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MUSINA-MAKHADO SPECIAL ECONOMIC ZONE (SEZ)

ROADS AND TRANSPORT IMPACT ASSESSMENT REPORT

FINAL
REVISION 00

AUGUST 2020

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EXECUTIVE SUMMARY

The Limpopo Provincial Government Development Plan aims to leverage the province's competitive advantage in mining, agriculture and tourism to turn around the provincial economy. According to the Limpopo Provincial Treasury (2019), the province's economy was the sixth largest economy in the country, recording a gross domestic product (GDP) value of R224 billion, surpassing North-West, Free State and Northern Cape provinces.

The planned development of the Musina-Makhado Metallurgical Special Economic Zone (SEZ) is seen as a key intervention in the province to achieve the provincial developmental objectives. The Musina-Makhado SEZ site is located across the border between the Musina and Makhado Local Municipal areas, and located within the area of jurisdiction of the Vhembe District municipality.

This document discusses the impact that the proposed Musina-Makhado SEZ will have on the existing municipal services and infrastructure for the following two scenarios:

- Implementing the site on the existing infrastructure, without upgrading or building new infrastructure; and
- Providing mitigation measures through various infrastructure upgrades for when the site will be implemented.

The results are presented in terms of an impact assessment that takes into account the intensity, extent, duration and probability of the impact the development will have on the roads and transport infrastructure.

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GLOSSARY OF TERMS AND ABBREVIATIONS

AFB	Air Force Base
CAA	Civil Aviation Authority
DTI	Department of Trade and Industry
GAAL	Gateway Airport Authority Limited
IDP	Integrated Development Plan
LDP	Limpopo Development Plan
MMSEZ	Musina-Makhado SEZ
MTPA	Million Tonnes Per Annum
NDP	National Development Plan
ORTIA	OR Tambo International Airport
PIA	Polokwane International Airport
RAL	Road Agency Limpopo
SAAF	South African Air Force
SANRAL	South African National Roads Agency LTD
VDM	Vhembe District Municipality

1 INTRODUCTION

1.1 BACKGROUND

The Limpopo Provincial Government was requested by the Department of Trade and Industry (DTI) to submit strategic areas eligible for possible development of the Limpopo economy through industrialisation for consideration. Preliminary studies were conducted and the province submitted four areas that align with potential growth points in the province. The department evaluated the submissions and this area was one of two areas that were approved for further investigation.

The Musina-Makhado Special Economic Zone (SEZ) is one of the ten SEZs pronounced by the Minister of Trade and Industry (DTI), in line with Act No. 16 of 2014: Special Economic Zone Act, 2014.

Its establishment is driven by the projected outlook for logistics and cross border transport as well as the potential downstream beneficiation of mineral resources such as diamonds and coking coal, endowed in Vhembe District and its neighbouring areas. The main focus for the SEZ is to support the development of targeted industrial activities and investment in Limpopo Province.

The strategic objectives of the Limpopo Economic Development Agency (LEDA) are to accelerate industrial diversification through strategic economic development interventions. These objectives were realised through the establishment of the Special Economic Zone (SEZ) unit within LEDA.

1.2 STUDY AREA

The designated Musina-Makhado SEZ, located at the intersection of the N1 highway and the R525, straddles the border of Musina and Makhado Local Municipalities. The SEZ is shown with the red line in Figure 1-1 and Figure 1-2 on the following page.

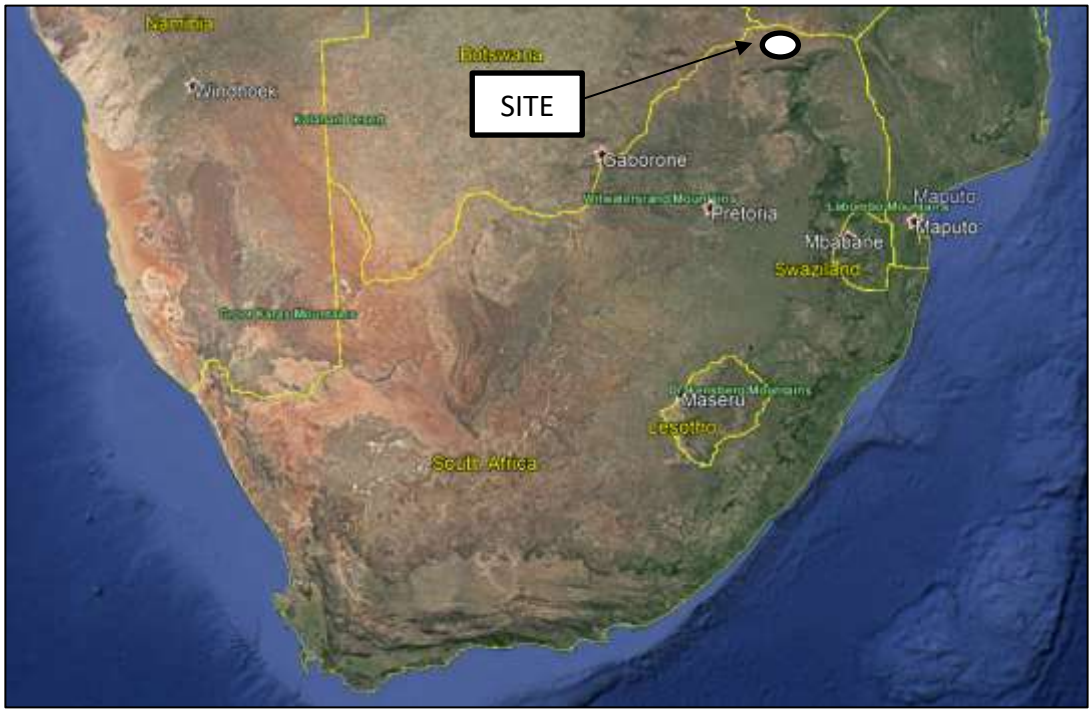

Figure 1-1: Musina-Makhado SEZ locality

Figure 1-2: Regional locality

The Southern SEZ falls within the areas of jurisdiction of both the Musina and Makhado Local Municipalities. The total SEZ property is approximately 8 048 ha in extent and will be established across eight previously mainly undeveloped farm portions. The southern part of the proposed SEZ falls under the jurisdiction of the Makhado Local Municipality and the northern part of the proposed SEZ falls under the jurisdiction of the Musina Local Municipality.

The site is situated on six farms:

- Van der Bijl 528 MS;
- Battle 585 MS;
- Portion 1 of Joffre 584 MS;
- Somme 611 MS;
- R/E of Lekkerlag 580 MS; and
- Steenbok 565 MS.

The site layout and overview of the six farms can be observed in Figure 1-3 below.

Figure 1-3: Musina-Makhado SEZ site overview

1.3 PURPOSE OF REPORT

The report presents the findings with regard to the impact of the proposed site on existing infrastructure, as well as the impact on all the mitigation measures that are proposed for the infrastructure on site and the wider area.

The impact of the site is illustrated in terms of local, provincial and national level. Due to the size of the development and services demand, it was estimated that the site will have an effect not only on the surrounding area, but also on the rest of South Africa and the SADIC region.

The results are illustrated in terms of how significantly each infrastructure element will be influenced by the proposed site. The following factors were used to determine this significance:

- Intensity (I);
- Extent (E);
- Duration (D); and

- Probability (P).

1.4 STRUCTURE OF REPORT

The report is submitted as a combined report that addresses matters relating to both of the development areas within the respective municipal areas, structured in accordance with each key element for both of the municipal areas.

The report comprises the following sections:

- Section 2: Transport Status Quo;
- Section 3: Development Demand and Requirements;
- Section 4: SEZ Impact on Roads and Transport;
- Section 5: Roads and Transport Assessment Rating;
- Section 6: Conclusion;
- Section 7: References; and
- Appendices.

2 TRANSPORT STATUS QUO

This section highlights all the existing infrastructure that is located within the area of the proposed Musina-Makhado SEZ, as well as the infrastructure that may be affected on a national scale. It is important to have a status quo of all the existing services in order to determine if they will be able to accommodate the additional demand from the development.

2.1 NATIONAL

2.1.1 ROADS, PUBLIC TRANSPORT AND LOGISTICS MANAGEMENT

2.1.1.1 Roads and Stormwater

The National Roads in the province include the N1, N11, R37, R71, R81, R510/R572 and R521/R523 under the responsibility of NDoT through SANRAL.

Provincial roads are numbered with a prefix D or R, excluding national and municipal roads of which the Department of Public Works, Roads & Infrastructure is responsible through RAL. Municipal roads are local, which includes streets and access. Stormwater is the responsibility/competency of local municipalities.

Challenges include many roads not being numbered, non-compliance to environmental legislations when improving transport infrastructure, the poor state of access and provincial roads, poor stormwater drainage systems and private roads access for which property owners are responsible.

The total length of Vhembe District surfaced roads is 1 368.44 km. However, there is a 2 482.39 km backlog (gravel road) in the district. In terms of maintenance, the main concerns are the regular break down of machines and equipment, the shortage of machines and ageing personnel.

Figure 2-1: Main road linkages showing the N1 as the key north–south road link and corridor feature through the VDM (Limpopo Provincial Govt, Dept of Transport)

2.1.1.2 Bus and Taxi Ranks/Routes

There are 4 formal bus ranks in the District and 22 formal taxi ranks, and 2 intermodal facilities in the district as indicated in the table below.

Table 2-1: Bus and taxi ranks per local municipality

FORMAL RANKS	THULAMELA	MAKHADO	COLLINS CHABANE	MUSINA
Bus	02	02	-	-
Taxi	06	10	01	02
Intermodal Facility	01	-	-	

Source: VDM, 2017

There are 3 147 taxis that operate on 272 routes and 232 subsidised bus routes with 576 buses operating in the district.

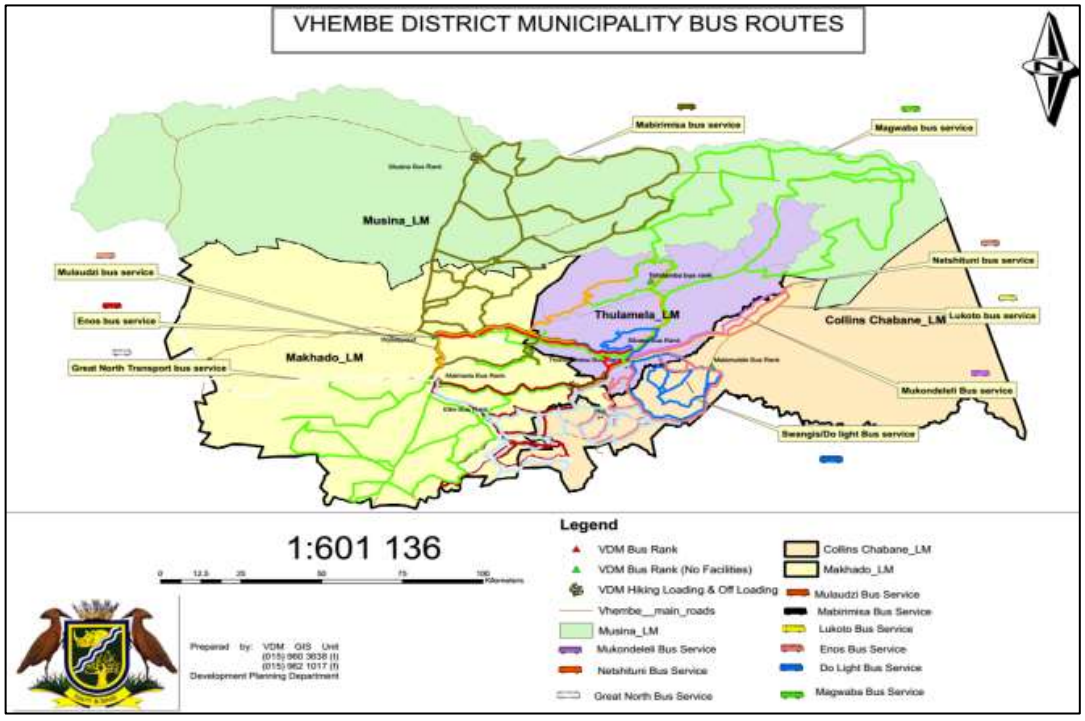

Figure 2-2: Subsidised bus routes within the district municipality

2.1.1.3 Airports

Gateway Airport Authority Limited (GAAL) is a schedule 3D provincial business enterprise. The mandate of the entity is to manage all airports in Limpopo Province in compliance with various legislative and administrative acts, including the Civil Aviation Authority (CAA) Act No. 40 of 98. GAAL receives a grant from the Department of Transport and Community Safety. The Mphephu airport is the only one in the district situated in Makhado municipality; however, it needs to be renovated. There are three air strips in the district, including Musina (one in Nancefield Ext. 7), one inside the Kruger Park and one at Makhado (Louis Trichardt air strip).

2.1.1.4 Railways

The primary rail network includes the railway line from Durban and Richards Bay to Pyramid, Polokwane, and linking to Musina and Zimbabwe as well as the link from Groenbult linking to Kaapmuiden and Maputo in Mozambique.

Figure 2-3: Main rail network linkages (Limpopo Dept of Transport)

Figure 2-4: Limpopo mineral feeder lines

2.2 MAKHADO LOCAL MUNICIPALITY

The total population of Makhado decreased from 516 031 in 2011 (based on the 2011 census outcome) to 416 728 due to the new demarcation of the municipal boundaries. The number of households has also decrease from 134 889 households (Census 2011) to 116 371 with about (145 147) registered voters. The Municipality is made up of four formal towns, namely Louis Trichardt, Vleifontein, Waterval and Dzanani, with more than 200 villages. The main administrative office is situated in Louis Trichardt town with two supporting regional administrative offices in Dzanani and Waterval.

