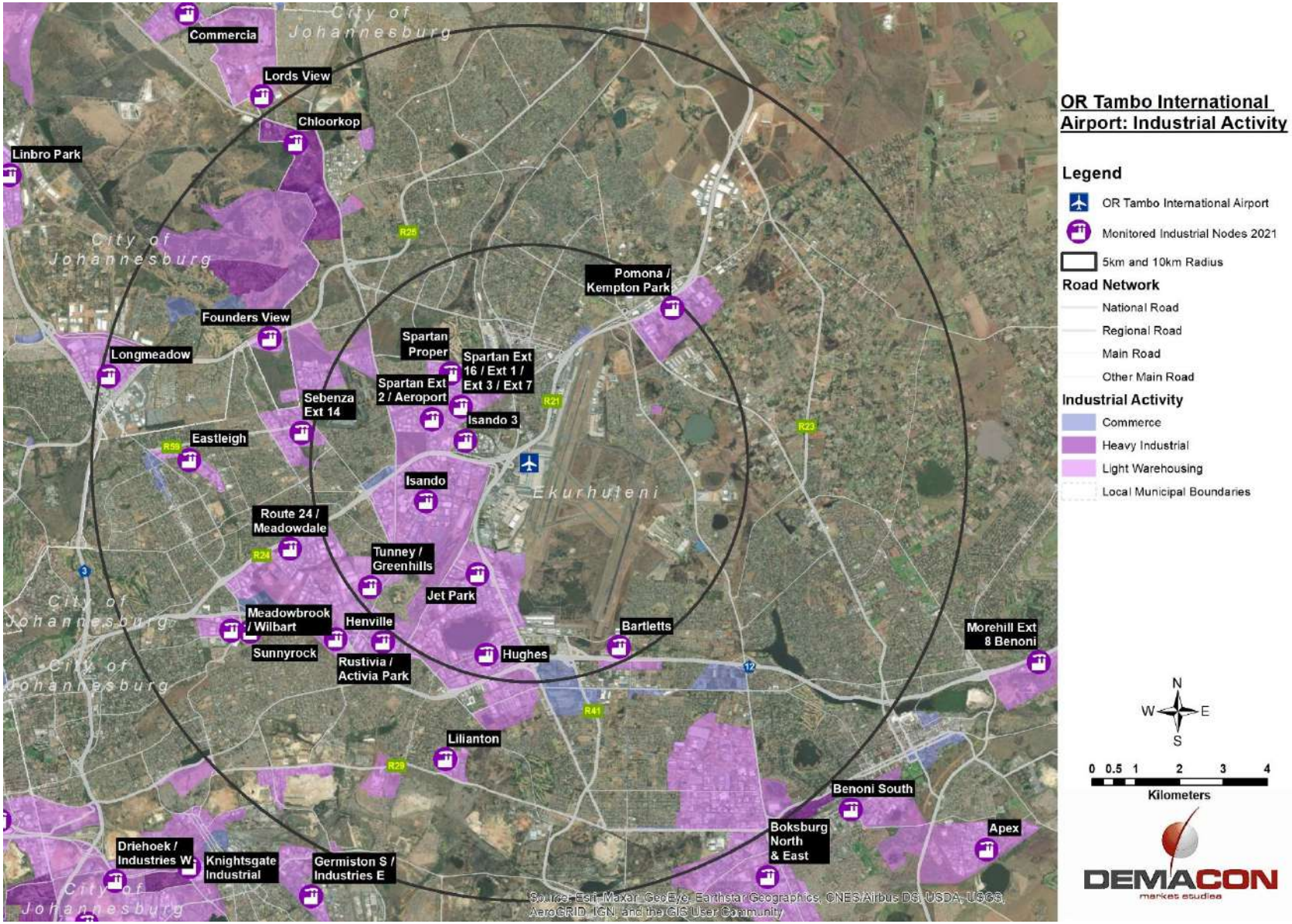
- National Road
- Regional Road
- Main Road
- Other Main Road
- Local Municipal Boundaries

N W E S

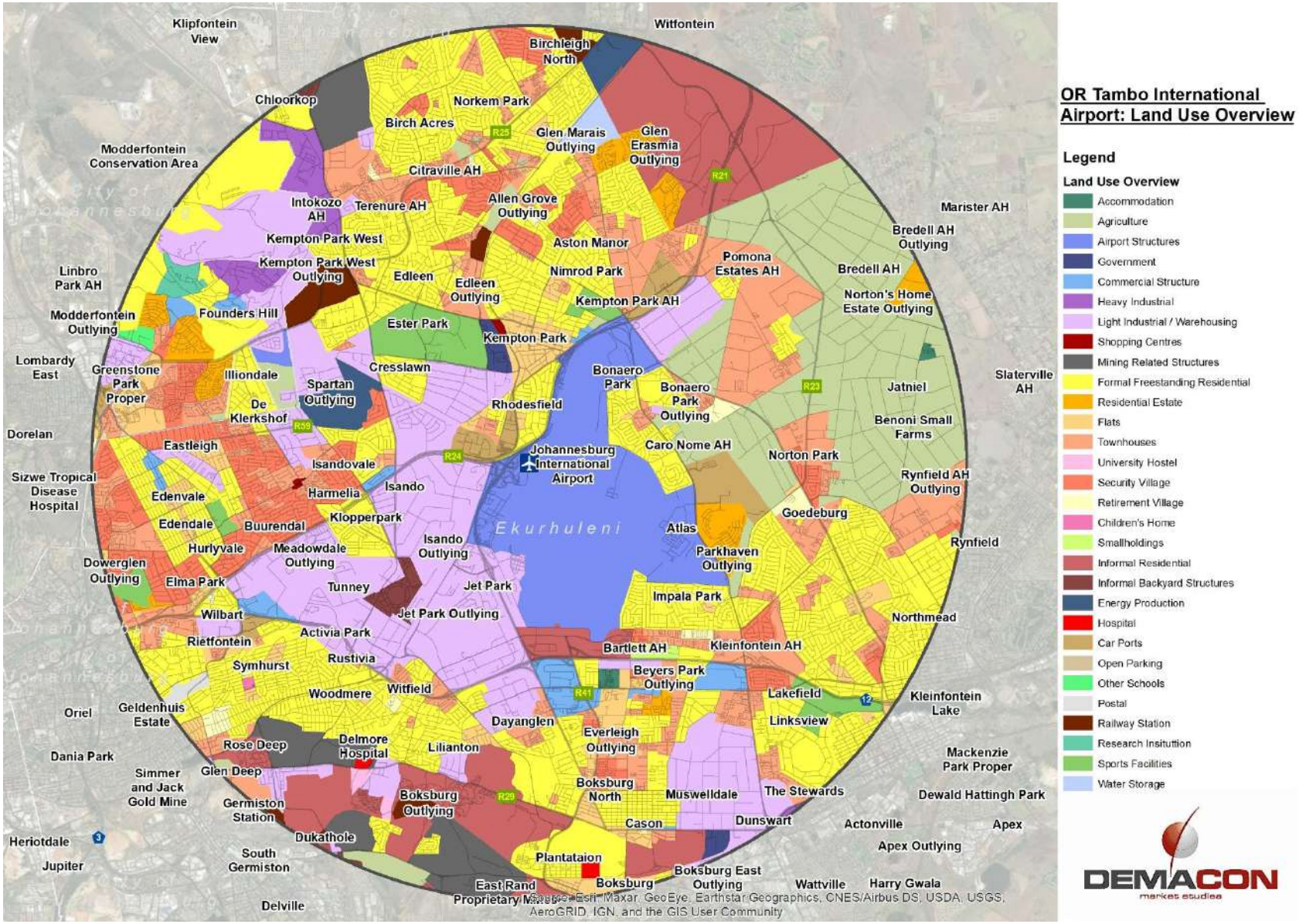
0 0.5 1 2 3 4
Kilometers

DEMACON
market studies

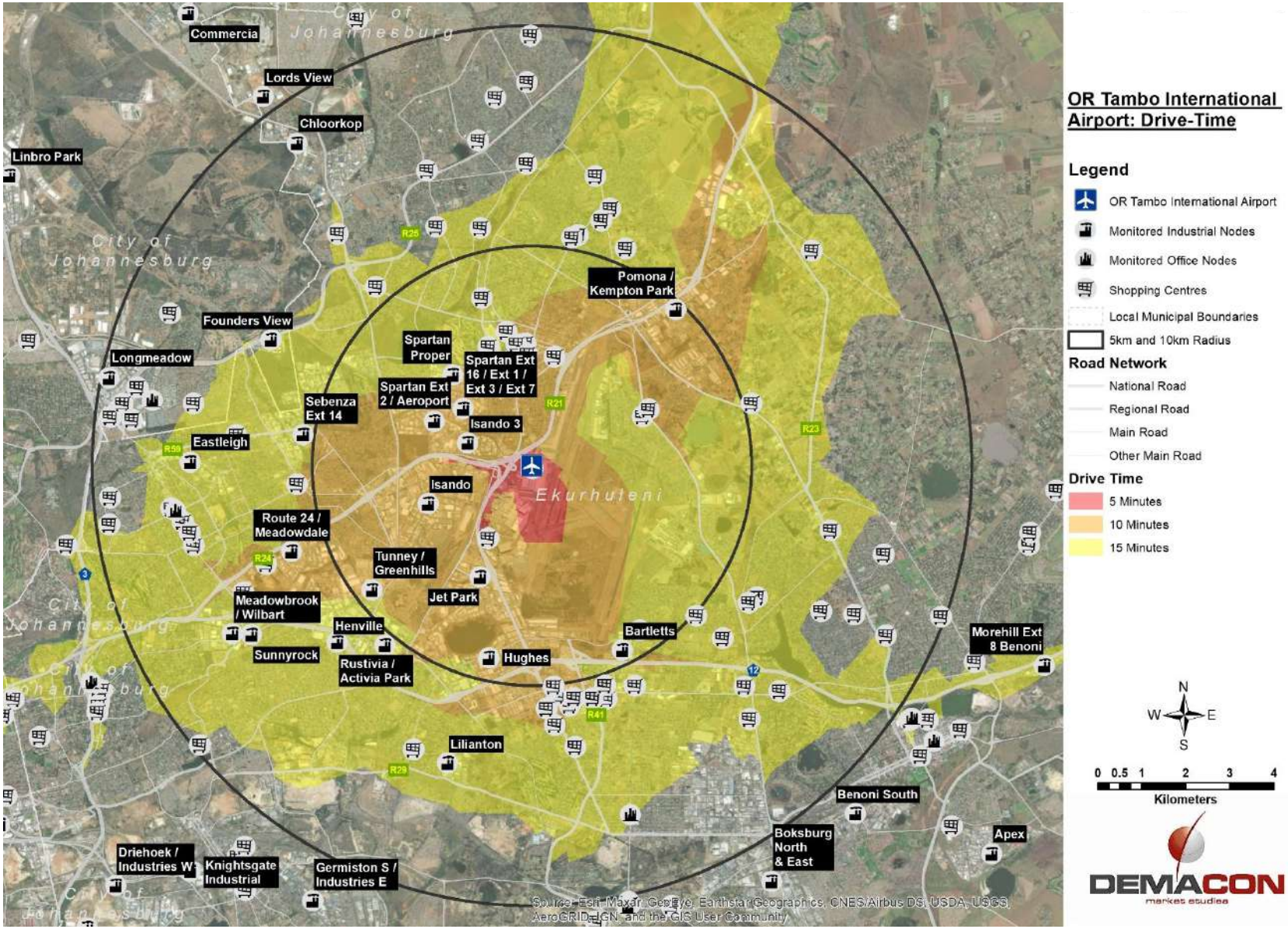
OR Tambo International Airport – Industrial Activity



OR Tambo International Airport – Land Use Profile



OR Tambo International Airport – Drive Time Overview



CAPE TOWN INTERNATIONAL AIRPORT

LOCATION

Matroosfontein

City of Cape Town, Western Cape Province

Opened in 1954

Replaced Cape Town's previous airport, Wingfield Aerodrome.

3rd Largest Airport in Africa

KEY CHARACTERISTICS

Location:

- Located in Matroosfontein, an area 20km east of the Cape Town City Centre
- Relatively central to the greater metropolitan area with access to key points of interest.

Access:

- Good freeway access including the N2, R300, M12, M10 and M22
- No direct rail access to the airport although PRASA has proposed a 4km rail link between the airport and the existing suburban rail network.
- Serviced by the MyCiti bus rapid transit system which connects to the Cape Town city centre.

Airport Features:

- Two asphalt runways, one of 3 201m and another of 1 701m.
- Passenger Terminal: 21 000m ²
- Annual passenger volume: 2.4 million during 2020/2021 with pre-covid volume at 10.8 million (2018/2019)
- Anticipated passenger capacity: 13.3 million
- Air traffic movements: 38 918 during 2020/201 with pre-covid movements at 98 666 aircraft during 2018/2019.
- Cargo capacity: 387 277 tonnes per annum
- 3 172 parking bays
- 4 050+ employees
- 24 airlines
- Recent increase of international arrivals - new runway of 3 500m as well as new domestic and international terminals are to be built.

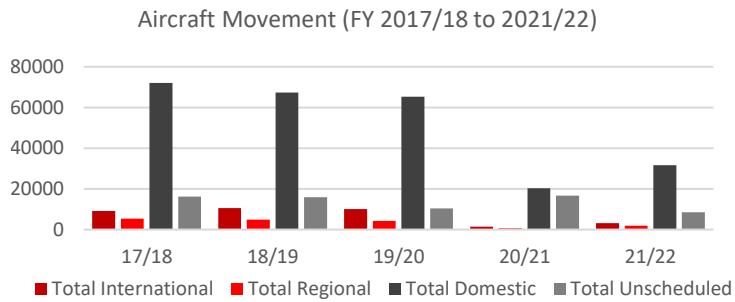
CAPACITY

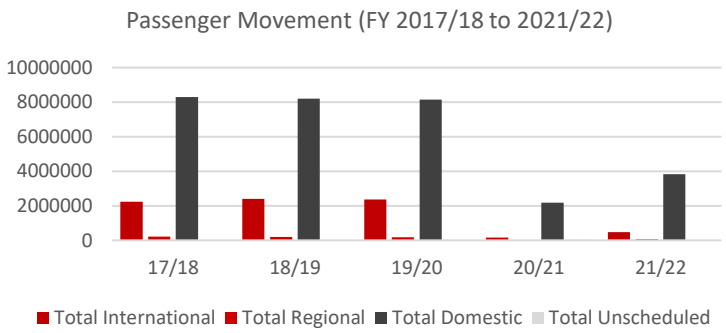
Aircraft (FY 20/21)

- International: 1 369
- Regional: 644
- Domestic: 20 287
- Unscheduled: 16 618
- Total: 39 918

Passengers (FY 20/21)

- International: 156 433
- Regional: 15 484
- Domestic: 2 181 670
- Unscheduled: 32 534
- Total: 2 386 121