The municipality has 38 ward councillors and 37 proportional councillors. There are 14 traditional leaders who are ex-officio members of the municipal council and 10 councillors who are members of the executive committee. The Municipality also has 38 established and fully functional ward committees.

The municipality forms part of the Vhembe District Municipality area.

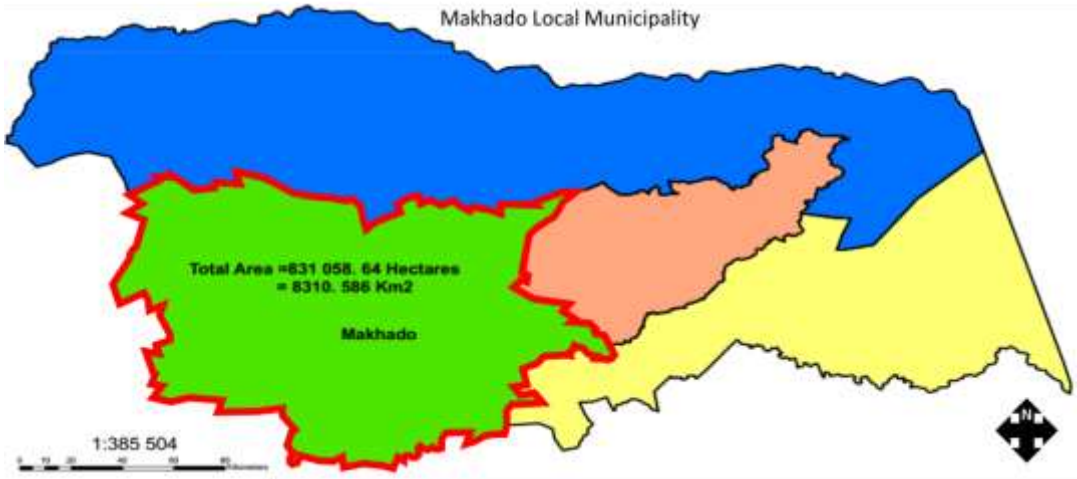

Figure 2-5 : Makhado Municipality

2.2.1 ROADS, PUBLIC TRANSPORT AND LOGISTICS MANAGEMENT

2.2.1.1 Road Network

The Roads Agency Limpopo is responsible for provincial and district roads, whereas the Municipality is responsible for local roads.

The internal street networks in the rural areas are predominantly gravel and un-tarred and are therefore generally problematic, particularly during rain seasons. Those in town and the surrounding townships are generally tarred and provided with stormwater drainage systems.

Most of the roads linking the villages are gravel roads and lack proper maintenance, and cannot be used in very wet conditions. In general, the roads in the Makhado Municipal area are in a bad condition and require upgrading.

The total road and stormwater management system backlog is estimated at approximately (4 400km). The Municipality is currently upgrading some of the roads from gravel to tar.

2.2.1.2 Rail Network

Within the Municipality the railway stations exist in the areas of Bandelierkop, Makhado town, Mara and Waterpoort. Only two private sidings serving grain mills at the Makhado station are currently in use, while those in the southern industrial area, including liquid fuel depots, are all out of use but still intact. The railway network from Pretoria-Pienaarsrivier-Polokwane-Musina-Beitbridge, which is 579 km-long, passes through the Municipality and it transports lime, liquid petroleum products, cement, coal and various grains.

A new rail line from Johannesburg-Musina (High Speed Standard Gauge Line) has been proposed. This new line will provide a high-speed passenger service between Johannesburg, Polokwane and Musina with services to major nodes along the route. A service for time-sensitive freight will also be provided. This will impact positively on movement of agriculture produce from the area. The status of this proposal is unknown.

2.2.1.3 Air Transport

Makhado has an air force base which caters for the needs of the military. There are two airstrips which cater for small civilian aircraft. Makhado Airport, which is located near the township of Tshikota, has one runway which is 1 200 m long, and the Bergtop Airport, which is located adjacent the R523. The nearest International Airport is the Polokwane Gateway, which is about +/-100 km from Makhado town.

Figure 2-6: Makhado Municipality air landing strips

2.2.1.4 Public Transport

Public transport within the Municipality is characterised by mini-bus taxis and buses which transport passengers to work, schools, etc. There are a number of formal and informal bus and taxi ranks, and 11 formal taxi ranks, some of which are located in Makhado town and Elim. The major public transport corridors in Makhado are depicted in the table below.

Table 2-2: Major public transport corridor routes in Makhado area

ROUTE CODE	CORRIDOR ROUTE
Louis Trichardt to Nzhelele	Along the N1 North from Louis Trichardt and turn right along Road R523 to Nzhelele
Louis Trichardt to Elim	Along the N1 South from Makhado and turn left along Road R578 to Elim
Louis Trichardt to Midoroni	Along Road R522 South West from Makhado to Midoroni/Maebane
Elim to Giyani	Along Road R578
Thohoyandou to Tshakhuma	Along Road R524
Thohoyandou to Nzhelele	Along Road R523
Bungeni to Giyani	Along Road R578

Table 2-3: Bus and taxi ranks per local municipality

FORMAL RANKS	MAKHADO
Bus	02
Taxi	03
Intermodal facility	0

2.3 MUSINA LOCAL MUNICIPALITY

The total population of Musina increased from 104 654 to 132 009 in 2016 (based on the 2011 census and 2016 Community Survey) due to the new demarcation of the municipal boundaries. The number of households has also increased from 29 555 to 43 730 households. The Municipality is made up of one formal town (Musina) and several scattered low-density, low population rural settlements (or "Sub Places" according the adopted 2018 SDF). These settlements include Mopane, north of the SEZ south site (Ward 1), which has a population of 46 and 38 households. The main administrative office is situated in Musina town and rural service nodes are proposed in the SDF in Pontdrift, Tshipise, Folovhodwe and Mutsie.

The municipality has 12 wards and elected councillors, and 12 proportional councillors. There are 5 traditional leaders in the municipal area.

The Mutale Local Municipality was disestablished and merged into Musina Local Municipality on 3 August 2016. The seat of Musina Local Municipality is Musina (previously Messina).

The municipality forms part of the Vhembe District Municipality area.

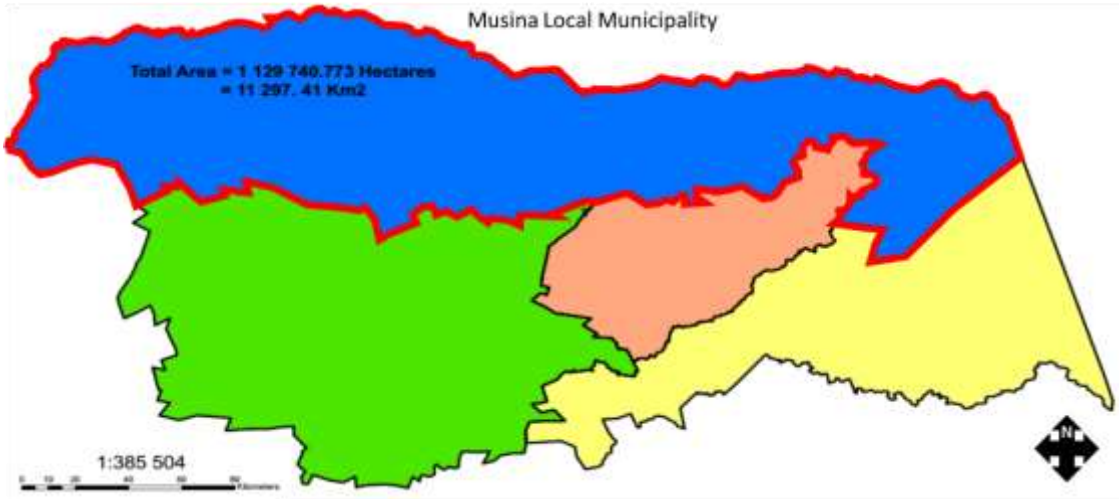

Figure 2-7: Musina Local Municipality

2.3.1 ROADS, PUBLIC TRANSPORT AND LOGISTICS MANAGEMENT

2.3.1.1 Road Network

The backlog in gravel roads that have to be tarred is 20 km and the backlog in tar roads that have to be upgraded/resurfaced is 25 km.

Table 2-4: Musina Cost Centre

ROAD NO.	DESCRIPTION	ROAD LENGTH (KM)	
		Gravel	Surface
D1174	Musina-Tshipise		36
D1483	Musina-Pontdrfit		89.24
D1942	Musina-Malale		8
D2018	Schuitdrift (P135/1-P135/1)		3.07
D2692	Musina-Alldays		87.88
D744	Mopani-Waterpoort		0.8

ROAD NO.	DESCRIPTION	ROAD LENGTH (KM)	
D777	Mopani-Nuwelust		11.72
D854	Waterpoort-Alldays		51.74
P135/1	Bokmakirie-Malale		81.11
P94/2	Alldays-Pontdrift		35.7
D3701	P135/1-Madimbo		4.5
UN1 mus	N1-Tshimutumbu Police		4
D1021	N1-Huntleigh	13.18	
D1369	Alldays-Broombreek	32.52	
D1543	Vetfontein-Broombreek	21.79	
D1559	Linton (D2692-D845)	22.77	
D1613	Doreen (D1174-P135/1)	8.6	
D1619	Mopani-Waterpoort	44.44	
D1632	Nuwelust-Linton	14.78	
D17	Brakrivier (D1543-D506)	24.72	
D1724	D745-farm (Nzheleledrift)	13.72	
D1764	Kortdraai-D845	12.52	
D259	Verbaard (N1-D1174)	19.08	
D3672	Mudimeli-Musekwa	11.82	
D3675	Nwanedi-Muswodi	8.6	
D3701	Herty-Tshiungani	3.8	
D506	Waterpoort-Musina	52.13	

ROAD NO.	DESCRIPTION	ROAD LENGTH (KM)	
D744	Waterpoort-Mopani	40.98	
D745	Mudimeli (N1-D777)	23.08	
D746	Doreen (D1174-D1613)	28.6	
D747	Linton-Coila	40.01	
D777	Mopani-Nuwelust	26.41	
D845	Broombreek-Alldays	37.09	

2.3.1.2 Rail Network

The station at Musina town is the main station in the municipal area and of importance for the town and the transport of freight across the border to Zimbabwe.

2.3.1.3 Air Transport

The Musina airport is an unlicensed airport strip, situated approximately 7 km west of Musina. It is used for general aviation purposes.

2.3.1.4 Public Transport

Public transport within the Municipality is characterised by mini-bus taxis and buses which transport passengers to work, schools, etc. There are a number of formal and informal bus services. The major public transport corridor in Musina is depicted in the following table.

Table 2-5: Major public transport corridor routes in Makhado Area

ROUTE CODE	CORRIDOR ROUTE
Musina to Nancefield and Beitbridge	Along the N1 North from Musina to Beitbridge

Table 2-6: Bus and taxi ranks per local municipality

FORMAL RANKS	MUSINA
Bus	-
Taxi	01
Intermodal facility	0

3 DEVELOPMENT DEMAND AND REQUIREMENTS

This section provides a more detailed description of the infrastructure services such as water, sewer and stormwater networks in the vicinity of the SEZ South Site, as well as the demand for the proposed development.

3.1 ROADS AND TRANSPORT

3.1.1 ROAD NETWORK

Primary access to the Musina-Makhado SEZ is currently obtained via the N1, which is situated along the east of the site and allows north-south traffic movement.

The secondary access to the site was identified as the R525, which is situated along the northern part of the site, and allows east-west traffic movement and connectivity to the N1. The following characteristics of the two major roads adjacent to the site are illustrated in the figure on the following page. Makhado Local Municipality currently has the following road networks that will primarily be affected by SEZ:

- N1 National Highway, which runs through the centre of the municipality and allows north-south traffic movement. The road varies between one and two lanes in each direction. The Hendrik Verwoerd tunnel, which is situated along the N1 just north of Makhado, only has the capacity to accommodate one lane in each direction.
- The R523, which allows for east-west movement north of the Soutpansberg mountain range, currently has one lane in each direction. This road will be used as an alternative to transport goods from the SEZ towards the south (Gauteng, etc.) if the Hendrik Verwoerd tunnel is not upgraded.
- The R524, which allows for east-west movement from Makhado towards Thohoyandou. The majority of the population of Makhado Local Municipality uses this road to connect between the communities situated in the Thohoyandou area and the N1.