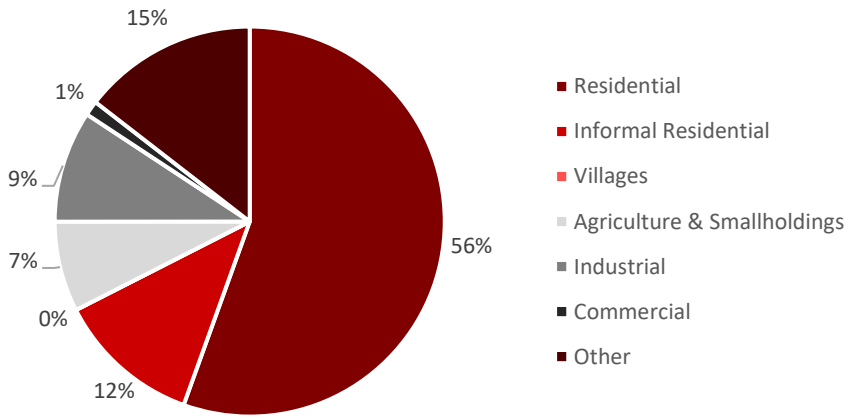




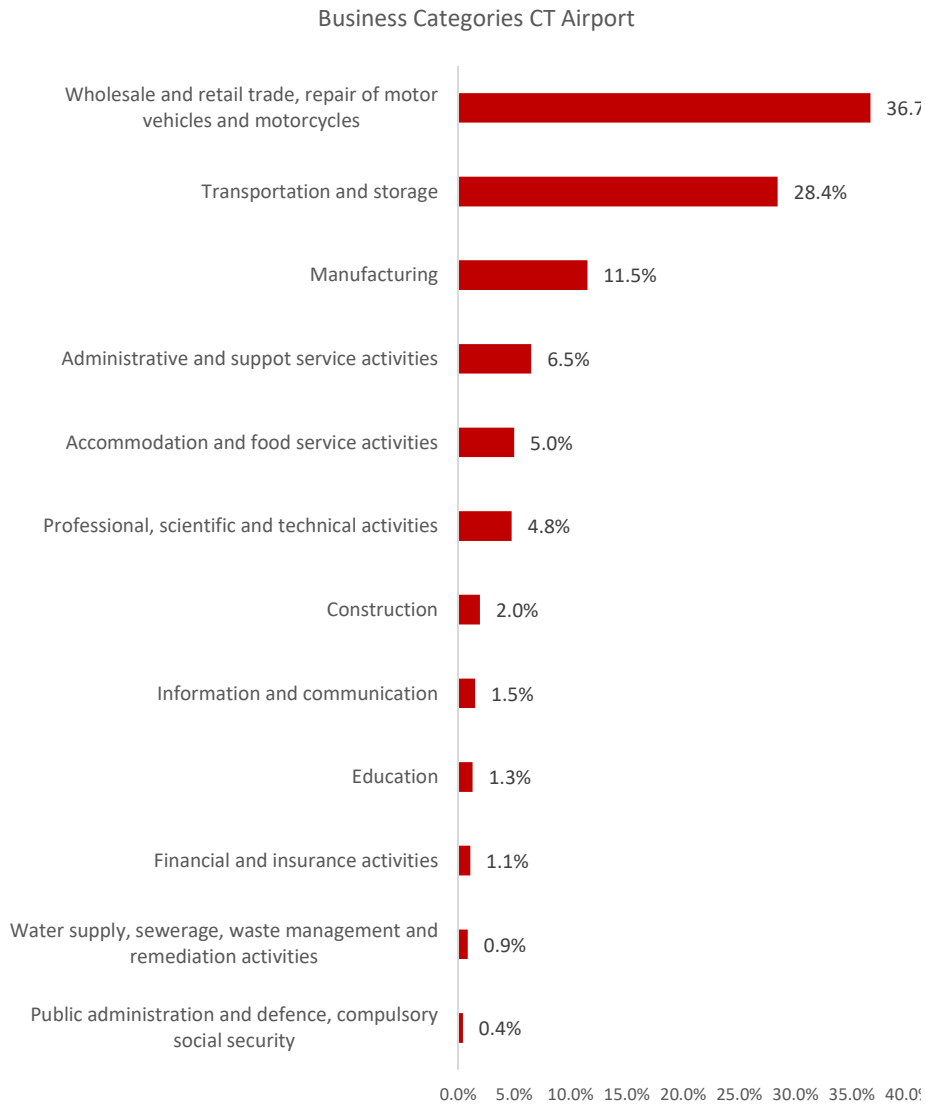
CAPE TOWN INTERNATIONAL: LAND USE PROFILE

The dominant land use within a 10km radius of the Cape Town International Airport is residential activities, occupying more than half of total land. This is followed by other activities at 15% and informal residential at 12%. The immediate environment surrounding airport is densely built up although areas just beyond the immediate airport area is characterised by significant by industrial and informal residential activity. The subsequent table and figure provide an overview of the land use profile within a 10km radius of the Cape Town International airport.

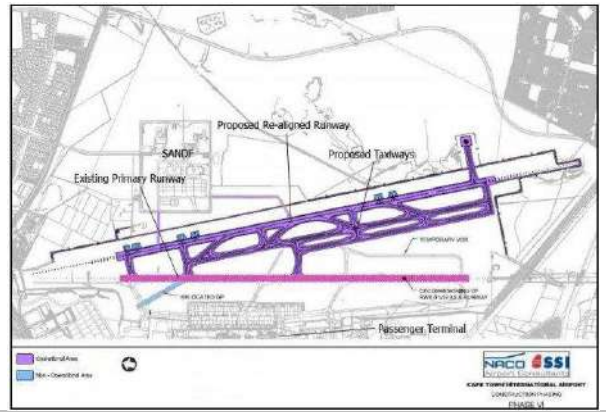
Land Use	Size (Ha)	Proportion
Residential	17 686	56%
Informal Residential	3 824	12%
Villages	-	0%
Agriculture & Smallholdings	2 385	7%
Industrial	2 956	9%
Commercial	389	1%
Other	4 624	15%
Total	31 865	100%



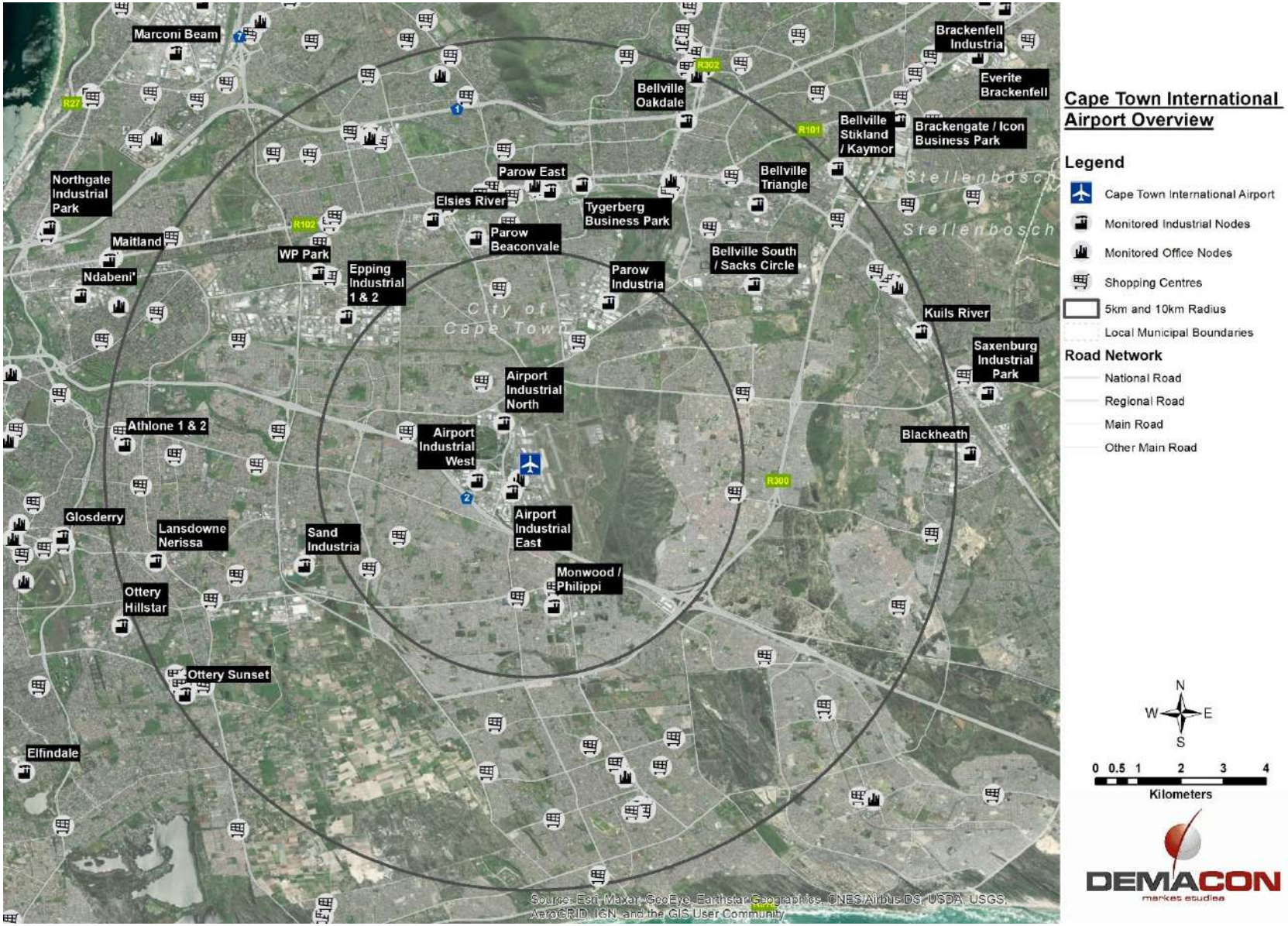
CAPE TOWN INTERNATIONAL: INDUSTRY PROFILE



KEY DEVELOPMENT TRENDS

Airport Expansion	• Airports Company South Africa (ACSA) is undertaking a major export expansion project for the Cape Town International Airport. • The expansion will include a realignment of its runway, expansion of its domestic arrival terminal as well as expansion of its international terminal. • Project value of R7 Billion. • Construction was indicated to commence in 2020 but has since been cancelled, awaiting improvement in air travel.	
King Air Industria	• King Air Industria is a 72ha industrial development in close proximity to the Cape Town International Airport is a recent development project that will add significant value to the local economy. • Large industrial park purpose built warehousing and distribution facilities • Warehouses range from 1 500m² to 50 000m², suitable for light industrial, distribution and logistics activities • The development is prompted by the growing demand for logistics businesses rather than warehousing. • The development is located 2km from the Cape Town International airport and is valued at R3 billion. • Infrastructure is nearing completion for the first two phases of the 72ha project. • Major tenants include a 10 112m² turnkey facility occupied by The Courier Guy as well as a 7 500m² tailor made facility for Morgan Cargo which comprises a provincial head office and specialised cold storage facility.	

Cape Town International – Key Commercial Points of Interest



Cape Town International Airport Overview

Legend

- Cape Town International Airport
- Monitored Industrial Nodes
- Monitored Office Nodes
- Shopping Centres
- 5km and 10km Radius
- Local Municipal Boundaries

Road Network

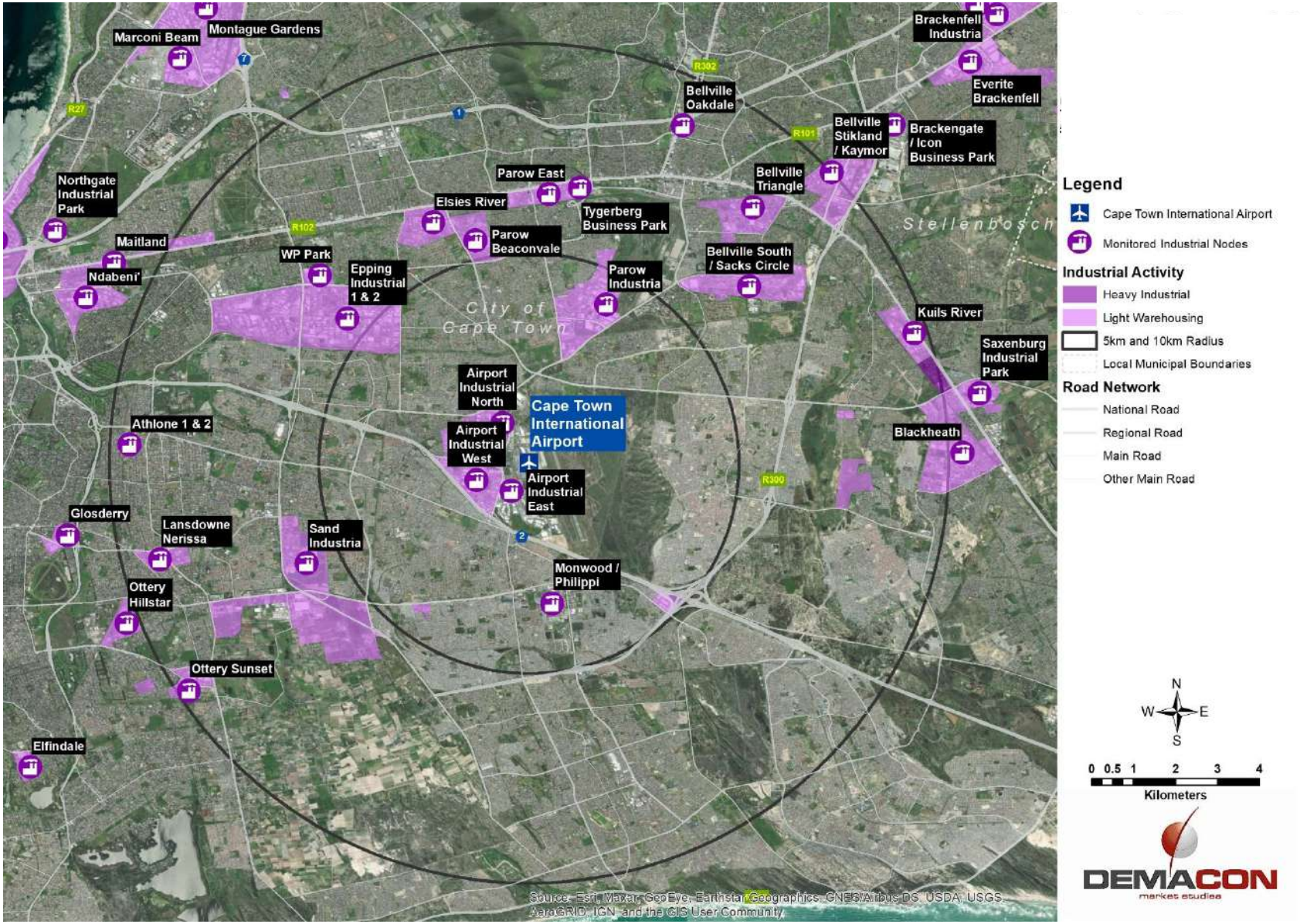
- National Road
- Regional Road
- Main Road
- Other Main Road