Road	Class	Road reserve	Carriageway	Lanes	Condition
N1	R1 (Principle arterial)	30 m (typical reserve 60 – 80 m)	Single	One lane in each direction	Good
R525	R3 (Minor arterial)	35 – 40 m (typical reserve 30 – 50 m)	Single	One lane in each direction	Fair

Figure 3-1: Major roads adjacent to the site

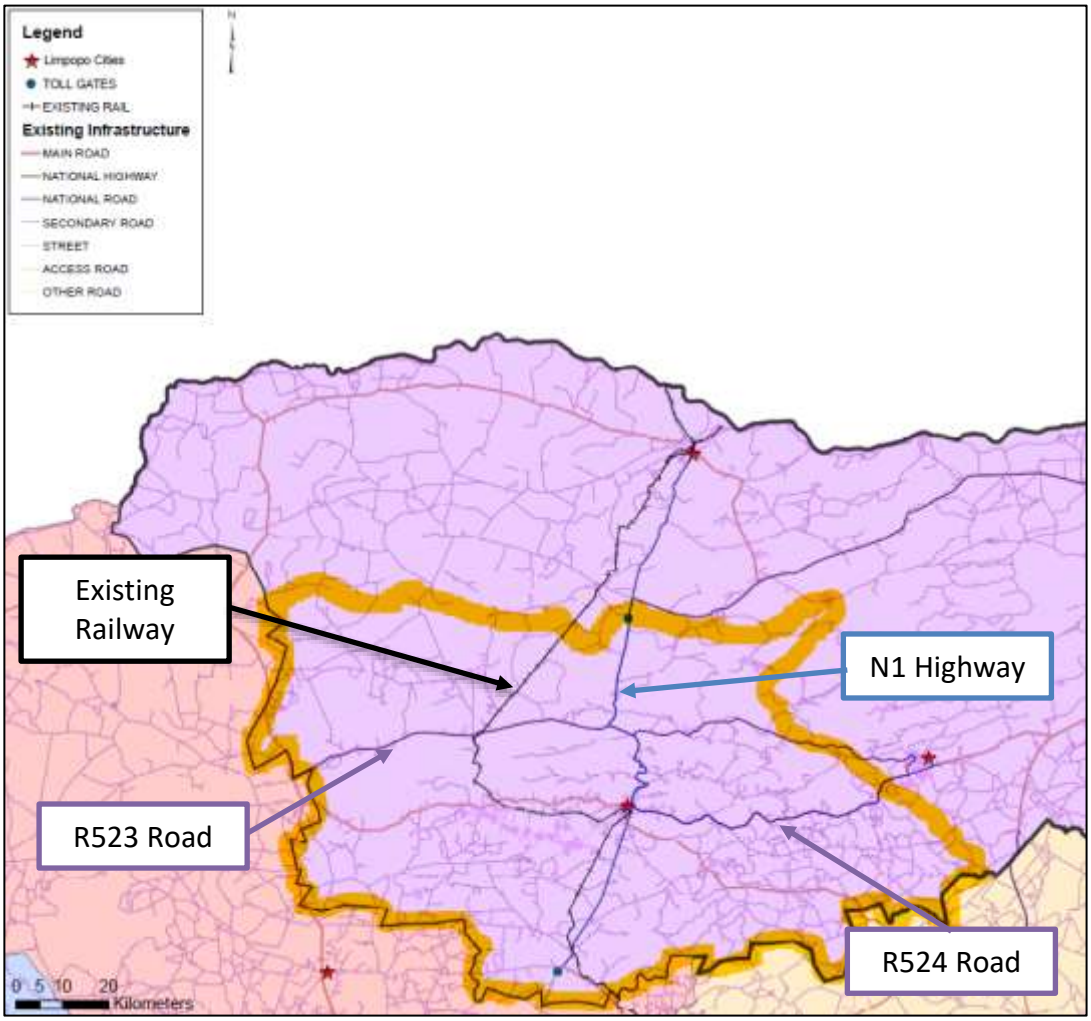

Figure 3-2: Makhado transport network (LIIMP)

3.1.2 ROAD DEMAND ANALYSIS

The summary of the Planning Design Technical Economy Parameters of the Musina-Makhado SEZ are illustrated in the table below. These projects and their specifications will be used to determine the total traffic demand. It should be noted that the year of completion is indicated for each project and phase. This was obtained by taking the starting year of construction and adding the anticipated construction period. Note that the demonstration projects for each major project were indicated as Phase 1 for simplicity in the demand calculations.

Table 3-1: Planning design technical economy parameters

NO.	PROJECT	PROCESS TECHNOLOGY	PHASE (YEAR COMPLETED)	CAPACITY (UNITS)	OCCUPIED LAND AREA (ha)
1.	Coal-Fired Power Plants	Coal-Fired Power Plant			

NO.	PROJECT	PROCESS TECHNOLOGY	PHASE (YEAR COMPLETED)	CAPACITY (UNITS)	OCCUPIED LAND AREA (ha)
2.	Coal Washery	Dense Medium Submersible Groove + Dense Medium Cyclone + Spiral Separator	Phase 1 (2023)	600 (10 ktpa)	30
			Phase 2 (2025)	700 (10 ktpa)	35
			Phase 3 (2028)	700 (10 ktpa)	35
3.	Coking Plant	Heat Recovery Coke Oven	Phase 1 (2022)	100 (10 ktpa)	135
			Phase 2 (2025)	100 (10 ktpa)	133
			Phase 3 (2028)	100 (10 ktpa)	132
4.	Heat Recovery Power Generation	Heat Recovery Steam Generator	Phase 1 (2022)	130 (MW)	0
			Phase 2 (2025)	130 (MW)	0
			Phase 3 (2028)	130 (MW)	0
5.	Thermal Power Plant	Ultra-Supercritical Unit	Phase 1 (2024)	1 320 (MW)	248
			Phase 2 (2027)	1 980 (MW)	372
6.	Ferrochrome Plant	Submerged Arc Furnace 33 000 kVA	Phase 1 (2022)	30 (10 ktpa)	50
			Phase 2 (2025)	170 (10 ktpa)	285
			Phase 3 (2028)	100 (10 ktpa)	165
7.	Ferromanganese Plant	Blast Furnace	Phase 1 (2022)	10 (10 ktpa)	10
			Phase 2 (2025)	45 (10 ktpa)	45
			Phase 3 (2028)	45 (10 ktpa)	45
8.	Silicomanganese Plant	Submerged Arc Furnace 33 000 kVA	Phase 1 (2023)	20 (10 ktpa)	40
			Phase 2 (2025)	30 (10 ktpa)	60

NO.	PROJECT	PROCESS TECHNOLOGY	PHASE (YEAR COMPLETED)	CAPACITY (UNITS)	OCCUPIED LAND AREA (ha)
9.	Vanadium – Titanium Magnetite Project	Innovative Technology	Phase 1 (2022)	200 (10ktpa)	200
			Phase 2 (2022)	200 (10 ktpa)	200
			Phase 3 (2024)	400 (10 ktpa)	400
			Phase 4 (2027)	200 (10 ktpa)	200
10.	High Manganese Steel	Patent Technology	Phase 1 (2022)	50 (10 ktpa)	140
			Phase 2 (2025)	50 (10 ktpa)	140
11.	High Vanadium Steel	Innovative Technology	Phase 1 (2022)	50 (10 ktpa)	50
			Phase 2 (2025)	50 (10 ktpa)	50
12.	Stainless Steel Plant	Innovative Technology	Phase 1 (2023)	100 (10 ktpa)	100
			Phase 2 (2025)	100 (10 ktpa)	100
			Phase 3 (2028)	100 (10 ktpa)	100
13.	Lime Plant	Rotary Kiln System	Phase 1 (2023)	150 (10 ktpa)	18
			Phase 2 (2025)	150 (10 ktpa)	18
			Phase 3 (2028)	100 (10 ktpa)	24
14.	Cement Plant	New Dry Process	Phase 1 (2023)	100 (10 ktpa)	15
			Phase 2 (2025)	100 (10 ktpa)	15
15.	Refractories Factory	Tunnel Kiln Firing	Phase 1 (2023)	20(10ktpa)	7.2
			Phase 2 (2025)	30 (10 ktpa)	10.8
16.	Sewage Treatment Plant	Advanced Technology	Phase 1 (2021)	4 000 (10 m^3/day)	6
			Phase 2 (2024)	5 000 (10 m^3/day)	7
			Phase 3 (2027)	5 000 (10 m^3/day)	7

NO.	PROJECT	PROCESS TECHNOLOGY	PHASE (YEAR COMPLETED)	CAPACITY (UNITS)	OCCUPIED LAND AREA (ha)
17.	Industrial Domestic Water Plant	Advanced Technology	Phase 1 (2021)	10 000 (10 m^3/day)	4
			Phase 2 (2024)	10 000 (10 m^3/day)	3
			Phase 3 (2027)	10 000 (10 m^3/day)	3
18.	Light Industrial Processing Zone	-	Phase 1 (2023)	-	600
19.	Machining Zone	-	Phase 1 (2023)	-	300
20.	Commercial Residential Zone	-	Phase 1 (2023)	-	300
21.	Living Area	-	Phase 1 (2023)	-	500
22.	Administrative Area	-	Phase 1 (2023)	-	200
23.	Bonded Area	-	Phase 1 (2023)	-	400
24.	Logistics Centre	-	Phase 1 (2023)	-	100
TOTAL AREA					**6 038**

3.1.3 TRAFFIC DEMAND ANALYSIS

The traffic demand for each project within the SEZ was calculated using TMH17, South African Trip Data Manual, 2013. The traffic demand for each year of completed projects was calculated as well as the total traffic demand for the site.

It should be noted that Trip Generation Adjustment Factors were applied to the traffic demand calculation in order to obtain a realistic representation of what can be expected once the projects are constructed. A size adjustment factor is used to account for the impact of the size of the urbanised or developed area on trip lengths. Trip lengths in smaller urbanised areas can be expected to be shorter than those in urbanised areas.

For this calculation, the following Trip Generation Adjustment Factors were applied:

- Mixed-use development:

  - For developments in an area that consist of two or more single-use developments between which trips can be made by means of non-motorised modes of transport, such as an SEZ.
- Very low vehicle ownership:
  - The majority of households (more than 90%) will rely on modes of public transport within and surrounding the SEZ, or will not drive to work with their own private vehicle.
- Transit nodes or corridors:
  - The SEZ will be located within a network of major public transport facilities.

The following illustrates the traffic demand calculations for each year of completed projects as well as the final traffic demand for the SEZ.

For the residential units (Residential 4), it was assumed that 120 units will be constructed per hectare.

As a final SDP has not been approved, a coverage percentage was assumed as follows:

- Heavy industry: 30%;
- Heavy industry/manufacturing: 30%;
- Residential: 40%; and
- Business park: 40%.

Table 3-2: The traffic demand

YEAR	PROJECT NO.	LAND USE	ha AS PER SDP	SIZE (UNITS)	FINAL PROJECT SIZE COVERAGE	HOURLY TRIP RATE	TRIPS PER HOUR	ADJUSTMENT	FINAL TRIPS PER HOUR
2021	15	None	6	-		-	20	-	20
	16	None	4	-		-	15	-	15
Total Peak Hour Trips 2021									**35**
2022	2	Heavy Industries	135	100 sqm GLA	405 000 sqm	0.19	770	0.565	435
	3	Heavy Industries	0	100 sqm GLA	0 sqm	0.19	0	0.565	0
	5	Heavy Industries	50	100 sqm GLA	150 000 sqm	0.19	285	0.565	161
	6	Heavy Industries	10	100 sqm GLA	30 000 sqm	0.19	57	0.565	32
	8	Heavy Industries	200	100 sqm GLA	600 000 sqm	0.19	1 140	0.565	644
	8	Heavy Industries	200	100 sqm GLA	600 000 sqm	0.19	1 140	0.565	644

YEAR	PROJECT NO.	LAND USE	ha AS PER SDP	SIZE (UNITS)	FINAL PROJECT SIZE COVERAGE	HOURLY TRIP RATE	TRIPS PER HOUR	ADJUSTMENT	FINAL TRIPS PER HOUR
	9	Heavy Industries	140	100 sqm GLA	420 000 sqm	0.19	798	0.565	451
	10	Heavy Industries	50	100 sqm GLA	150 000 sqm	0.19	285	0.565	161
Total Peak Hour Trips 2022									**2 528**
2023	1	Heavy Industries	30	100 sqm GLA	90 000 sqm	0.19	171	0.565	97
	7	Heavy Industries	40	100 sqm GLA	120 000 sqm	0.19	228	0.565	129
	11	Heavy Industries	100	100 sqm GLA	300 000 sqm	0.19	570	0.565	322
	12	Heavy Industries	18	100 sqm GLA	54 000 sqm	0.19	103	0.565	59
	13	Heavy Industries	15	100 sqm GLA	45 000 sqm	0.19	86	0.565	49

YEAR	PROJECT NO.	LAND USE	ha AS PER SDP	SIZE (UNITS)	FINAL PROJECT SIZE COVERAGE	HOURLY TRIP RATE	TRIPS PER HOUR	ADJUSTMENT	FINAL TRIPS PER HOUR
	14	Heavy Industries	7.2	100 sqm GLA	21 600 sqm	0.19	41	0.565	23
	17	Heavy Industry/ Manufacturing	600	100 sqm GLA	1 800 000 sqm	0.19	3 420	0.565	1 932
	18	Heavy Industry/ Manufacturing	300	100 sqm GLA	900 000 sqm	0.19	1 710	0.565	966
	19	Apartments and Flats	300	1 D/Units	14 400 units	0.62	8 928	0.361	3 223
	20	Living Area	500	-	-	-	-	-	0
	21	Business Centre (Park)	200	100 sqm GLA	600 000 sqm	1.5	9 000	0.506	4 554
	22	Mini-Warehousing	400	100 sqm GLA	1 200 000 sqm	0.25	3 000	0.565	1 695

YEAR	PROJECT NO.	LAND USE	ha AS PER SDP	SIZE (UNITS)	FINAL PROJECT SIZE COVERAGE	HOURLY TRIP RATE	TRIPS PER HOUR	ADJUSTMENT	FINAL TRIPS PER HOUR
	23	Business Centre (Park)	100	100 sqm GLA	300 000 sqm	1.5	4 500	0.506	2 277
Total Peak Hour Trips 2023									**15 326**
2024	4	Heavy Industries	248	100 sqm GLA	744 000 sqm	0.19	1 414	0.565	799
	8	Heavy Industries	400	100 sqm GLA	1 200 000 sqm	0.19	2 280	0.565	1 288
	15	None	7	-		-	30	-	30
	16	None	3	-		-	10	-	10
Total Peak Hour Trips 2024									**2 127**
2025	1	Heavy Industries	35	100 sqm GLA	105 000 sqm	0.19	200	0.565	113