N W E S

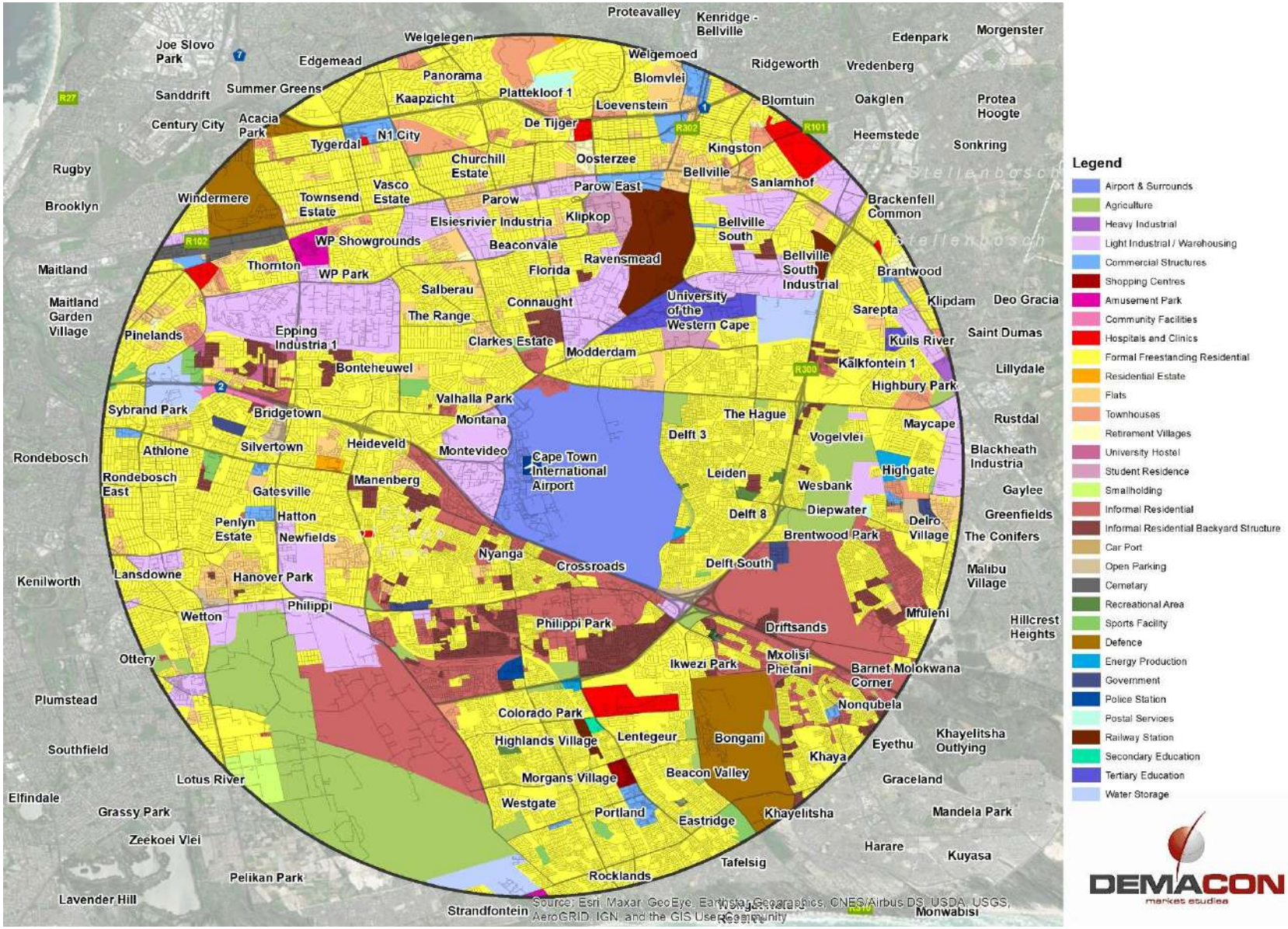
0 0.5 1 2 3 4
Kilometers

DEMACON
market studies

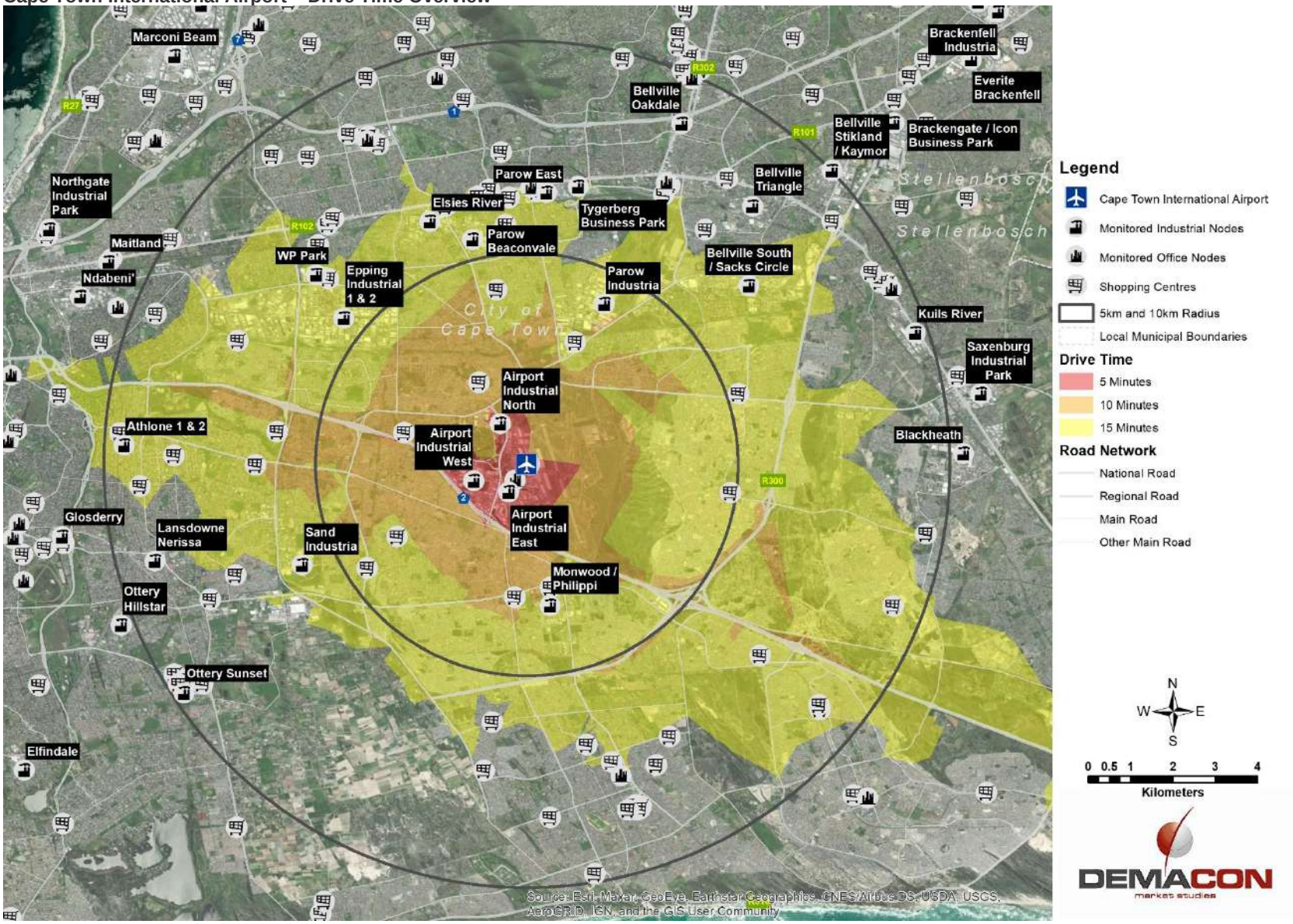
Cape Town International Airport – Industrial Activity



Cape Town International Airport – Land Use Profile



Cape Town International Airport – Drive Time Overview



Legend

- Cape Town International Airport
- Monitored Industrial Nodes
- Monitored Office Nodes
- Shopping Centres
- 5km and 10km Radius
- Local Municipal Boundaries

Drive Time

- 5 Minutes
- 10 Minutes
- 15 Minutes

Road Network

- National Road
- Regional Road
- Main Road
- Other Main Road

N W E S

0 0.5 1 2 3 4
Kilometers

DEMACON market studies

KING SHAKA INTERNATIONAL AIRPORT

LOCATION

La Mercy

eThekwini Metro
KwaZulu-Natal Province

Opened in 2010

Replaced the Durban International Airport. Due to a short runway, a need emerged for a new airport – King Shaka International Airport

KEY CHARACTERISTICS

Location:

- Located in La Mercy, an area 35km north of the Durban City Centre
- Good regional location – relative proximity to major nodes and points of interest.

Access:

- Good freeway access with ease of access to the N2 Coast Road, M43 and the R102.
- Transport provided by private taxi and bus services
- The main railway line heading north from Durban along the North Coast runs close to the R102.

Airport Features:

- One asphalt runway of 3 700m with provision for a second runway made when demand requires this in future.
- Terminal size: 102 000m ²
- Annual passenger volume: 1.5 Million (2020/2021) with pre-covid volume at 6 million passengers (2019/2020).
- Annual passenger capacity: 7.5 million
- Air traffic movements: 14 650 (2020/2021) with pre-covid air traffic movement at 50 753 aircraft per annum (2019 to 2020).
- Cargo capacity: 150 000 tonnes per annum
- 6 500 parking bays
- 7 passenger airlines and 2 cargo airlines
- Retail: 6 500m² - 52 stores
- The airport will form an integral part of the DubeTradeport SEZ and associated development.

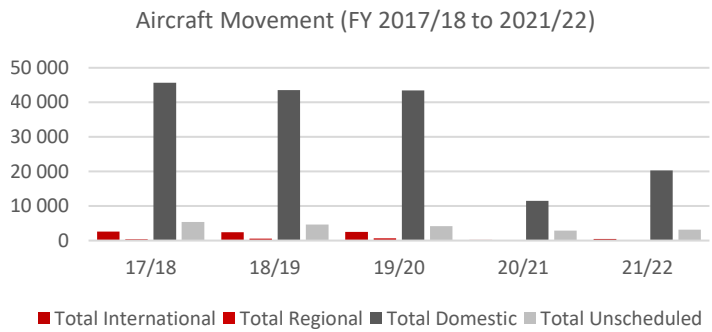
CAPACITY

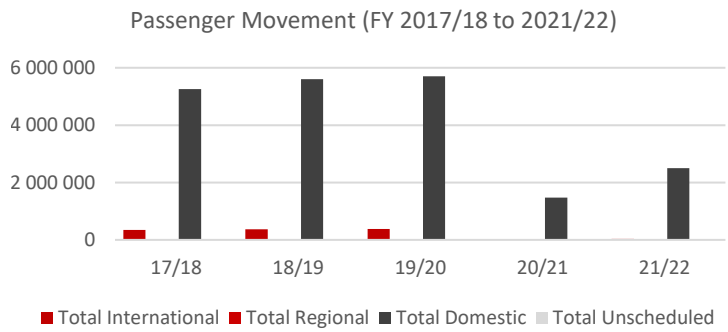
Aircraft (FY 20/21)

- International: 233
- Regional: 0
- Domestic: 11 505
- Unscheduled: 2 912
- Total: 14 650

Passengers (FY 20/21)

- International: 21 829
- Regional: 0
- Domestic: 5 699 080
- Unscheduled: 7 329
- Total: 6 099 628

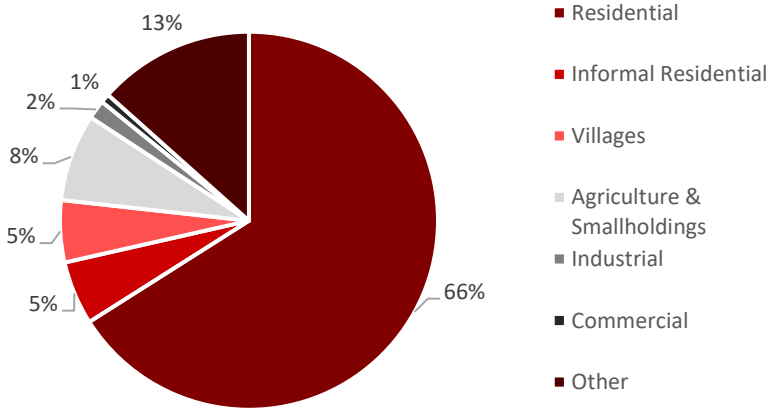




KING SHAKA INTERNATIONAL: LAND USE PROFILE

The dominant land use within a 10km radius of the King Shaka International Airport is residential activities, occupying more than half of total land. This is followed by other activities at 15% and informal residential at 12%. The immediate environment surrounding airport is densely built up although areas just beyond the immediate airport area is characterised by significant by industrial and informal residential activity. The subsequent table and figure provide an overview of the land use profile within a 10km radius of the King Shaka International airport.