YEAR	PROJECT NO.	LAND USE	ha AS PER SDP	SIZE (UNITS)	FINAL PROJECT SIZE COVERAGE	HOURLY TRIP RATE	TRIPS PER HOUR	ADJUSTMENT	FINAL TRIPS PER HOUR
	2	Heavy Industries	133	100 sqm GLA	399 000 sqm	0.19	758	0.565	428
	3	Heavy Industries	0	100 sqm GLA	0 sqm	0.19	0	0.565	0
	5	Heavy Industries	285	100 sqm GLA	855 000 sqm	0.19	1 625	0.565	918
	6	Heavy Industries	45	100 sqm GLA	135 000 sqm	0.19	257	0.565	145
	7	Heavy Industries	60	100 sqm GLA	180 000 sqm	0.19	342	0.565	193
	9	Heavy Industries	140	100 sqm GLA	420 000 sqm	0.19	798	0.565	451
	10	Heavy Industries	50	100 sqm GLA	150 000 sqm	0.19	285	0.565	161
	11	Heavy Industries	100	100 sqm GLA	300 000 sqm	0.19	570	0.565	322

YEAR	PROJECT NO.	LAND USE	ha AS PER SDP	SIZE (UNITS)	FINAL PROJECT SIZE COVERAGE	HOURLY TRIP RATE	TRIPS PER HOUR	ADJUSTMENT	FINAL TRIPS PER HOUR
	12	Heavy Industries	18	100 sqm GLA	54 000 sqm	0.19	103	0.565	58
	13	Heavy Industries	15	100 sqm GLA	45 000 sqm	0.19	86	0.565	49
	14	Heavy Industries	10.8	100 sqm GLA	32 400 sqm	0.19	62	0.565	35
Total Peak Hour Trips 2025									**2 873**
2027	4	Heavy Industries	372	100 sqm GLA	1 116 000 sqm	0.19	2 120	0.565	1 198
	8	Heavy Industries	200	100 sqm GLA	600 000 sqm	0.19	1 140	0.565	644
	15	None	7	-		-	30	-	30
	16	None	3	-		-	10	-	10

YEAR	PROJECT NO.	LAND USE	ha AS PER SDP	SIZE (UNITS)	FINAL PROJECT SIZE COVERAGE	HOURLY TRIP RATE	TRIPS PER HOUR	ADJUSTMENT	FINAL TRIPS PER HOUR
Total Peak Hour Trips 2027									**1 882**
2028	1	Heavy Industries	35	100 sqm GLA	105 000 sqm	0.19	200	0.565	113
	2	Heavy Industries	132	100 sqm GLA	396 000 sqm	0.19	752	0.565	425
	3	Heavy Industries	0	100 sqm GLA	0 sqm	0.19	0	0.565	0
	5	Heavy Industries	165	100 sqm GLA	495 000 sqm	0.19	941	0.565	532
	6	Heavy Industries	45	100 sqm GLA	135 000 sqm	0.19	257	0.565	145
	11	Heavy Industries	100	100 sqm GLA	300 000 sqm	0.19	570	0.565	322
	12	Heavy Industries	24	100 sqm GLA	240 000 sqm	0.19	456	0.565	258

YEAR	PROJECT NO.	LAND USE	ha AS PER SDP	SIZE (UNITS)	FINAL PROJECT SIZE COVERAGE	HOURLY TRIP RATE	TRIPS PER HOUR	ADJUSTMENT	FINAL TRIPS PER HOUR
Total Peak Hour Trips 2028									**1 795**
TOTAL PEAK HOUR TRIPS FOR THE COMPLETED OPERATIONAL ENTIRE SEZ									**26 566**

From the findings in the table on the previous pages, it can be concluded that the SEZ, throughout all the phases, will have a significant effect on the surrounding road network.

The values in the trips generation calculations are not final and only illustrate the current traffic demand based on the concept layout. Further calculations will be made once the final site layout has been approved.

As an alternative approach to the traffic demand calculations, the number of executives, professionals and ordinary staff from the SAMSEZ development plan were used to estimate the number of trips to be expected for the completion of the entire Musina-Makhado SEZ. Refer to the table below for the alternative traffic demand estimate. The following assumptions were made regarding the transport of the employees without using rail passenger transport of the SEZ:

- Executives: 1 Person Per Vehicle (Car);
- Professionals: 2 Persons Per Vehicle (Car);
- Ordinary Staff: 60 Persons Per Vehicle (Bus); and
- Workers: 60 Persons Per Vehicle (Bus).

Table 3-3: Alternative trip generation calculations (SAMSEZ)

STAFF CLASSIFICATION	NUMBER OF STAFF (SAMSEZ)	VEHICLE UNIT (PERSON/VEHICLE)	VEHICLES
Executives	10 568	1	10 568 cars
Professionals	7 330	2	3 665 cars
Ordinary Staff	63 619	60	1 060 buses
Workers	81 517	60	1 359 buses
TOTAL VEHICLE TRIPS (CARS)			14 233
TOTAL VEHICLE TRIPS (BUSES)			2 419

The trips above only represent the transport for people working within the site. Although it is not possible to calculate the number of freight trucks required per day for the finished products, it is estimated that the SEZ will have to accommodate for approximately 300 trucks per day.

3.1.4 PUBLIC TRANSPORT

The National Land Transport Transition Act, 22 Of 2000, Section 18 (1), (2) and (3) stipulates that land transport planning must be integrated with land development processes and must be carried out so as to cover both public and private transport, and all modes of land transport relevant in the area concerned, and must focus on the most effective and economic way of moving from one point to another in the system. Transport plans must be developed to enhance effective functioning of cities, towns and rural areas through integrated transport planning of transport infrastructure and facilities, transport operation including freight movement, bulk services and public transport services.

The Act requires municipalities to develop their ITPs which comply with the minimum requirements as set out in the Minimum Requirements for Preparation of Integrated Transport Plans, published 30 November 2007. The transport vision is an integrated, safe, reliable, efficient, affordable and sustainable multimodal transport system and adequate infrastructure.

The SA transportation system is inadequate to meet the basic needs for accessibility to work, health care, schools, shops, etc. and for many developing rural and urban areas. In order to meet these basic needs for accessibility, the transport services offered must be affordable for the user. The transport system must aim to minimise the constraints on the mobility of passengers and goods, maximising speed and service, while allowing customers a choice of transport mode or combination of transport modes where it is economically and financially viable to offer a choice of modes. This demands a flexible transport system and transport planning process that can respond to customer requirements, while providing online information to the user to allow choices to be made

Public transport within the municipality is characterised by mini-bus taxis and buses which transport passengers to work, schools, etc. There are a number of formal and informal bus and taxi ranks, and 11 formal taxi ranks, some of which are located in Makhado town and Elim. The major public transport corridors in Makhado are listed in the table below.

Table 3-4: Major public transport corridor routes in Makhado area

ROUTE CODE	CORRIDOR ROUTE
Louis Trichardt to Nzhelele	Along the N1 North from Louis Trichardt and turn right along Road R523 to Nzhelele
Louis Trichardt to Elim	Along the N1 South from Makhado and turn left along Road R578 to Elim
Louis Trichardt to Midoroni	Along Road R522 South West from Makhado to Midoroni/Maebane
Elim to Giyani	Along Road R578
Thohoyandou to Tshakhuma	Along Road R524
Thohoyandou to Nzhelele	Along Road R523
Bungeni to Giyani	Along Road R578

Table 3-5: Bus and taxi ranks per local municipality

FORMAL RANKS	MAKHADO
Bus	02
Taxi	03

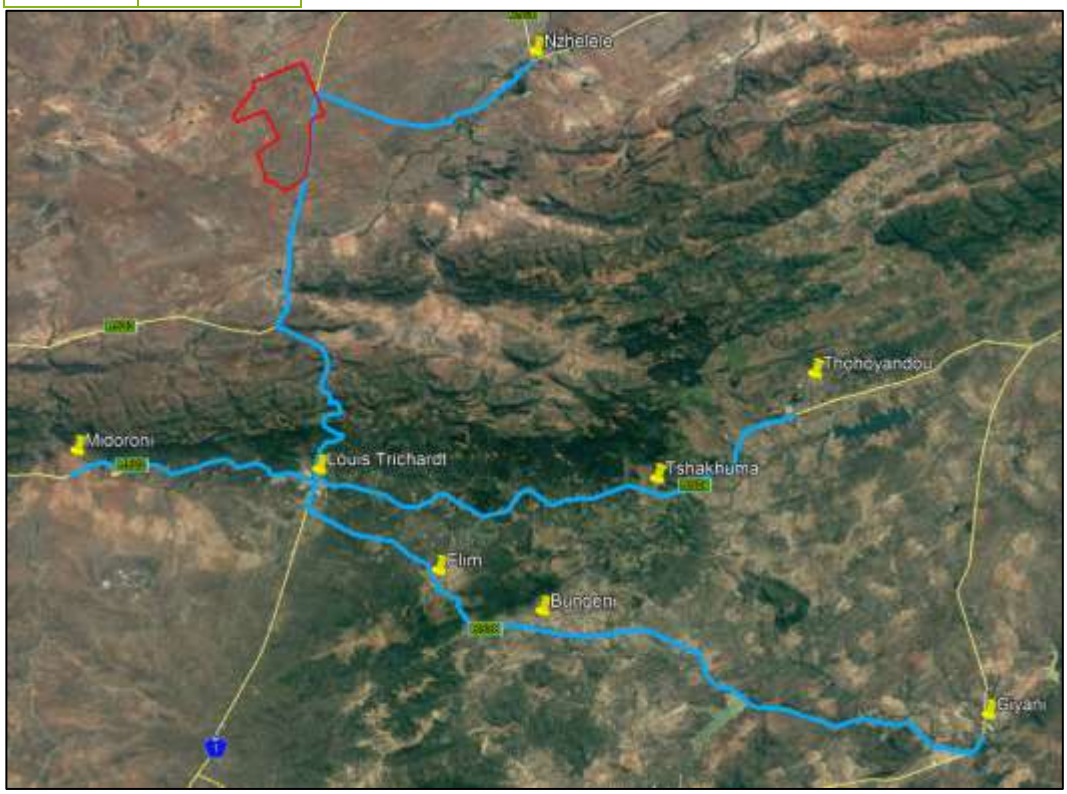

Figure 3-3: Public transport routes

3.1.5 RAIL NETWORK

The railway network that is situated within the Makhado Municipality is part of the North-Eastern System according to Transnet's Long Term Planning Framework (LTPF). Makhado Municipality currently only has one railway line, which starts approximately 15 km north of the important Groenbult connection and ends at the SEZ. This line is currently a single, non-electrified diesel line that stretches from Musina to Polokwane and can carry 20 t/axle loads.