Land Use	Size (Ha)	Proportion
Residential	15 520	66%
Informal Residential	1 279	5%
Villages	1 248	5%
Agriculture & Smallholdings	1 752	7%
Industrial	380	2%
Commercial	183	1%
Other	3 149	13%
Total	23 511	100%



KING SHAKA INTERNATIONAL: INDUSTRY PROFILE

The environment around King Shaka International Airport is comparatively less developed that the OR Tambo and Cape Town International airport, given that the King Shaka Airport is a more recent development that OR Tambo and CTIA. The area is anticipated to continue developing an attract investment as part of the greater Dube TradePort SEZ. The area does accommodate a few existing tenants including:

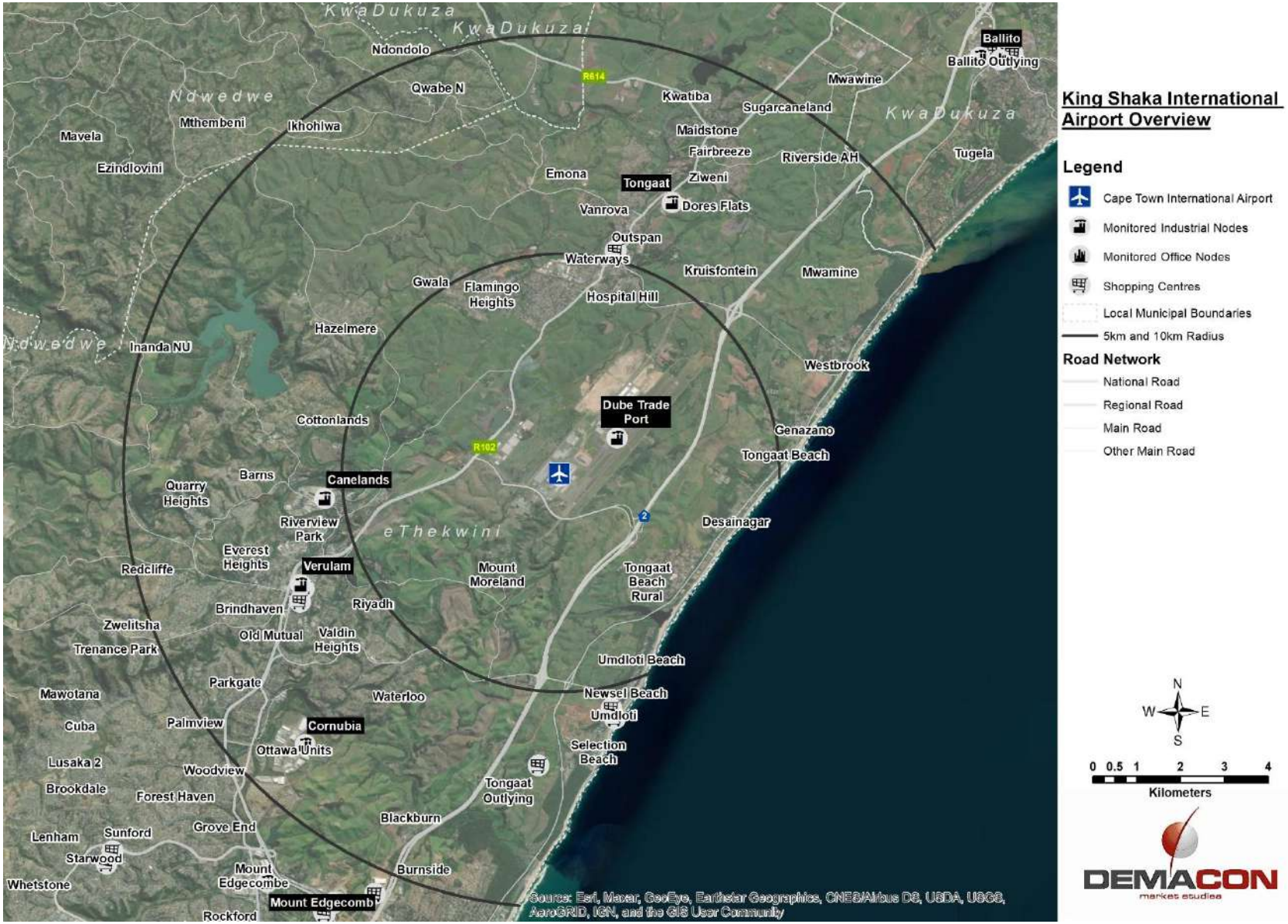
- iDube Cold Storage (Pty) Ltd
- Dube Tradeport Corporation Head office
- Dube TradePort AgriHouse
- Car hire and airport shuttle
- Logistics companies
- Manufacturing of washing lines
- Manufacturing of optical fibre, speciality fibre and integrated cabling
- Packaging manufacturing – bulk bags, dunnage bags, container liners and mine support systems
- Manufacturing of high-end SCUBA equipment
- Manufacturing of high-quality re-usable face masks suited to the medical, commercial and public sectors
- Manufacturing of smart meters – single & three phase & wireless solutions
- Stationary supplier
- Manufacturing of packaging for dangerous goods as well as providing training and consultation for the industry
- Manufacturing of helical and bevel helical gear reducers and gearmotors, planetary, work and coaxial gear reducers, gearmotors, precision servo gearmotors for automation purposes.
- Samsung factory manufacturing of “white goods” – fridges & appliances
- Automotive renovators – manufacturer, repairer, panel beating and spray painting.
- Signage manufacturing, construction for retail fitout, installation and maintenance, manufacturing, design and solution development.
- Plant and equipment providers focused on the can sugar industry
- Cable manufacturing – micro blown cables, duct cables, armoured cables, all self-support cables, access building cables, drop cables
- 4x4 accessories sales
- Restaurants / eateries

KEY DEVELOPMENT TRENDS

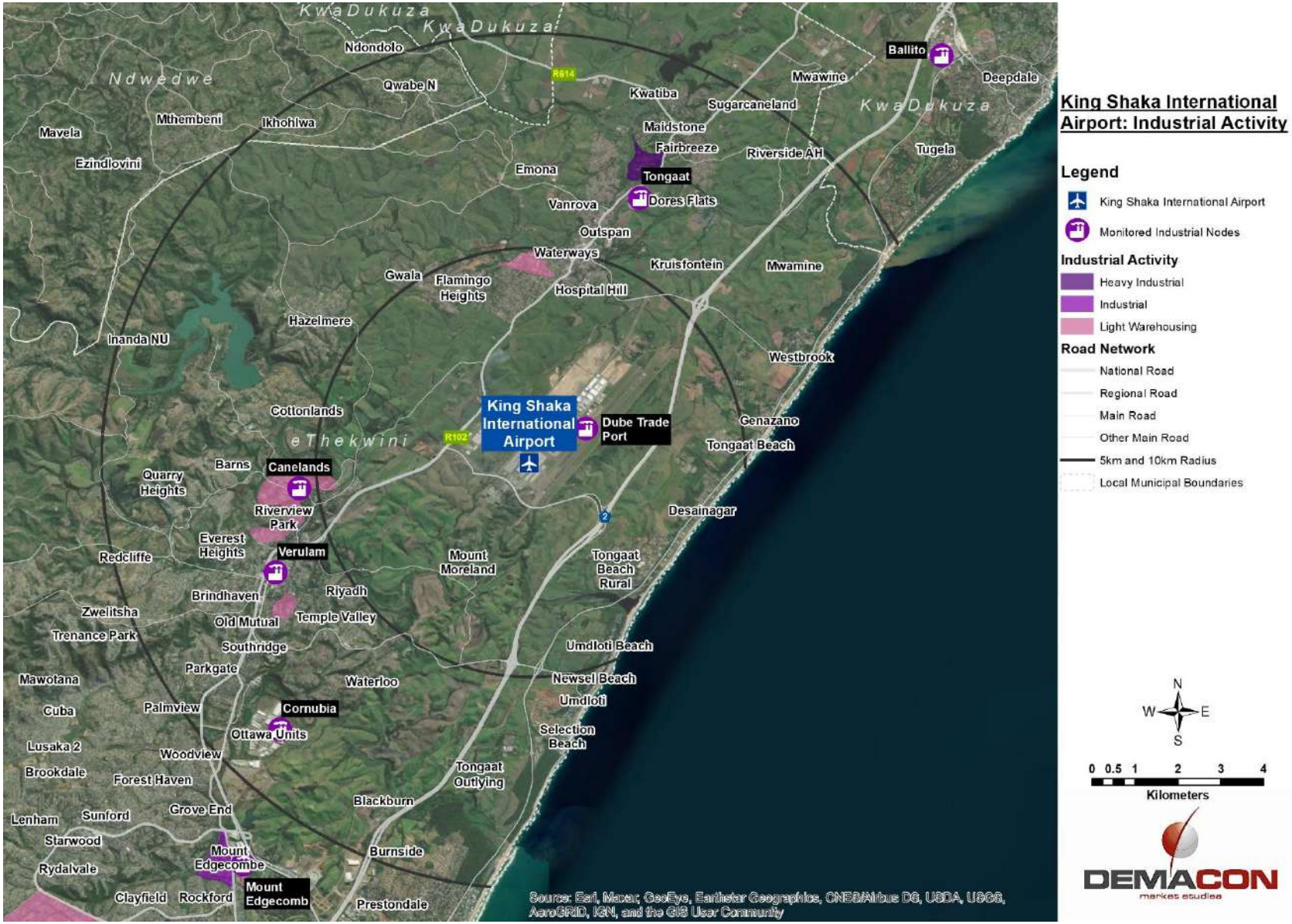
Dube TradePort Special Economic Zone (SEZ)	• Dube TradePort is an SEZ development located 30km north of Durban and in close proximity to the King Shaka International Airport.
	• The Dube TradePort development will consist of the following components:
	  ○ Dube City: 12 hectares of premium business and hospital precinct, 3 minutes from the passenger terminal
	  ○ Dube TradeZone: Prime, fully-serviced industrial precinct of 77 hectares, growing to 300 hectares for electronics, pharmaceuticals and aerospace manufacturing, assembling and distribution
	  ○ Dube Cargo Terminal: State of the art cargo handling facility with digital tracking and secure cargo flow through on-site statutory bodies
	  ○ Dube Agrizone: An advanced agricultural precinct that provides world-class facilities and technical support for propagating, growing, packing and distributing high-value perishables and horticultural products through an efficient supply chain.
	• In addition, the SEZ will be connected through Dube IConnect, a cutting-edge telecommunications platform and premier cloud service provider, servicing the Dube TradePort precinct and KwaZulu-Natal's only locally-hosted cloud service.
	• DubeTradeport takes advantage of its prime location and combines an international airport, dedicated cargo terminal, warehousing, offices, retail, hotels and agriculture.	