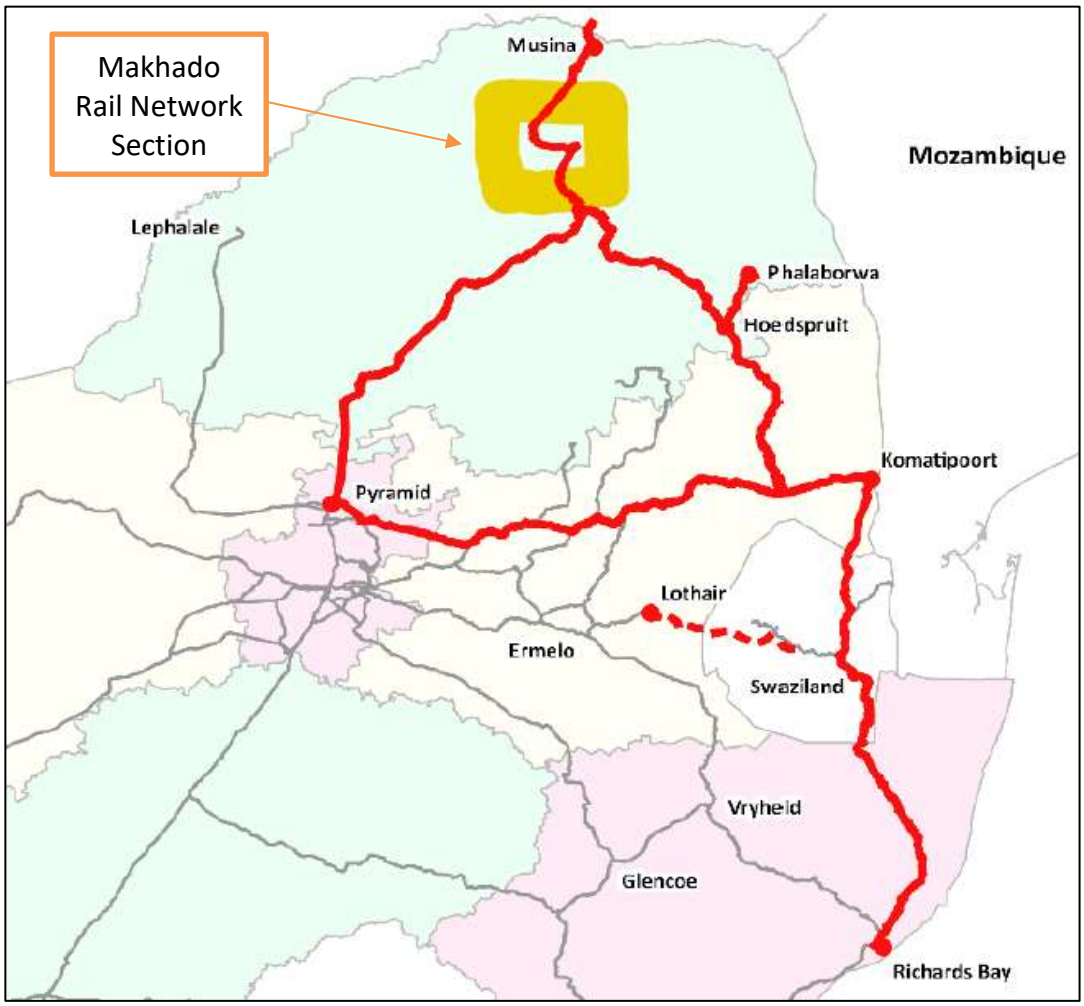

Figure 3-4: Makhado rail network – Transnet LTPF

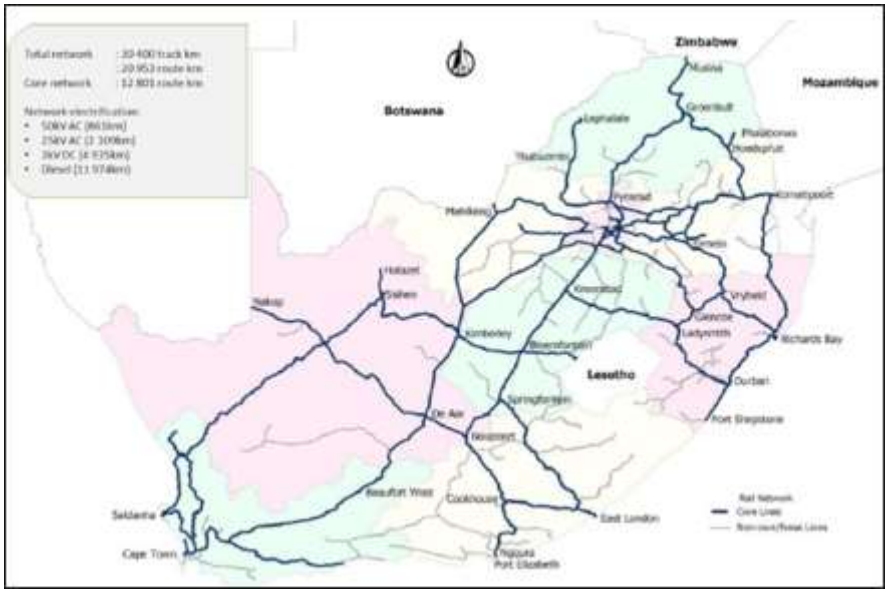

Figure 3-5: South African railway network

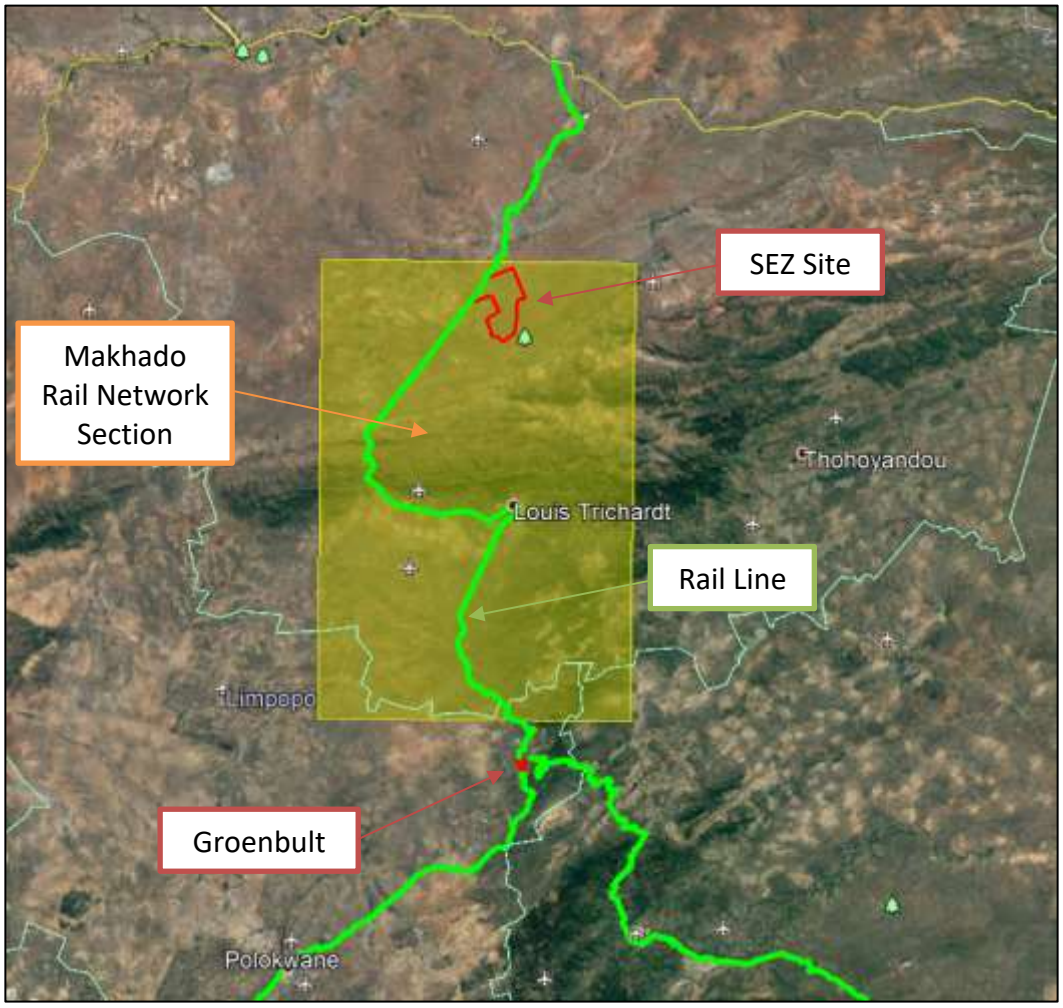

Figure 3-6: Makhado rail network (Google Earth 2018)

The site is situated adjacent to the existing railway network known as the North-Eastern System. Train sizes along this system are currently light to medium, with the properties indicated in the figure below.

Line properties

Section	Line Type	Axle load	Traction	Train control	Sharpest curve	Steepest gradient
Musina – Pyramid	Single/Double	20t	Diesel/25kV AC	TWS/CTC	200m	1:50
Groenbult - Kaapmuiden	Single/Double	18.5t/20t	Diesel/25kV AC	TWS/CTC	160m	1:66
Greenview - Komatipoort	Single	20t	3kV DC	CTC	250m	1:66
Komatipoort – Richards Bay	Single	20t	Diesel/25kV AC	TWS	250m	1:120
Dawn - Phalaborwa (Future)	Single	26t	Diesel	TWS	350m	1:80

General condition

Section	Formation	Structures	Tunnels	Electrical	OHTE	Signals	Telecoms	Overall
Musina - Pyramid								
Groenbult - Kaapmuiden								
Greenview - Komatipoort								
Komatipoort – Richards Bay								

Figure 3-7: Railway characteristics (Transnet LTPF)

The current (2016) as well as future (2025) operations on the rail networks, according to Transnet's 30-year Long Term Planning Framework, are illustrated in the following figures.

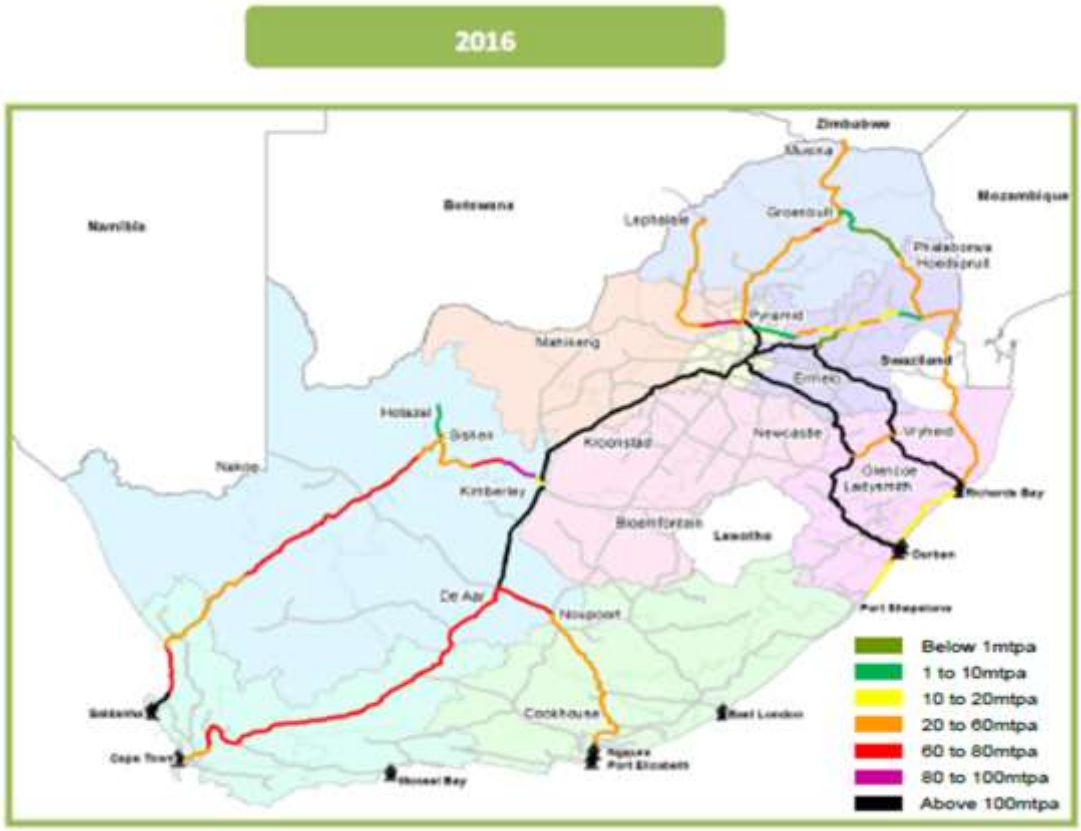

Figure 3-8: The current operations on the rail networks (Transnet LTPF)

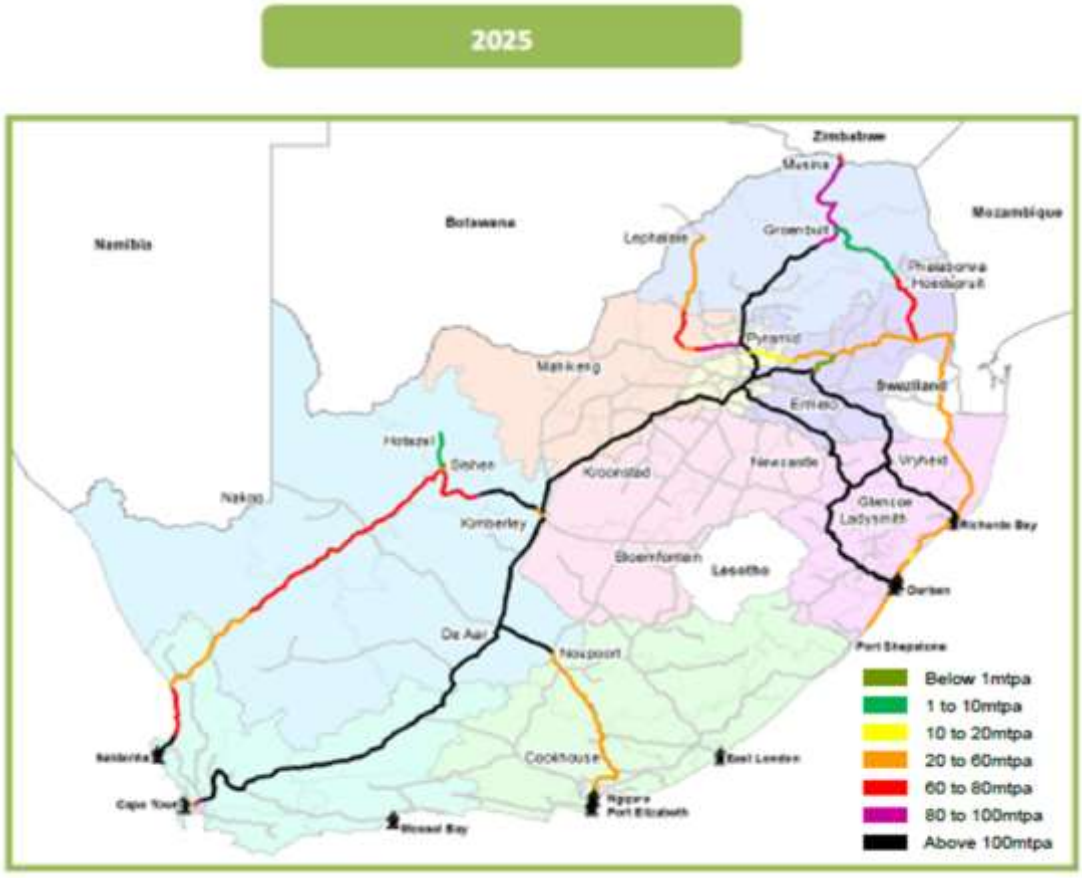

Figure 3-9: The future operations on the rail networks (Transnet LTPF)

3.1.5.1 Musina – Pyramid Rail Section

This route is operated with greater independence that other routes in the system. Single track with crossing loops which can accommodate a maximum train length of 40 wagons. The train configuration for this section is 40-wagon trains, which will later be increased to 75/80 wagons in conjunction with lengthening of crossing loop according to Transnet's Long-Term Planning Framework (LTPF). The section from Polokwane towards Pyramid is to be 25 kV AC traction and the section from Polokwane to the SEZ site is to be diesel.

3.1.5.2 Groenbult – Kaapmuiden Rail Section

This route connects hinterland locations including Gauteng, Phalaborwa and Rustenburg to the eastern seaboard ports of Maputo and Richards Bay for the export of bulk minerals. The train configuration for this section is 75 wagons, or multiples thereof. A 150-wagon train test has been performed between Phalaborwa and Richards Bay in anticipation of the planned change in operation philosophy.

According to the flow density maps on the previous page, it is clear that the current railway network in the Limpopo Province is transporting less minerals and cargo than the rest of South Africa. The Musina/Pyramid line handles 20 to 60 million tonnes per annum (mtpa), whereas the line from Groenbult to the eastern parts of the country only handles from below 1 mtpa to approximately 60 mtpa.

3.1.5.3 Rail Demand Analysis

The rail network adjacent to the site as well the rail network throughout South Africa will be affected by the development of the Musina-Makhado SEZ. The SEZ will require a rail network that will be able to import raw material and export manufactured products to and from different locations in South Africa. Resource distribution throughout South Africa will play a crucial role in the development of a transport masterplan and the future rail network planning. Main features of the resource distribution in South Africa, according to the SAMSEZ 2019 Development Plan, are as follows:

- **Limpopo:** Limpopo province is rich in coal and iron resources. The coal resources are mainly concentrated in the northern part of the province, most of which are in the exploration stage with great potential for development. The iron ore resources are mainly at the stage of feasibility study. Certain nickel and chrome resources are located in the central and southern part of the province.
- **Northern Cape:** The main resource in Northern Cape is manganese ore (in production and exploration) and iron ore in production. This province is relatively short in coal resources.

- **Mpumalanga:** The province has a large amount of coal resources (basically in a near depletion stage). There are also small amounts of iron ore and manganese ore resources.

At this stage of the demand analysis, it will only be possible to estimate the total demand in million tonnes per annum (mtpa) that the SEZ will generate. This demand does not necessary reflect the amount of cargo on the external rail network as interconnectivity within the site may reduce this amount. The table below illustrates the raw material estimate for each project that will be imported through the external rail network per year.

Table 3-6: Raw material rail demand (SAMSEZ)

NO.	PROJECT	RAW MATERIAL	TOTAL CAPACITY
1	Coal Washery	Coal	20.0 mtpa
2	Coking Plant	Coal	3.0 mtpa
3	Ferrochrome Plant	Chrome/Quartzite/Coke	3.0 mtpa
4	Ferromanganese Plant	Manganese/Coke	1.0 mtpa
5	Silicomanganese Plant	Silicon/Manganese/Coke	0.5 mtpa
6	Vanadium – Titanium Magnetite Project	Iron Ore	10.0 mtpa
7	High Manganese Steel	Manganese/Carbon/Silicon	1.0 mtpa
8	High Vanadium Steel	Iron Ore	1.0 mtpa
9	Stainless Steel Plant	Iron Ore/Chrome/Silicon/Nickel	3.0 mtpa
10	Lime Plant	Lime Magnesium Carbonate Rocks	5.0 mtpa
11	Cement Plant	Limestone	2.0 mtpa
12	Refractories Plant	Aluminium/ Magnesite/Chromite	0.5 mtpa
TOTAL MATERIAL			**50.0 mtpa**

In order to establish the number of tonnes that will be imported into the SEZ per day for the complete development of the SEZ, the following assumptions were made:

- 50 trains will be used for importing bulk, raw material;
- Each train with approximately 40 wagons, according to the current railway network capacity; and
- Each wagon with an estimated average capacity weight of 50 tonnes.

Refer to the following table for the estimated number of train trips required for the bulk raw material.

Table 3-7: Train demand/rail freight

CAPACITY PER TRAIN (TONNES)	TONNES OF RAW MATERIAL PER YEAR	TONNES PER DAY REQUIRED	40-WAGON TRAINS REQUIRED PER DAY
2 000	50 000 000	140 000	70

3.1.6 AIR TRANSPORT

The following airports/airfields are situated in Makhado Local Municipality:

- Air Force Base Makhado;
- Private Airfield (Ekland Ranch); and
- Makhado Airstrip.

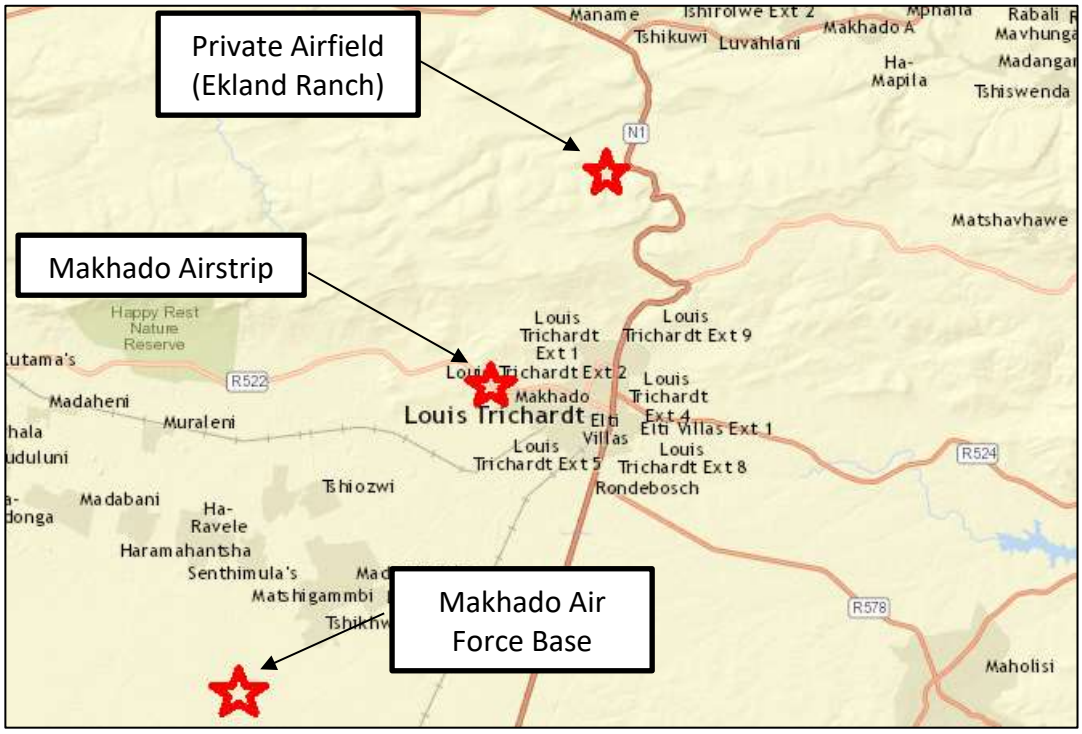

Figure 3-10: Air transport facilities – Makhado Municipality

The Air Force Base Makhado is a military airport and a national key point. The airport is operated by the SAAF (South African Air Force) and is situated approximately 35 km south west of Makhado (not suitable for commercial operations).

Figure 3-11: Air Force Base Makhado

The Makhado Air Force Base has a single runway that is 4 000 m in length and 45 m in width.

Table 3-8: Air Force Base Makhado runway dimensions

DESIGNATIONS RWY NR	DIMENSIONS OF RWY (m)	STRENGTH (PCN) AND SURFACE OF RWY AND SWY	THR ELEVATION AND HIGHEST ELEVATION OF TDZ OF PRECISION APP RWY (ft)
1	**2**	**3**	**4**
10	4 000 x 45	ASPH LCN 65	3 059
28	4 000 x 45	ASPH LCN 65	3 059

All military aerodromes are unlicensed, therefore this aerodrome may not be nominated as an alternate destination for civilian flights. Diversion and landing in emergency only.

The Ekland Ranch airfield is an unlicensed private airfield situated on a farm approximately 60 km south of Musina. It is not clear who the owners and operators are, but as far as can be established, the airport is not open for use by the public (not suitable for commercial operations).

Figure 3-12: Ekland Ranch Private Airport

The Ekland Ranch Airfield has a single runway 14/32 that is 1 000 m in length and 18 m in width.

Table 3-9: Ekland Ranch Private Airport runway dimensions

DESIGNATIONS RWY NR	DIMENSIONS OF RWY (m)	STRENGTH (PCN) AND SURFACE OF RWY AND SWY	THR ELEVATION AND HIGHEST ELEVATION OF TDZ OF PRECISION APP RWY (ft)
1	**2**	**3**	**4**
14	1 000 x 18	Unknown	2 389
32	1 000 x 18	Unknown	2 425

Makhado airstrip has a single runway that is 1 000 m in length and 20 m in width.

Figure 3-13: Makhado Airstrip

3.1.6.1 Demand

The Musina-Makhado SEZ is expected to accommodate approximately 53 000 people during the construction and operational phases of the project. Of the total staff compliment of the SEZ, approximately 5 000 or 10% are expected to be middle to senior management.

The following list of assumptions is made regarding air travel between the SEZ and OR Tambo:

- 2 500 or 50% of senior/middle management to utilise air transport on monthly basis;
- 20% additional passengers per month from neighbouring towns and communities;
- Total 3 000 passengers per month peak;
- 150 passengers during the peak (150% of average daily passengers);
- Typical aircraft to be used by potential operator Airlink (ERJ 135 – 37 seats 80% capacity); and
- Five flights per day during the peak.

3.1.6.2 Airport Requirements

- Landside:
  - Access road: adequate and easy access road from regional or national roads.
  - Parking: approximately 80-100 parking bays for passengers, staff and vehicle rentals.
- Airside:
  - Runway: runway with a length of approximately 1 800 m and a width of 23 m to accommodate ERJ 135 aircraft for landing and take-off.
  - Taxiway: a taxiway with a width of 15 m linking the runway with the apron.
  - Apron: apron that can accommodate three ERJ 135 aircraft (power in, power out stands) during the peaks. The apron will require an area of approximately 50 m in length and 120 m in width.

- Terminal: A terminal building complete with check-in counters, security screening, boarding gates, baggage reclaim area, arrivals hall, offices and concessions of approximately 1 000 m² will be required.
- Air Traffic Control and Navigation: the airport operating commercial flights will require a manned control tower and some form of airfield ground lighting. At minimum, the airport will require a RNAV airport navigation system or an ILS navigation system for arrivals on the dominant runway.
- Rescue and Fire Fighting: the airport will have to comply with ICAO safety regulations in terms of rescue and firefighting.
- Fuel: the airport will require aviation fuel storage and bowsers for transferring fuel to aircraft.

3.1.6.3 Suitable Airport Site

Based on the high-level assumptions and requirements for an airport capable of handling 150 passengers a day during the peak day and the high-level overview of the airports in the region the most suitable airport in terms of airside infrastructure and location in relation with the Musina-Makhado SEZ is the Musina Airport.

Although the Limpopo International Airport operated by GAAL will have the necessary capacity and facilities with zero capital expenditure required, its location and proximity to the Musina-Makhado SEZ (which will accommodate large amounts of staff and contractors) are out of range for the expected demand.

The Musina Airport has adequate runway length and width to cater for the ERJ 135 aircraft that can potentially be used for operations to and from OR Tambo. It is assumed that the airport will require major upgrades in order for it to become ICAO and CAA compliant.

The airport currently does not have a terminal building, control tower, rescue and firefighting services as well as parkings, which will have to be constructed, and the access road to the airport is a dirt road that will require significant upgrading.

There seems to be no significant obstacles like mountains and electrical power transmission lines limiting airport operations, although this should be confirmed by a detailed airport obstacle analysis.

3.1.7 PLANNING INITIATIVES

The following new rail freight projects in Makhado Municipality were identified[8]:

- Planning investigation/feasibility study of a rail link between Makhado and Thohoyandou, and a link between Makhado and Lephalale
- Current 40-wagon trains, to be increased to 75/80-wagon trains
- Lengthening of loop at Groenbult to accommodate 40-wagon trains (2040).

The following strategies have been extracted from the NATMAP 2050 for Makhado Municipality in Limpopo[8]:

- The development of a freeway, which will serve as a direct link between the Maputo export harbour and the SADC countries located north of Limpopo. The specific link that is going to affect Makhado Municipality is the proposed link between Giyane, Thohoyandou and the N1 south of Musina.

The following road widening projects are proposed in the NATMAP 2050 plan for Makhado Municipality:

- Addition of one additional lane on the N1 on the section between Makhado and the N1/R525 junction, which was proposed for the year 2005.
- Addition of two additional lanes on the R524 on the section between Makhado and Thohoyandou (at the R523 junction), which was proposed for the year 2005.
- Addition of one additional lane on the N1 on the section between the R36 junction and Makhado in the year 2030.
- Addition of one additional lane on the N1 on the section between Makhado and the R525 junction and at Musina in the year 2030.
- Addition of one additional lane on the R523 on the section between the R521 and the R524 in the year 2050.

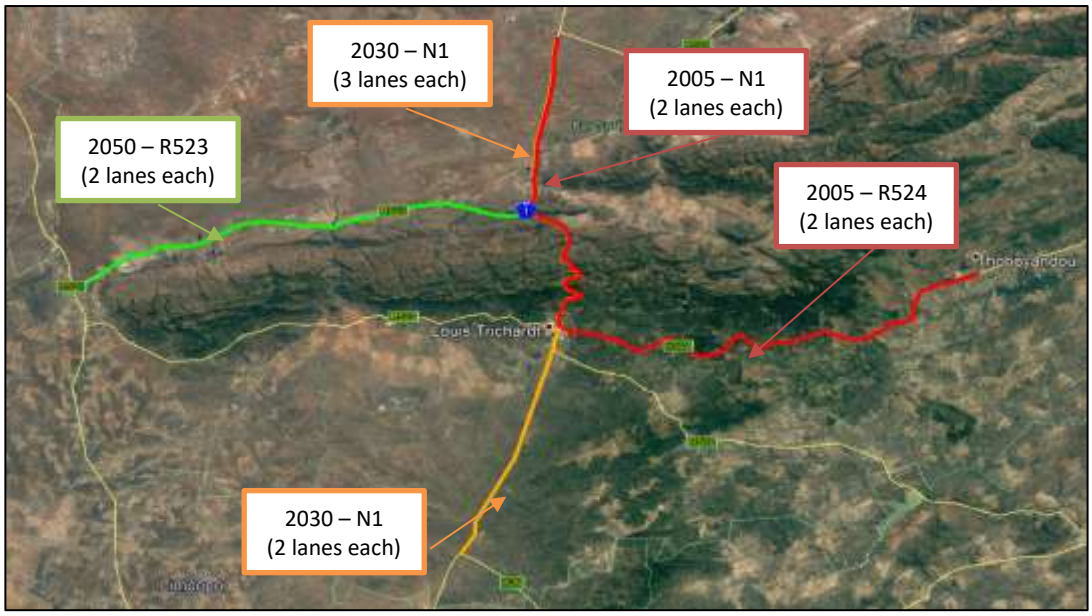

Figure 3-14: Makhado road upgrade planning

4 SEZ IMPACT ON ROADS AND TRANSPORT

4.1 MUSINA-MAKHADO SEZ POTENTIAL INCREASE IN ROAD TRAFFIC

The current trend in traffic patterns within the study area indicates that the majority of the traffic on the roads is in the north-south movement. This movement depends on the existing N1, which connects the area to economic hubs such as Polokwane and Gauteng to the south, as well as Beit Bridge (Zimbabwe) to the north. The majority of the N1 is currently a single carriageway, with one lane in each direction and already experiencing traffic congestion. With the addition of the SEZ traffic demand, the N1 will experience severe congestion, which will restrict the traffic movement in the entire Vhembe District. Traffic operations at Beit Bridge and traffic towards Gauteng Province will be heavily affected.