Durban Aerotropolis	• The Durban Aerotropolis is a long term development vision for the environment surrounding the King Shaka Airport. • The vision is deemed as a long term plan with a 50 year development horizon. • This aerotropolis is anticipated to cover 32 000ha of land which translates to 42 million square metres of property for development and 10 000ha of green space. • The Durban Aerotropolis is due to take advantage of the Dube Trasport's SEZ status • The formal adoption of the Aerotrpolis concept commenced in 2012 and was adopted in 2017.	

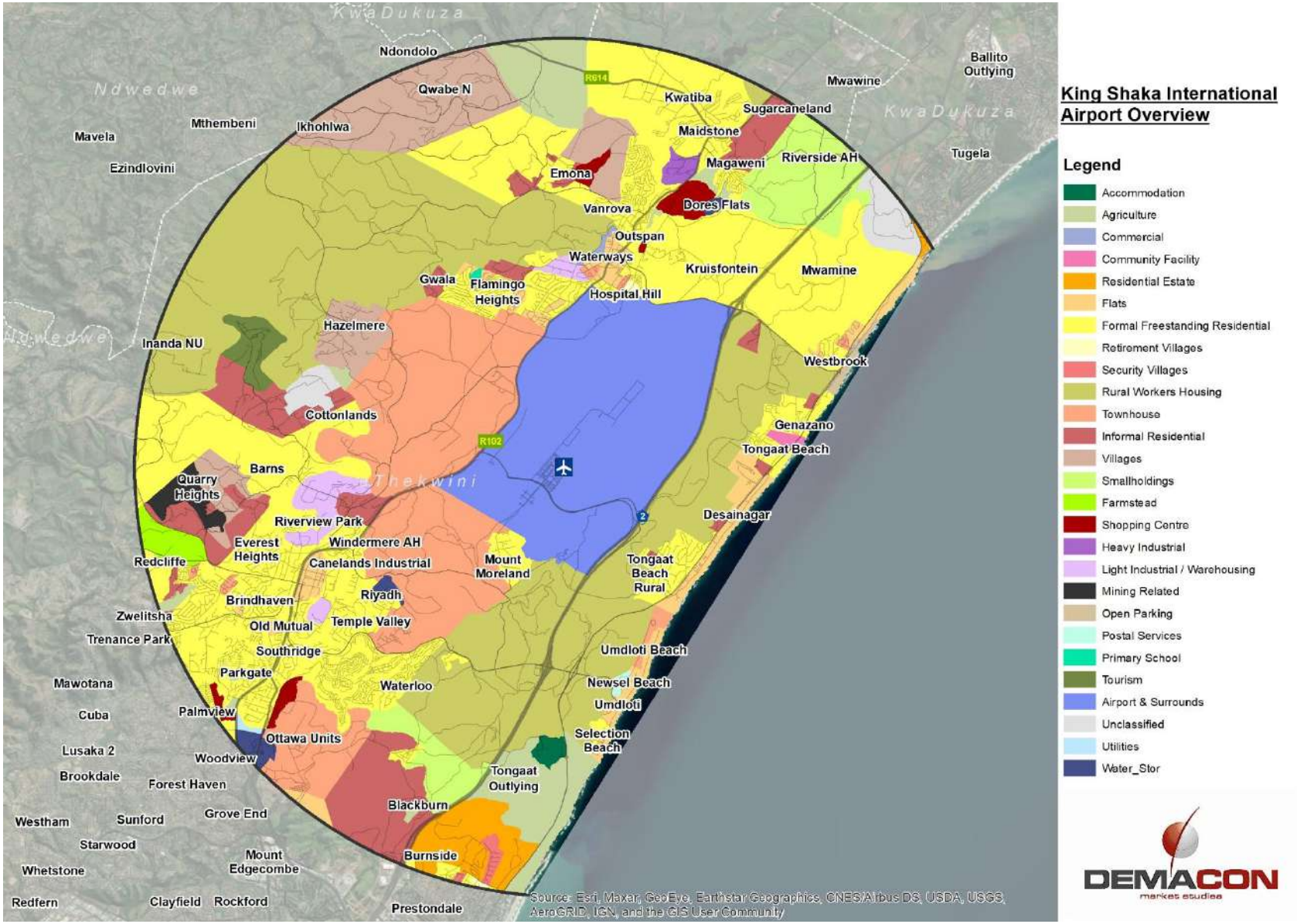
King Shaka International – Key Commercial Points of Interest



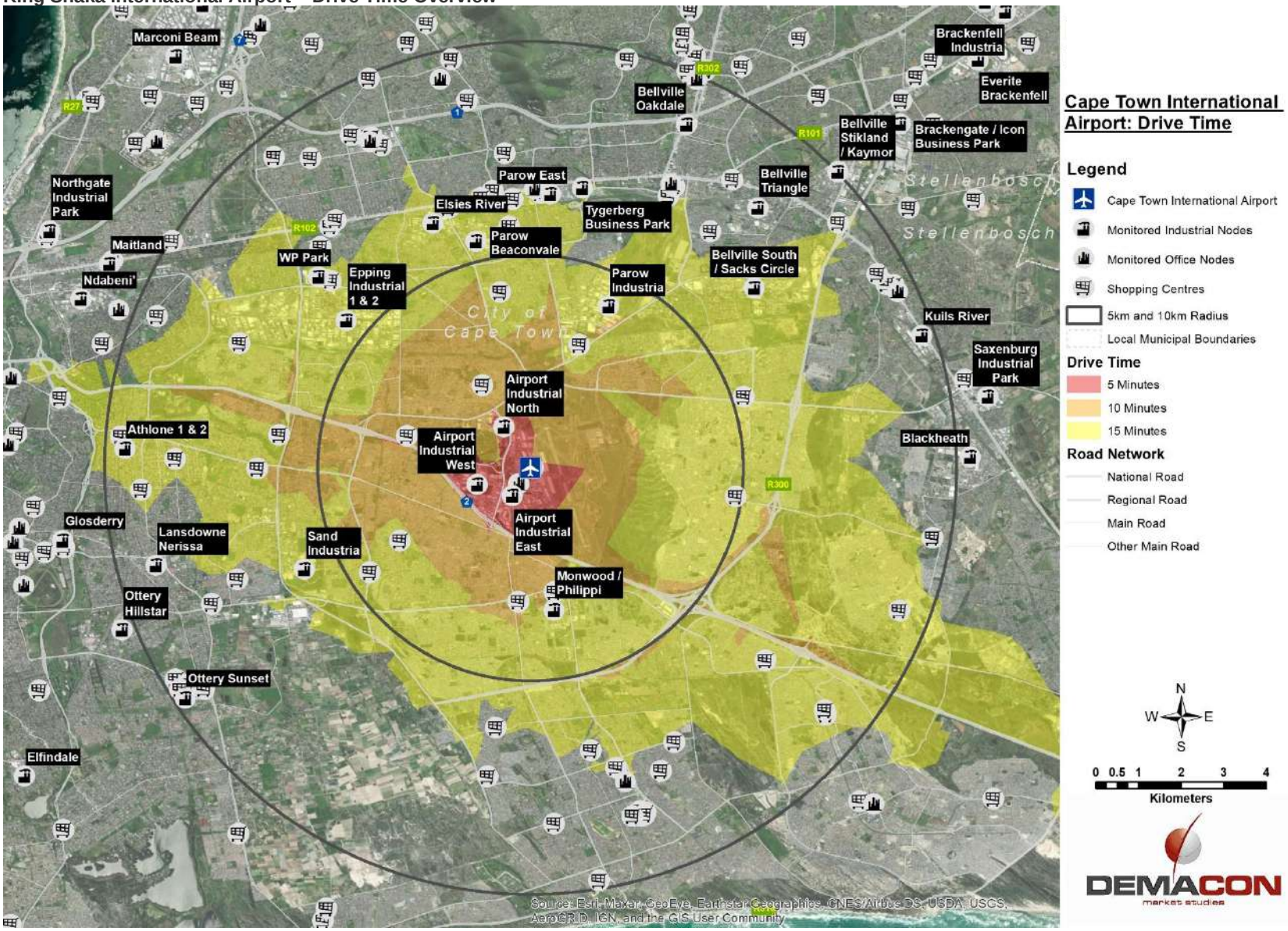
King Shaka International Airport – Industrial Activity



King Shaka International Airport – Land Use Profile



King Shaka International Airport – Drive Time Overview



Cape Town International Airport: Drive Time

Legend

- Cape Town International Airport
- Monitored Industrial Nodes
- Monitored Office Nodes
- Shopping Centres
- 5km and 10km Radius
- Local Municipal Boundaries

Drive Time

- 5 Minutes
- 10 Minutes
- 15 Minutes

Road Network

- National Road
- Regional Road
- Main Road
- Other Main Road

N W E S

0 0.5 1 2 3 4
Kilometers

DEMACON market studies

KEY CASE STUDY FINDINGS:

- The OR Tambo International Airport is the most established and busiest airport within the case study overview. Given the airport's maturity, popularity and location, it handles the most passengers and cargo between the three case studies. The environment around the airport is characterised by a diversified commercial and residential offering. Industrial and commercial activity includes logistics, distribution and courier services, automotive parts and services, engineering services, specialised manufacturing etc. New development in the surrounding environment is largely focused on providing larger warehousing and distribution facilities.
- The Cape Town International Airport is the second busiest airport in South Africa. The Industrial component surrounding the airport is dominated by logistics, distribution, warehousing and courier functions. Some smaller scale manufacturing of miscellaneous goods is also evident. New development is focused on mini-units and super-sized maxi units for the logistics and distribution industry.
- King Shaka International Airport is the youngest of the three airports within the case study overview. As such, the surrounding industrial and commercial component is still comparatively underdeveloped. The area is anticipated to receive continued investment as the Dube TradePort concept is further developed. To date, the airport and Dube TradePort has attracted several tenants.
- The bulk of land use activity around airports are dedicated to the transport sector including cargo handling, warehousing, land-distribution services including couriers and freight forwarders.
- Other dominant activities include specialised manufacturing and supporting services and miscellaneous industries.
- All of the case study locations offer good accessibility to surrounding nodes and other major points of interest and boast a well-established road network.

SMALLER NATIONAL AIRPORTS CASE STUDIES

The following section elaborates on smaller airports in South Africa more geared towards cargo and passenger overflow of larger airports.

WONDERBOOM NATIONAL AIRPORT

Wonderboom National Airport is situated in Pretoria, Gauteng. It is surrounded by residential development to the east and south with an army base and small holdings located west and north of the site.

Map 5.13: Wonderboom National Airport

KEY TENANTS:

The following is a list of the tenants of Wonderboom National Airport. The development (excluding the landing strip) measures approximately 90 ha. Main uses include light manufacturing / commercial industries geared towards the aviation industry and parts manufacturing.

Accommodation (1)	• Villa San Giovanni Accommodation
Aerial Photography (1)	• Fotogramensura (Pty) Ltd
Aerial Surveys (1)	• Camo Group
Aeronautical Engineering Services (1)	• Aero Struct Consulting
Air Ambulance (1)	• Flyfofa Air Ambulance

Avionics (3)	• Aeronautical Instrument and Autopilot • Century Avionics CC • Dodson International Parts SA (Pty) Ltd
Car Rental (3)	• Avis Rent a Car • Budget Rent-a-Car /McCarthy Limited • Europcar
Charters (9)	• African Sky Air Charters • Dodson International Parts SA (Pty) Ltd • Flyfofa Charter Services • FlyJetstream • General Airways • Helibip • Phoenix Aviation Solutions • Pretoria Flying School • VortX Aviation Training (Vortx Aviation CC)
General (8)	• Blokkies Eindomme • Blue Gambit Aviation Consultants (Aero Insurance & Finance/Businessure) • Executive Clearance and Aviation Consultants (BSA) • NAC – National Airways Corporation • Phoenix Aviation Solutions • Pilots and Planes (Shop in Terminal) • South African Police • Warbird Aircraft Services CC
Helicopters (2)	• Utair South Africa (Pty) Ltd • VortX Aviation Training (Vortx Aviation CC)
Instruments and Radios (1)	• Aero Electrical CC
Maintenance (23)	• 208 Aviation Aircraft Maintenance Organisation • Adventure Air • Aero Engineering and Powerplant • Aero Inspections • Aero Maintenance Centre • Aircraft Powerplant Company (Pty) Ltd • ALR Flight Investments • AMC – Aero Maintenance Centre • AMI – Aircraft Maintenance International • Aviation @ Work (Pty) Ltd • Aviation Manufacturing and Maintenance • Breytech Aviation • Dodson International Parts SA (Pty) Ltd • Heli Fix • International Aerospace Industries • Montana Aircraft Services • Multi Aircraft Services • PAS – Precision Aviation Services • Pilatus Centre SA • Pro-Av Aviation and Maintenance • Sport Plane Builders • Transvaal Aircraft Maintenance • Warbird Aircraft Services CC
Manufacturing (4)	• Aviation Manufacturing and Maintenance • Global Composite Solutions(Pty) Ltd • Pretorius MC (Spestechon Ingenieursdienste BK/Finmech) • SA Ravin Aircraft
Parts (4)	• International Aerospace Industries • Placo Wonderboom • Propeller Centre • Republic Aircraft Parts
Restaurant (1)	• Villa San Giovanni Ristorante
Sky Diving (1)	• Skydive Pretoria
Tools (1)	• Itshitshi Aviation Tools and Supplies
Training (14)	• Aviation Safety Training Africa (ASTA) • Big Sky Cabin Training Academy • Blue Chip Flight School • Flyfofa Airways and Flight Training • General Airways • Helibip • Integrated Aerospace Training Centre • Precision Aviation Training Academy • Pretoria Flying School • Pro-Av Aviation and Maintenance • Professional Flight Centre • Thompson Aviation • TR Eagle Air • VortX Aviation Training (Vortx Aviation CC)

LANSERIA INTERNATIONAL AIRPORT

Location: Krugersdorp, Gauteng.

The airport is located next to the R512. Surrounding land uses include manufacturing / warehousing to the south of the site and agricultural land mainly utilised as lodges / wedding destinations on the eastern, northern and western sides of the site.

The airport is located approximately 10km from the nearest formal urban areas of Diepsloot and Dainfern.

Lanseria International Airport

The airport land uses include accommodation, aviation, maintenance, restaurants and shops.

There is light industrial / warehousing / commercial development next to the airport measuring approximately 80 ha. Tenants at this development include:

- SAMD
- The Generator King
- Gulfstream Energy
- Bizerba
- Van Dyk Pharmaceutical Products
- My Gas
- SICK Automation Southern Africa
- TAG – Transtech Africa Global
- Intel Cab
- Medena
- Li Feng Textiles head Office
- Cash Crusaders Regional Office
- Dyna Trade
- The Media Connection

FINDINGS

From the smaller airport case studies, it can be concluded that land uses next to the airport / as part of the airport mainly include light manufacturing / commercial uses of approximately 80 ha to 100 ha.

The existence of lodges / wedding destinations / small holdings with a B&B offering does not seem to be affected detrimentally.