The traffic congestion will not be limited to the N1. The additional traffic volumes will create congestion on local and provincial roads, these major roads in the study area include, but are not limited to the following: R525, R508, R523, R527, R522, R524, R578 and R521. These roads are indicated in Figure 4-1 below.

Figure 4-1: Affected local and provincial roads

Areas other than the national, provincial and local roads that will be affected by the increased traffic demand on the roads are listed on the following pages.

4.1.1 LIMITED CAPACITY AT HENDRIK VERWOERD TUNNELS

These tunnels are situated along the N1, roughly 35 km south of the site. They were constructed for a single carriageway, with one lane in each direction. These tunnels will not be able to accommodate the additional traffic demand. Upgrading these tunnels to accommodate an additional lane in each direction will have an impact on the environment, as well as a severe cost implication. The location and illustration of these tunnels can be observed in Figure 4-2 below.

Figure 4-2: Hendrik Verwoerd tunnels

4.1.2 CONGESTION AT TRANSPORT NODES

Several new interchanges will have to be implemented. These interchanges will require additional road reserves, which in return will result in land expropriation. Currently, four new interchanges are proposed and include:

- The interchange at the R523 and N1;
- The interchange at Huntleigh Road and N1;
- The interchange at R525 and N1, which will serve as the primary access to the site; and
- The interchange along the new N1 route situated at Musina.

The locations of these proposed interchanges are indicated in Figure 4-3 below.

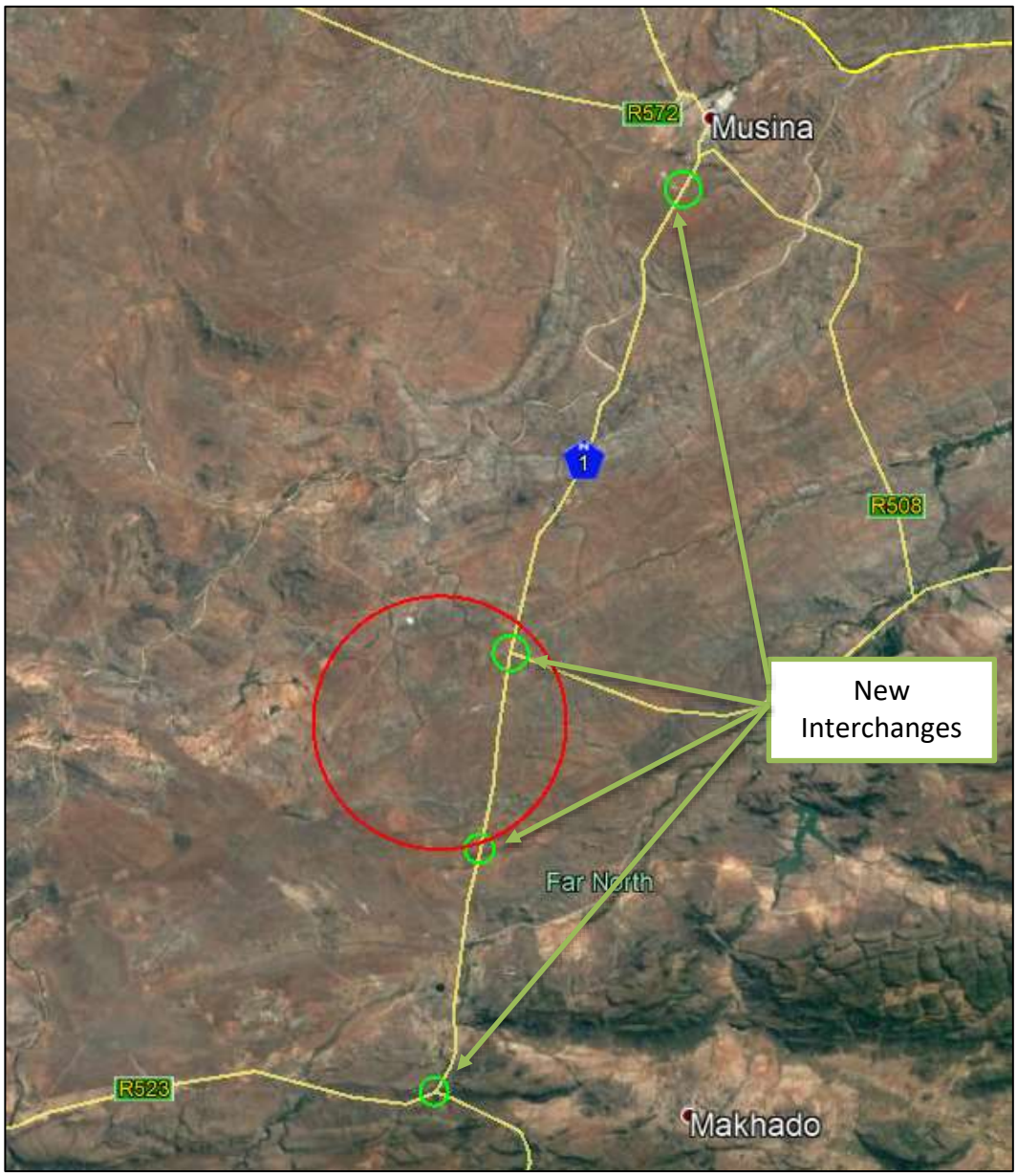

Figure 4-3: Proposed interchanges along the N1

4.1.3 CONGESTION IN NEIGHBOURING TOWNS

Although this can be considered a good thing for additional business development and opportunities in Musina and Louis Trichardt, various large-scale transport infrastructure upgrades will be required to secure these possibilities. Driver and pedestrian safety issues may arise in these two adjacent towns due to the increased traffic volumes which are generated by the SEZ. The locations of these two adjacent towns are indicated below in Figure 4-4.

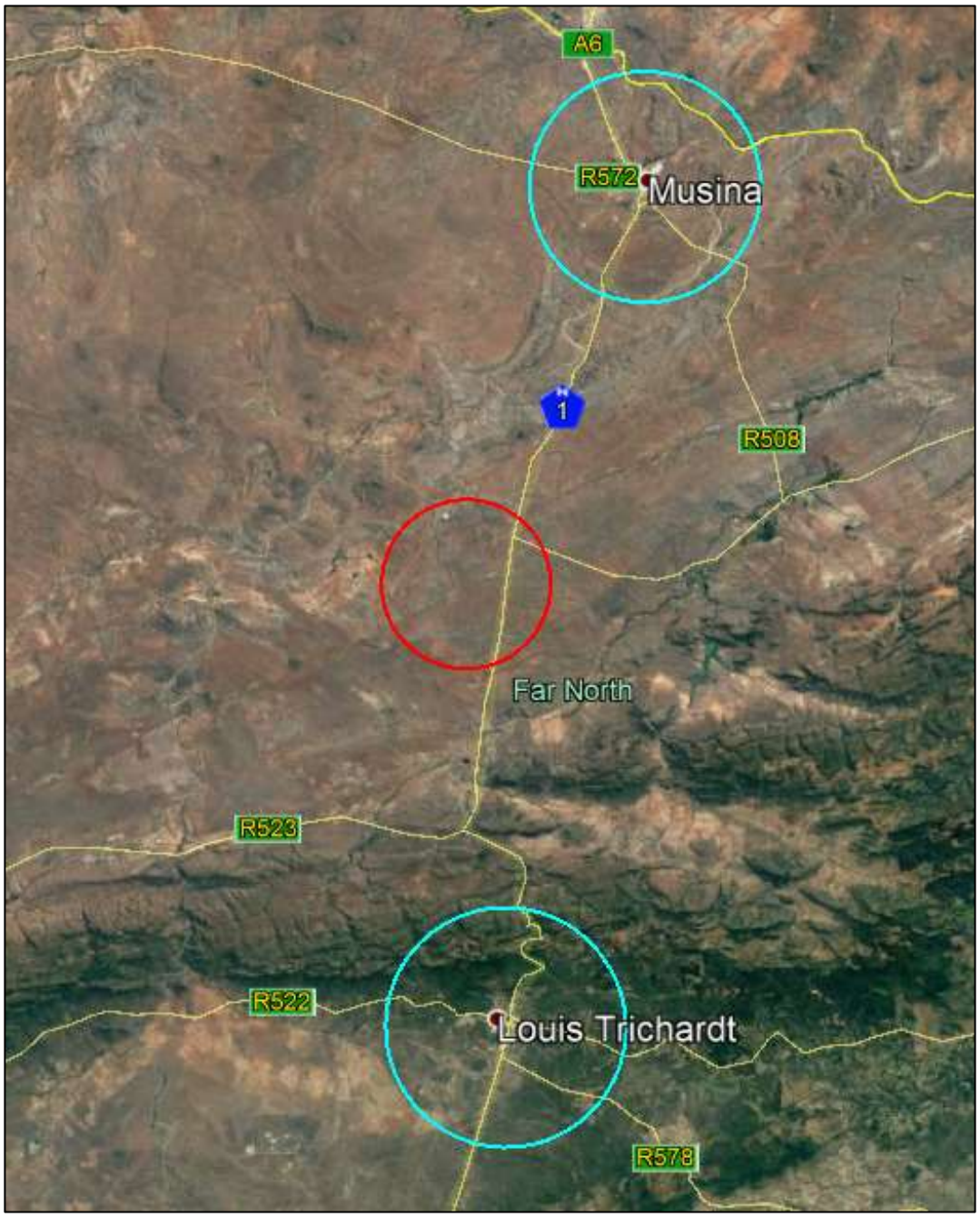

Figure 4-4: Affected towns with increased congestion

4.1.4 CONGESTION AT BEIT BRIDGE

Beit Bridge serves as the border post between South Africa and Zimbabwe, and will be utilised for trade once the site has been established. The increased number of road freight that will pass through the border post will create further congestion and increased travel time for commuters between South Africa and Zimbabwe. The border post will require several upgrades to ensure acceptable level of service. These upgrades include upgrading road capacity, additional stacking facilities, upgrades regarding operational services, etc. The locality of this border post can be observed in Figure 4-5 below.

Figure 4-5: Limited capacity at Beit Bridge

4.1.5 LIMITED PUBLIC TRANSPORT

The site currently has no public transport facility. In order to limited congestion on roads, adequate public transport facilities should be implemented for the site. These facilities should prioritise the use of dedicated bus services, as well as using the existing railway to transport workers at the SEZ. Locations of some areas that will require adequate public transport facilities can be observed in Figure 4-6 below.

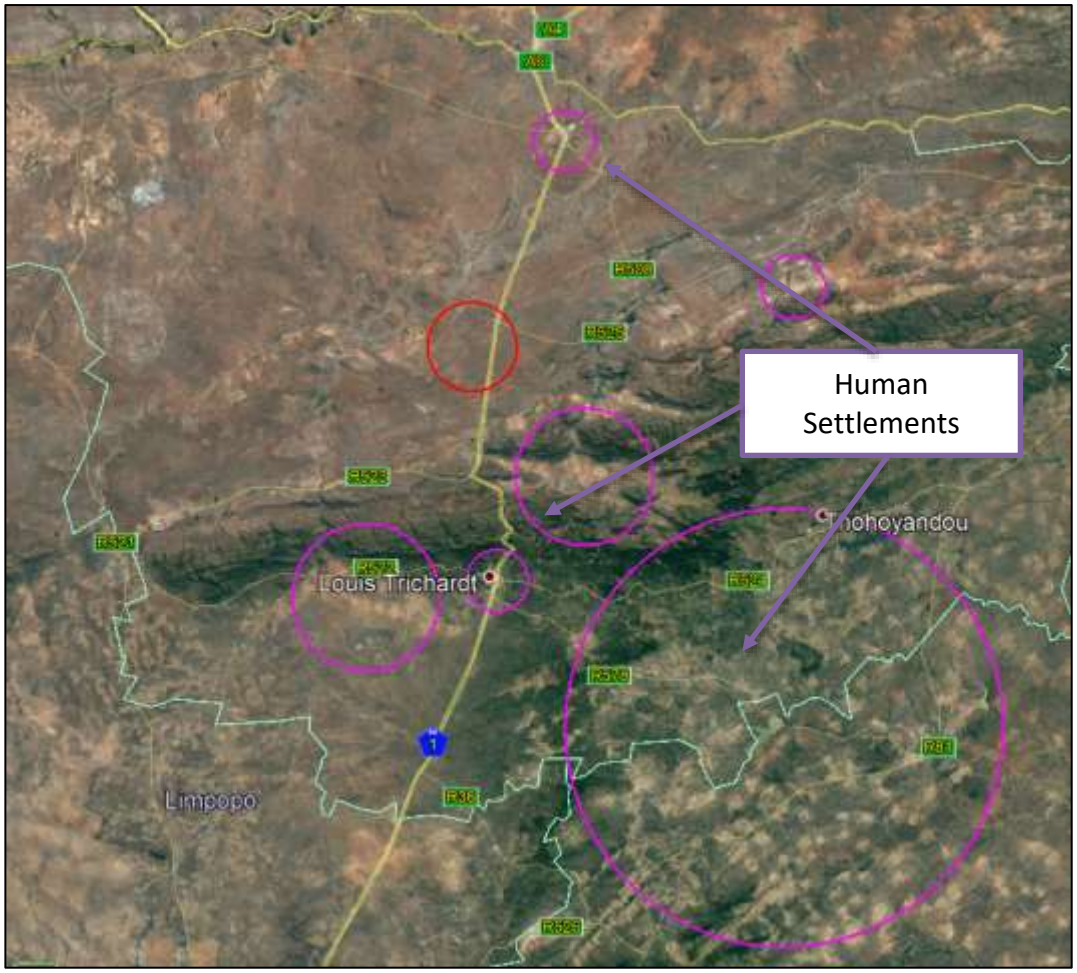

Figure 4-6: Limited public transport services to communities

4.2 MUSINA-MAKHADO SEZ POTENTIAL INCREASE IN RAIL TRAFFIC

The increase in rail freight can be considered one of the biggest contributors of additional traffic on existing transport infrastructure. The site will depend on importing raw material and exporting finished products. The use of railway services that will be utilised by the site will have an influence on the entire railway network of South Africa. Materials from other provinces will be used as raw materials for the site and finished products will be exported to international companies through various ports in South Africa. Some upgrades that were considered are indicated on the following pages.

4.2.1 LIMITED RAILWAY INFRASTRUCTURE ON SITE

There is currently no existing infrastructure on site to accommodate any importing and exporting of materials and finished products. A new proposed intermodal facility is proposed that will integrate road and rail freight of the site. The SEZ will not be able to operate without this new proposed facility.

4.2.2 LIMITED CAPACITY OF EXISTING RAILWAY STATIONS

These stations refer to all the train stations that are situated within the Vhembe District. These stations should be able to accommodate the additional freight, as well as possible commuters to and from the SEZ. Mopane station is situated adjacent to the site and will serve as the primary access for existing railway operations to the site. This station should be integrated into the proposed intermodal facility to ensure accessibility for freight and commuters and to reduce congestion on the road networks.

4.2.3 LACK OF FUNCTIONALITY OF RAIL NETWORKS

Although the site is accessible through existing railway networks, most of these railway systems are currently under-utilised and not operational. The railway system adjacent to the site is a single track, diesel operated system and will not be able to accommodate the additional freight demand. Some systems will have to be upgraded through electrification or adding additional tracks.

Most of the northern railway networks situated in Limpopo are under-utilised, but systems in Gauteng and towards KwaZulu-Natal are currently operating at capacity. Nationwide upgrades will be required and the extent of these upgrades cannot be determined at this stage.

4.2.4 LIMITED CAPACITY OF PORTS

The use of ports for the SEZ will ensure exporting of finished products to international clients. The SEZ will generate additional freight towards Durban and Maputo ports. Detailed studies should be done to estimate the actual capacity before and after the SEZ, but it can be estimated that these ports will experience additional demands, which could result in congestion that will require upgrades at these ports.

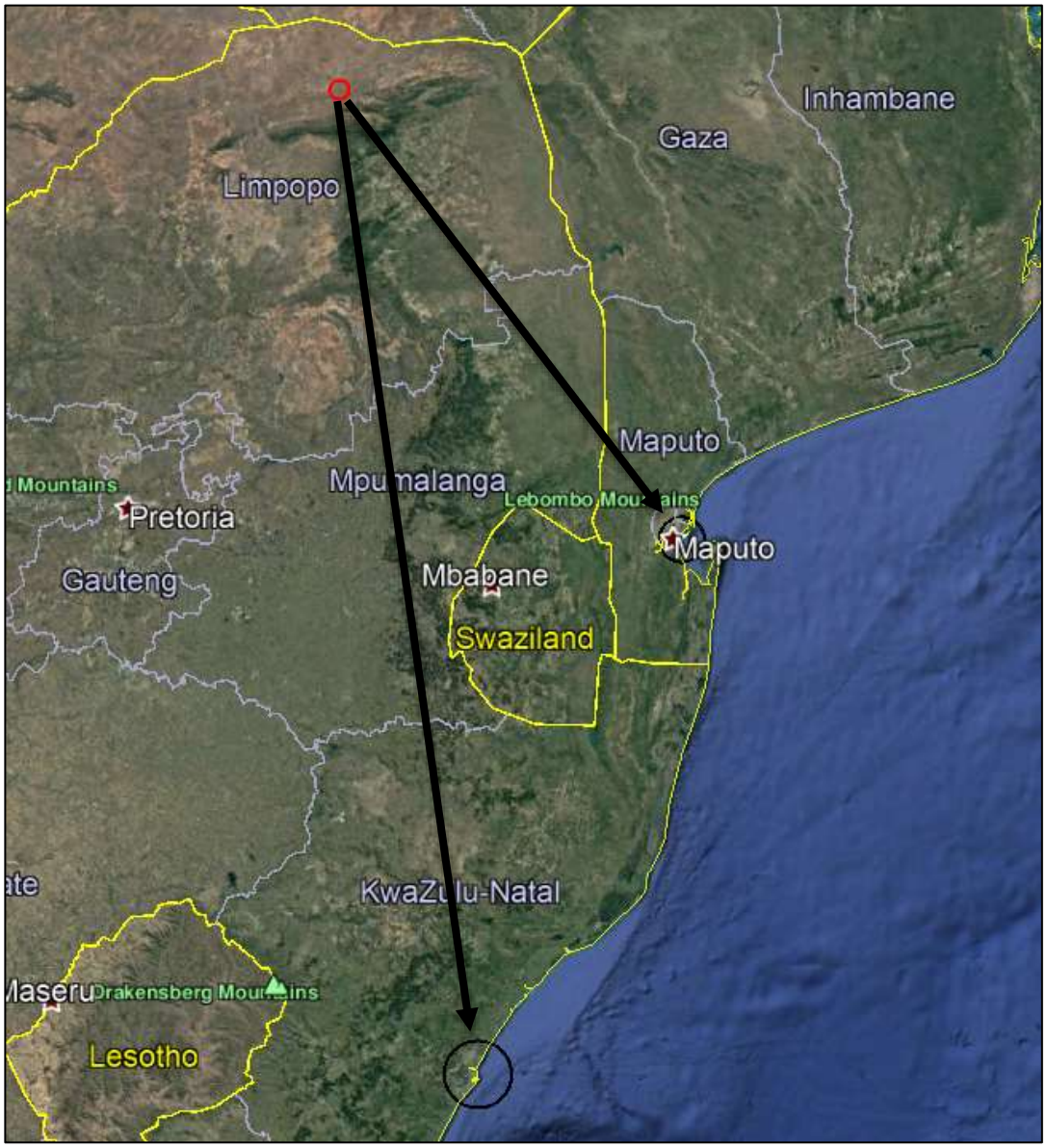

Figure 4-7: Limited capacity of existing ports

4.3 MUSINA-MAKHADO SEZ POTENTIAL INCREASE IN AIR TRAFFIC

Additional air traffic can be considered as the increase of passengers that will make use of airport, through either private or commercial airlines. The site does not have its own airstrip so facilities such as the Musina and Makhado airstrips will be used.

5 ROADS AND TRANSPORT ASSESSMENT RATING

The impact of the proposed development on the roads and transport is assessed in terms of the criteria in Appendix A.

6 CONCLUSION

The proposed SEZ is the first of its type in the Limpopo province. However, there are nine other SEZs in South Africa that are in the planning and operation phase.

The SEZ will function as a geographically designated area of the Limpopo Province set aside for specifically targeted economic activities to promote national economic growth and export.

Given the significant impact on the roads and transport infrastructure, this development could only become desirable and gain the necessary support if the infrastructure benefits accrued can be demonstrated clearly to the general public and to the regional community which will be impacted greatly by the proposed development.

7 REFERENCES

Adam, A. et al. CSIR Building and Construction Technology. Guidelines for Human Settlement Planning and Design 2000.

Indalo Development Consultants, Makhado Spatial Development Framework, 2019.

iX Engineers (Pty) Ltd, MCC and Hoimor, Musina-Makhado SEZ Southern Site – Internal Master Planning, 10 September 2019.

iX Engineers, EMSEZ – Internal Masterplan, Extract of Land Use and Infrastructure, 10 September 2019.

Limpopo Provincial Government, Development of the Limpopo Integrated Infrastructure Master Plan (LIIMP), March 2017.

Limpopo Provincial Government, Growth and Development Strategy, 2004.

Limpopo Provincial Government, Limpopo Development Plan (LDP) 2015-2019, March 2015.

Limpopo Provincial Government, Limpopo Employment, Growth and Development Plan, 2009 – 2014.

Makhado Municipality Integrated Development Plan 2019/2020.

Mott MacDonald, Draft Report: Musina Logistics Special Economic Zone, November 2014.

Mott MacDonald, Makhado (SAEMIDZ) Development in Limpopo Province, June 2015.

Musina Local Municipality Draft Integrated Development Plan 2019/20.

StatsSA, Community Survey Limpopo Province, 2016.

The China/South Africa Metallurgical Project Technical Exchange Workshop Musina-Makhado SEZ, 14 November 2017.

TradeMark Southern Africa, North South Corridor, Delivering an integrated and sustainable transport network, Regional Transport Roundtable, October 2012.

Vhembe District Municipality IDP 2012-2017.

Vhembe District Municipality IDP 2019/20 Review.

Vhembe District Municipality IDP 2017/18-2021/22 IDP.

APPENDIX A: ROADS AND TRANSPORT IMPACT RATING

MUSINA-MAKHADO SEZ

Road Infrastructure

Aspect	Mitigation Measures	Status	Mitigation	Intensity (I)	Extent (E)	Duration (D)	Probability (P)	Significance (I+E+D)xP
Excesive Road Congestion	Upgrading the N1 to a four-lane dual carraigeway from Polokwane to Musina and upgrading of various local and provincial roads.	-	Without	16	3	5	1	24
		-	With	8	3	4	0.75	11.25

Aspect	Mitigation Measures	Status	Mitigation	Intensity (I)	Extent (E)	Duration (D)	Probability (P)	Significance (I+E+D)xP
Limited Capacity at Hendrik Verwoerd Tunnels	Upgrade tunnels to accommodate a four-lane dual carraigeway	-	Without	16	3	5	1	24
		-	With	8	3	5	0.5	8

Aspect	Mitigation Measures	Status	Mitigation	Intensity (I)	Extent (E)	Duration (D)	Probability (P)	Significance (I+E+D)xP
Congestion at Transport Nodes	The Construction of several new interchanges along the N1	-	Without	16	3	5	1	24
		-	With	8	3	4	0.75	11.25

Aspect	Mitigation Measures	Status	Mitigation	Intensity (I)	Extent (E)	Duration (D)	Probability (P)	Significance (I+E+D)xP
Congestion in neighbouring towns	Upgrading existing transport infrastructure in surrounding towns	-	Without	16	3	5	1	24
		-	With	8	4	4	0.5	8

Aspect	Mitigation Measures	Status	Mitigation	Intensity (I)	Extent (E)	Duration (D)	Probability (P)	Significance (I+E+D)xP
Congestion at Beit Bridge	Upgrading of the border post between South Africa and Zimbabwe	-	Without	16	5	5	1	26
		-	With	4	5	3	0.5	6

Aspect	Mitigation Measures	Status	Mitigation	Intensity (I)	Extent (E)	Duration (D)	Probability (P)	Significance (I+E+D)xP
Limited Public Transport	Providing adequate public transport systems and facilities for surrounding human settlements	-	Without	16	3	5	1	24
		-	With	4	3	4	0.5	5.5

Rail Infrastructure

Aspect	Mitigation Measures	Status	Mitigation	Intensity (I)	Extent (E)	Duration (D)	Probability (P)	Significance (I+E+D)xP
Limited Railway Infrastructure on Site	New Intermodal facility to accommodate freight transport	-	Without	16	4	5	1	25
		-	With	8	4	5	0.5	8.5

Aspect	Mitigation Measures	Status	Mitigation	Intensity (I)	Extent (E)	Duration (D)	Probability (P)	Significance (I+E+D)xP
Limited Capacity of Existing Railway Stations	Upgrading of affected railway stations	-	Without	16	4	5	1	25
		-	With	8	4	5	0.5	8.5

Aspect	Mitigation Measures	Status	Mitigation	Intensity (I)	Extent (E)	Duration (D)	Probability (P)	Significance (I+E+D)xP

Lack of Functionality of Rail Networks	Upgrading of national railway systems to accommodate SEZ demand	-	Without	16	4	5	1	25
		-	With	16	4	5	0.5	12.5

Aspect	Mitigation Measures	Status	Mitigation	Intensity (I)	Extent (E)	Duration (D)	Probability (P)	Significance (I+E+D)xP
Limited Capacity of Ports	Upgrading of Durban and Maputo Ports	-	Without	16	5	5	1	26
		-	With	8	5	5	0.5	9

Air Travel Infrastructure

Aspect	Mitigation Measures	Status	Mitigation	Intensity (I)	Extent (E)	Duration (D)	Probability (P)	Significance (I+E+D)xP
Limited Capacity of existing airports and airstrips	Upgrading of airport and airstrips	-	Without	8	4	4	0.75	12
		-	With	4	4	4	0.5	6